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Risk Perception Gaps Between Construction Investors and Financial Investors of International Public–Private Partnership (PPP) Projects

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Abstract: Many international public–private partnership projects have suffered from frequent project pending status or failure because of dissimilar interests among stakeholders over projects' long development period. Thus, this study compares the perception gaps of 27 risks between Korean construction investors and Korean financial investors depending on different development phases of international public–private partnership projects. In the project selection phase, construction investors and financial investors show few risk perception gaps. However, in the bid and proposal phase, they perceive many risks differently: construction investors tend to perceive the construction risk and financial risk as more important, whereas financial investors perceive stakeholder risk and country risk as more significant. This study also discusses the causes of risk perception gaps from three perspectives: (1) time-dependent risk; (2) risk exposure period; (3) risk transfer and responsibility. These findings will be helpful in recognizing the dynamic risk perception gaps between two leading investors for the sustainable development and investment of international PPP projects.

Keywords: public–private partnership project; project development; risk perception gap; construction investor; financial investor

1. Introduction

International public–private partnership (PPP) projects have become increasingly popular over the last two decades, with the market growing from USD 447 billion (1998–2007) to USD 1049 billion (2008–2017) [1]. Project developers, construction companies, and financial institutions have increased their interest, and have made effort to participate, develop, and implement, PPP projects. Nevertheless, many PPP projects have become pending or eventually failed for various reasons [2]. For example, the Magdalena river project in Colombia failed to raise finance due to corruption issues that involved one of the private shareholders [3], and the Hyderabad Metro project in Thailand also failed to reach financial closure due to inadequate due diligence by an inexperienced lead developer [4].

Many studies investigate which risk induces the failure or success of PPP projects. Some studies identified the risk factors or critical success factors for PPP projects [5–11]. A group of studies derived the quantitative relations between the risk amount and success of the PPP project [12–16]. Other studies analyzed the risk perception and suggested the risk allocation strategies between PPP stakeholders [7,8,14,17]. These studies have contributed to expanding the body of the knowledge for developing successful PPP projects.

However, to the authors' best knowledge, some important issues remain under-studied. International PPP projects are different from traditional delivery methods in several respects,

which impedes sustainable development and investment. The salient characteristic of the PPP project is the involvement of various stakeholders. Due to the dissimilar interests among stakeholders, project goals could not easily align at each phase, which is recognized as a major reason for PPP project failure [18]. Thus, for sustainable project development and investment, understanding how much and why the risk perception gap exists among stakeholders is essential to align the project goals and establish an appropriate strategy.

From the perspective of stakeholder perception, knowledge regarding the current needs should be enhanced in two aspects. First, few studies have analyzed the time-dependent risk perception according to the PPP project development phase. Risk is reduced, increased, or transferred as the PPP project develops, which impacts the risk perception gaps between the project stakeholders so that the risk perception can vary depending on the phase. Only a few studies solely mentioned the different issues according to the project development phase [6,9,19,20]. Second, previous research mostly focused on the perception gap between the public and private sectors [7,8,17]. Whenever a PPP is chosen, the public agrees to transfer full or partial control over the project to the private within the contractual arrangements. In addition, many governments enhanced the value of PPP by providing a minimum revenue guarantee (MRG) or by supporting a government subsidy [21]. Brazil, Canada, Chile, Columbia, Spain, and the United Kingdom offers MRG to PPP projects for sharing the revenue risk [22]. Whereas Japan, United States and Vietnam do not support MRG. In addition, in 2009, the Korean government discontinued offering the MRG to the private sector after experiencing the excessive fiscal burden [23]. The roles and responsibilities of the private sector is increased for more risks. So, the financial risk of the private sector is increased in many projects. The risk perception and the risk allocation between private stakeholders became a more crucial factor for successful PPP project development.

In these contexts, the objectives of this study are: first, this study statistically compares the risk perception gaps between two private leading investors in project selection phase and in bid and proposal phase. International PPP projects developed by Korean investors are usually leaded by a construction investor (CI) and financial investor (FI). This paper will explain the detail of CI and FI at Section 2.2.2. Second, this study discusses the causes of these perception gaps and suggests several strategies, which help to increase the viability and bankability of international PPP projects. This study follows the research process (Figure 1): (1) define the development phase of international PPP project (2); identify the risk factors through a literature review and expert interviews; (3) survey the risk perception of Korean CI and FI; (4) evaluate the weight of risk factors; (5) compare the risk perception gap between CI and FI depending on the development phase; and (6) discuss the three causes of risk perception gap.

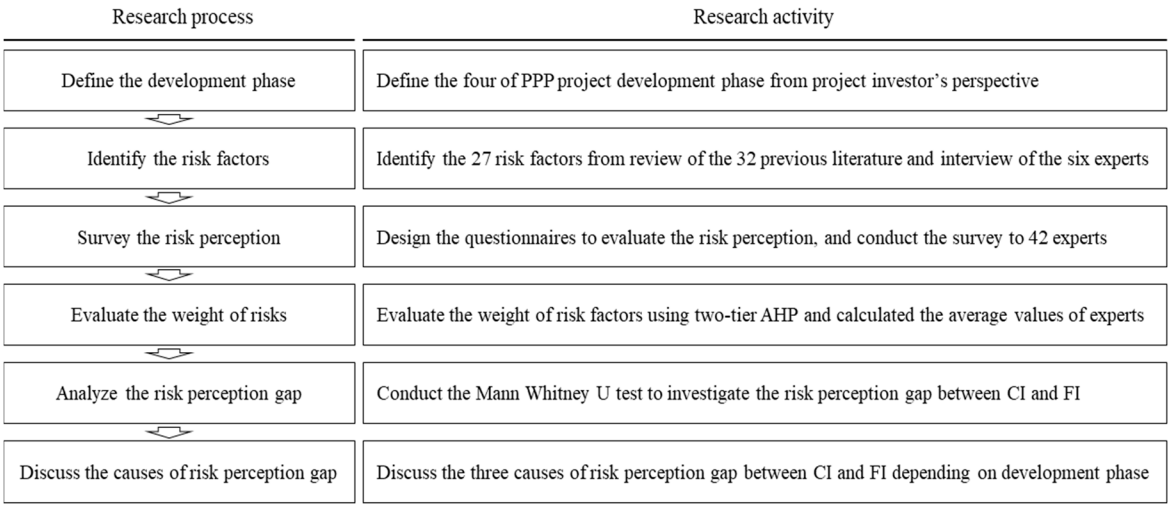

Figure 1. Research Process.

2. Research Backgrounds

2.1. Development Phase of an International PPP Project

An international PPP project development phase varies according to government regulation, solicited/unsolicited project, and owner/developer perspective. Thus, many studies suggested different development phases, as shown in Figure 2. The United Nations Economic and Social Commission for Asia and the Pacific (UN ESCAP) [24] provides the PPP process and guidance, which consists of four development phases: project identification and preparatory activities, project development and due diligence, implementation arrangement and pre-procurement, procurement, and project construction. Farquharson et al. [25] categorized the development process into six phases: need analysis, project selection, project preparation, bidder qualification, request for bidder proposal, and financial close, whereas the European investment bank European PPP expertise center [26] divided the development process into six phases: project selection and definition, assessment of the PPP option, getting organized, pre-tendering work, bidding process, PPP contract, and financial close. The World Bank [19] provided PPP process and guidance comprising five development phases: identifying priority projects, appraising and structuring projects, designing contracts, managing transactions, managing contracts. Like the examples above, it is difficult to construct a standardized PPP development phase to satisfy all cases. So, this study assumes four different development phases from the international PPP project investor: (1) project selection phase; (2) project structuring phases; (3) bid and proposal phase; and (4) award and contract phase. This study focuses on analyzing risk perception gaps in the project selection phase and in the bid and proposal phase (Figure 2).

2.2. Stakeholders in International PPP Projects

2.2.1. Previous Research about Stakeholder Theory on PPP Project

Stakeholder theory was developed as a perspective of strategic business management. Stakeholder theory puts the emphasis on the interconnected relationships between stakeholders not just shareholders and states that a firm should create value for all stakeholders [27]. As stakeholder is defined as "any group or individual who can affect or is affected by the achievement of the organization's objectives" [27], and stakeholder approach identifies the stakeholders and both establishes and recommends methods by which management can satisfy interests of various stakeholders [28]. The concept of stakeholders has been adopted from the domain of strategic management to areas including business ethics, corporate social responsibility (CSR), and environmental justice [29]. Previous applications in various areas make stakeholder theory well suited for the researches incorporating perspectives of various stakeholder [30].

PMI [31] states that project stakeholders are individuals and organizations that are actively involved in the project or whose interests may be affected by a project outcome. In many research studies, project stakeholders are considered an important factor from the various aspects of project management such as project evaluation, project environment, and project strategy [32]. More specifically, for successful project outcomes, Jergeas et al. [33] identified "setting of common goals, objectives and project priorities" as one of the important aspects for managing of stakeholders. Olander and Landin [34] identified five factors within the stakeholder management process. These factors include "analysis of stakeholder concerns and needs; communication of benefits and negative impacts".

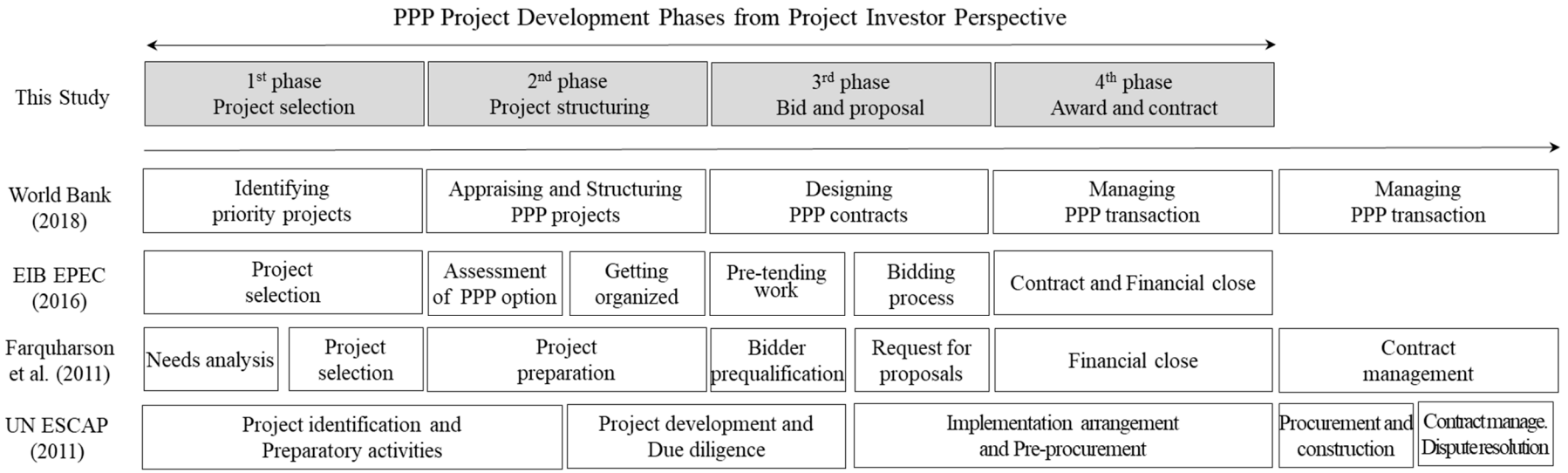

Figure 2. Development phase of public–private partnership (PPP) Projects.

In PPP projects, many stakeholders, such as equity investors, loan investors, government departments, project owners, construction contractors, operation contractors, financial agencies, legal agencies, and local end-users are involved [35]. The complicated stakeholder structure of PPP is the main reason for unpredictable project outcomes [30]. Because of the complex structure, project goals do not easily align with those of the various stakeholders, and in some cases, they are oppositional [36]. Stakeholder opposition has been reported as the main reason for failure in several major PPP projects [18]. Stakeholder opposition mainly emerges from the gap between the expectations of different stakeholders and the desired process or outcome of the project [37]. To prevent stakeholder opposition, one needs to understand and manage stakeholders' perceptions and objectives [30,38,39]. In other words, capturing and addressing risk perception according to each stakeholder is crucial for the success and sustainability of PPP project development.

2.2.2. Private Stakeholders in International PPP Project

All stakeholders are important for a successful project; as aforementioned, the participation of private stakeholders is essential for successful PPP project development [40]. When opting for a PPP, the public sector contracts with a special purpose company (SPC) to design, build, finance, maintain, and operate infrastructure. The private instead of the public becomes at the nexus of contracts unlike traditional project delivery. Especially for project development, equity investors and loan investors play a most important role in SPC to make a feasible and bankable PPP project [38].

Equity investors invest their money in an SPC in exchange for a share in ownership. If the PPP construction project is completed on time and yields the planned profits, equity investors can gain the dividends corresponding to their investment. However, if the project delays or fails to yield revenue according to their expectations, they might not earn the planned return [19]. In many cases, equity investors in the PPP project will simultaneously pursue extra earnings besides the dividend profit. For example, the CI, as the project sponsor and construction contractor, is a leading international PPP developer. CI earn not only from dividend profit but also from construction profit and prefer those earnings to dividends. Operation investors (OI), as equity investors and operation contractors, also pursue dividend profit and operation profit.

Loan investors lend their money to SPCs instead of receiving the principal and interest over a long period. Compared to domestic projects, international construction projects are frequently delayed and suspended. Further, predicting end-user demand for international projects is more difficult than for domestic projects [19]. For these reasons, international loan investors are more cautious about lending and generally request a more rigid requirement for SPCs [25]. Loan investors often participate as lenders and minor equity investors, so they can supervise the project development management and decision making. This type of lender is called FI. The FI, such as a commercial bank or export credit agency, lend loans to special purpose company (SPC) and invest small equity together with CI.

In Korea, most international PPP projects are led by CI and FI, who are major sponsors [41]. However, Korean CI have some different characteristics with Korean FI. CI are not only the project sponsor but also the project developer. So, CI are more susceptible to project viability than FI. Since the project developer should spend most of the development cost, they could lose high sunk costs, such as investigation, partnering, consulting, and the opportunity cost for other projects when one project fails to develop [25,42]. Furthermore, CI, who concurrently participate as the engineering-procurement-construction (EPC) contractors, tend to be more concerned with construction profit rather than dividend profit [42]. Whereas FI are more interested in lending rather than sponsoring. FI do not spend much of their money before the financial agreement, which means they are less concerned with the development cost. Since the international PPP project is one of the many investment portfolios for financial investors, lenders select the most favorable option, scrutinizing the project's bankability and the extent of stable profit over the long operation [43]. Thus, a lender requires a guarantee to secure equity and debt, such as recourse for financing the contract, obligation of the sponsor for repayment, enforceability of the contract and agreements, security rights and priority in insolvency,

right to step in project failure, availability of alternative contractors, and effective insurance [25,44]. FI come from sources, such as a commercial bank, export credit agency, or multilateral development bank, which usually gives them more bargaining power than CI.

3. Methodology

3.1. Risk Identification

This study reviewed 32 previous studies dealing with PPP project risks from journals related to construction projects and engineering published over the past 20 years (Journal of Management in Engineering, Journal of Construction Engineering and Management, IEEE Transactions on Engineering Management, International Journal of Project Management, Sustainability, Construction Management and Economics, Journal of Infrastructure Systems, etc.). From the review of literature, this study derived 78 initial risk factors. However, 78 factors are too many for an available survey and effective analysis. The pair-wise comparison of 78 factors for anayltical hierarchy process (AHP) is difficult and a burden to survey respondents. For this reason, this study needs to reduce the number of risk factors. This study invited six special experts, three construction investors, and three financial investors, whose experience in PPP projects exceeds ten years, to select the key risk factors between stakeholders over the duration of international PPP project development: (1) merging the risk factors which have similar definition; (2) eliminating the factors extraneous to the development phase; and (3) selecting the important risk factors based on the experience of experts. Finally, they chose the 27 factors assigned into four categories, as shown in Table 1. This study agrees that these key risk factors could be varied according to the type of product, each stakeholder's perspective, and the expert's experience and intuition [45,46].

For stakeholder risk, leading investors consider each potential participant to have sufficient experience in the host country and a track-record with the same product for successful development and implementation [10,14,35,47,48]. Equity investors and lenders assess project risks and assess how well risks are allocated among the stakeholders throughout the contract to ensure bankability [9,15,49–51].

For financial risk, equity investors reliably estimate a PPP project's cost and revenue and provide favorable and reasonable financial returns for potential investors [43,52–55]. When revenue or market value of product exceeds costs and yields enough return for profit, the project is regarded as commercially attractive [19,25,55,56]. Lenders scrutinize the associated cash flows to check that the profit is acceptable and the credit to ascertain the ability for loan repayment of project. Analyzing the market, business plan, and management capability could provide a standard for whether the cash flow is sufficient and steady, and liabilities are likely to expand [12,25,47,57,58].

For the construction risk, leading investors check and approve the required administrative work, such as the acquisition of business permits and licenses, land handover, and environmental regulations, which cause construction delays [5,8,10,25,59]. They also confirm that construction and operation are available using proven technologies without unreasonable risks [7,8], since any risks during the implementation phases cause delays, which bring huge losses to projects. Thus, EPC contractors should have enough capability to satisfy the technical requirements and comply with their obligations under the contract [5,7,8,10].

For country risk, investors carefully investigate the host country's political and economic status to maintain stable project development and implementation. Many projects have suffered from country risks, such as government interference, political reneging and withdrawal of support, termination of concession, and expropriation [10,15,16,59,60]. Equity investors and lenders ensure that a clear legal and regulatory framework exists to specify the rights and obligations for private sector investment and to facilitate private sector participation [14,48,60,61], because it increases the certainty of long-term PPP contracts to successfully attract investment from the private sector [8,16,57].

Table 1. Risk factors over international PPP project development.

Level-1	Level-2	Definition of Risk	References
Stakeholder Risk	Track record of leading investor	Leading investor does not experience PPP projects in the host country, and has no financial soundness	[9,15,47,59]
	Track record of EPC contractor	EPC contractor does not experience PPP projects in the host country, and has no financial soundness	[5,7,8,35]
	Track record of O&M contractor	O&M contractor does not experience PPP projects in the host country, and has no financial soundness	[10,15,25,35]
	Track record of public authorities	The public authorities do not experience PPP projects in the host country, and has no financial soundness	[9,10,51,62]
	Voting rights among stakeholders	Decision-making process and authority among stakeholders are arbitrary established by leading company	[14,47,54]
	Risk allocation among stakeholders	Risk and responsibilities are not fairly allocated from each stakeholder perspective	[8,11,15,50]
Financial Risk	Uncertainty of project cost	The accuracy of project cost estimation is not reliable and does not consider the risks and uncertainties	[12,25,44,62]
	Demand and Tariff	Risk of demand and end-user price is not secured by agreement or government guarantee	[25,43,54,61]
	Stable feedstock	Fuel supply is not expected to be provided by agreement or government guarantee	[8,44,61]
	MDB/ECA/ODA assistance	Multilateral Development Bank, Export Credit Agency or Official Development Assistance do not participate	[25,58]
	Willingness of financial investor	Financial investors are not interested in international PPP project comparing other financial investment	[5,10,53]
	Project IRR	Internal rate of return (IRR) of project is not highly attractive to project investors	[15,16,47,52]
	Payback period	Payback period of SPC is evaluated as relatively long to attract financial investors	[16,25,43]
Construction Risk	Permit and license	Construction permit process and license requirement are not established in host country	[5,7,8,25]
	Site handover	Site is expected to be handover as planned by local government	[5,7,8,25]
	Environmental regulation	There could be environmental issues and strict environmental regulation to suspend construction completion	[6,11,25,54]
	Local resource availability	Local resources such as material, equipment, and labor are not available in host country	[13,14,17,39]
	Technical uncertainty	There could be significant technical risk to delay construction completion or reduce construction quality	[7,8,51]
	Public acceptance	There could be significant public acceptance issues to suspend construction completion	[10,16,17,39]
	Construction period	Construction period is evaluated too short to complete construction as planned	[8,13,17]
Country Risk	Country credit rating	Country credit rating from authorized financial institution is not appropriate to invest	[13,16,44]
	Political risk	Political status of host country is not stable and property rights are not secured	[11,25,49]
	Legal and regulatory risk	Legal/regulatory framework for PPP project is not established	[25,48,63]
	Economic growth risk	Average economic growth rate over five years was low to attract financial investors	[15,43,62]
	Inflation risk	Average inflation rate over five years was high and the economic condition is unstable	[7,8,14]
	Corruption risk	Corruption is expected to hard to perform construction completion	[7,8,14]
	Exchange risk	Payment currency is local currency or cannot be hedged	[5,8,11]

3.2. Questionnaire and Survey

This study designed the structured questionnaire survey to evaluate perceptions on the importance of each risk factor in the project selection phase and the bid and proposal phase. The survey consisted of three parts. Part one acquired basic information, such as respondent profiles and the expertise regarding PPP projects. In part two, the participant evaluated the relative importance of the four level-1 risk factors in the first and third development phases. Part three investigated the relative importance of the level-2 risk within the same level-1 risk factors in two different phases (Appendix A).

The survey targeted Korean CI and FI for research objectives to compare the risk perception gap between CI and FI. Among the more than two hundred international PPP projects conducted by Korean companies, more than half are ongoing or ended in the first phase [64]. In addition, the number of international PPP experienced by Korean investors is limited. So, this study used purposive sampling for reliability of survey and high response rate. Thus, this study distributed the 60 questionnaires to the CI and FI who experienced at least one bid and proposal phase of the international PPP projects. Among the 60 distributed questionnaires, 42 responded and were subsequently analyzed, resulting in a response rate of 70%: 21 respondents were CI from EPC contractors, whose average experience is 15.8 years in construction projects and 7.2 years in PPP projects; and 21 respondents were FI from an export credit agency, commercial bank, and investment bank, whose average PPP project experience is 7.5 years.

3.3. Weight Measurement

Many weight measurement methods such as AHP, the analytic network process (ANP), the preference ranking organization method for enrichment of evaluations (PROMETHEE), and fuzzy set theory are used in the field of project and risk management fields. Among them, this study selected two-step AHP to measure the weight of the risk factors, which helps to prioritize or rank the factors and distinguish the more important factors from the less important factors [65]. AHP uses the pairwise comparison matrix within risk factors and calculates and orders the relative importance of risks [66–68]. AHP has benefits to collect multilateral data and ensures the consistency of the risk perception from the subjective value of many experts [69]. Particularity, if the number of available project cases and experts is small, AHP is used for accurate evaluation by objectively synthesizing the opinion of limited experts [69]. From these advantages, the Korean Development Institute which is in charge of the feasibility study of governmental investment projects, uses the AHP method to assess the project feasibility. Thus, this study selected the AHP to measure the weight of risks.

The AHP values of level-1 and level-2 risk factors were calculated using Microsoft Excel set by the authors, and the output included, for each respondent, weights for level-1, level-2 risk factors, and the consistency ratio (CR) for each matrix. The CR is used to measure the inconsistency in the pair-wise comparison [65,70]. If the CR values satisfy the acceptable criteria, usually below than 0.1, the weighted results are valid [71]. This study checked that the CR for all respondents is below 0.1, then used them for analysis.

In Figure 3, level-1 AHP weight (W_i) refers to the relative importance of risk factors among four level-1 risk factors. Level-2 AHP weight (W_{ij}) refers to the relative importance of risk factors included in the same level-1 risk. This study determined the weight of each factor by multiplying the AHP weight of level-1 factors and level-2 factors (Equation (1)), and the total sum of the weight of 27 risk factors equals one (Equation (2)).

$$\text{Weight of risk factor} = W_i \times W_{ij} \tag{1}$$

$$\sum_i \sum_j W_{ij} = 1 \tag{2}$$

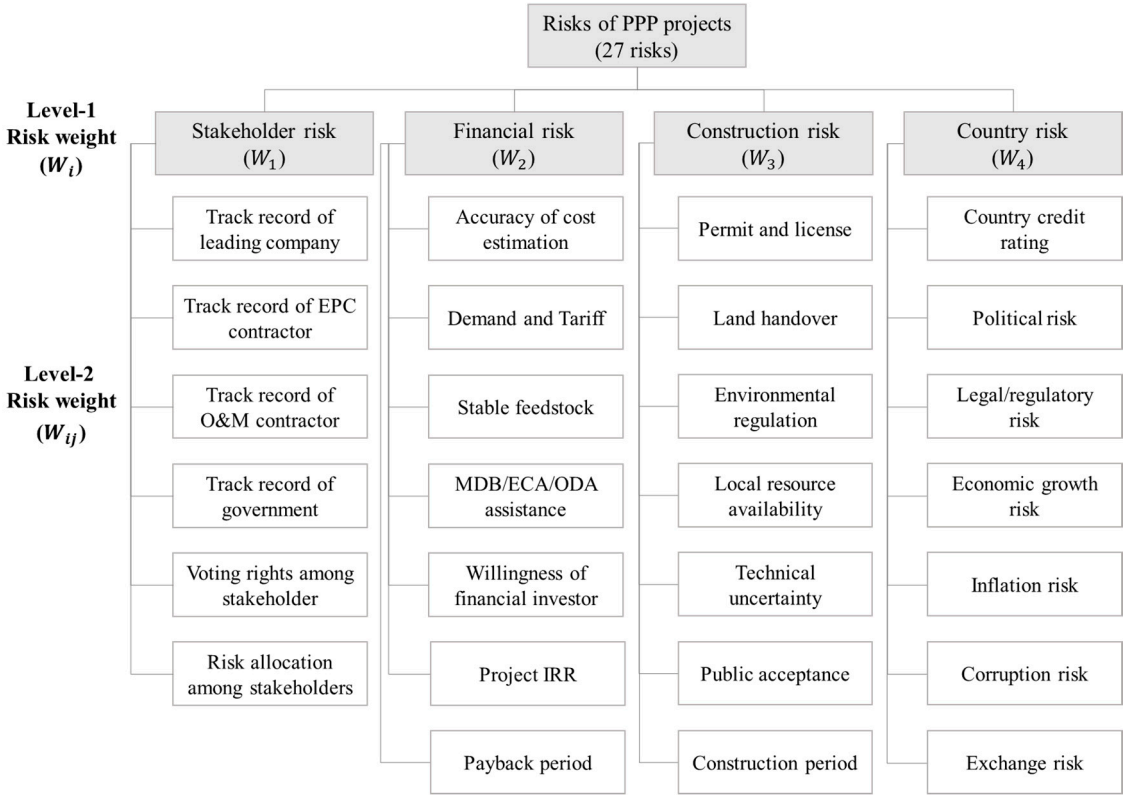

Figure 3. Level-1 and level-2 AHP structure.

3.4. Mann–Whitney U test

The Mann–Whitney U test is a nonparametric alternative for two-sample t-test used to compare two sets of values [72]. If the result of this test is significant ($p < 0.05$), it means that two sets of values are statistically significant different [14]. This study used a Mann–Whitney U test to demonstrate the risk perception gap between the CI and FI. In each phase of project development, the weight of each risk of CI and FI is compared. When the *p*-value of the Mann–Whitney test is below 0.05, the result is interpreted as a statistically significant risk perception gap that exists between CI and FI.

4. Results

4.1. Risk Perception Gap in Project Selection Phase

Table 2 shows the weight and rank of risk factors at the first phase through the results of AHP analysis and the *p*-value of the Mann–Whitney U test that shows the significance of differences of weight (risk perception gap) between the construction investor and financial investor in the project selection phase.

Table 2. Risk weight and rank of the construction investor (CI) and financial investor (FI) in the project selection phase.

Risk Factors	Construction Investor		Financial Investor		*p*-Value
	Weight	Rank	Weight	Rank	
Stakeholder risk	0.338	1	0.388	1	0.047 *
- Track record of leading company	0.076	1	0.094	1	0.194
- Track record of EPC contractor	0.051	5	0.067	2	0.050 *
- Track record of O&M contractor	0.049	6	0.058	4	0.086
- Track record of public authorities	0.053	4	0.057	5	0.659
- Voting rights among stakeholders	0.054	3	0.055	6	0.344
- Risk allocation among stakeholders	0.056	2	0.058	3	0.596
Financial risk	0.230	3	0.215	3	0.385
- Uncertainty of project cost	0.041	8	0.043	9	0.657
- Demand and Tariff	0.038	10	0.040	10	0.667
- Stable feedstock	0.031	16	0.031	13	0.605
- MDB/ECA/ODA assistance	0.029	20	0.029	15	0.919
- Willingness of financial investor	0.031	17	0.028	16	0.470
- Project IRR	0.032	15	0.023	20	0.018 *
- Payback period	0.028	21	0.021	23	0.113
Construction risk	0.188	4	0.171	4	0.890
- Permit and license	0.032	14	0.036	11	0.791
- Land handover	0.031	18	0.031	12	0.316
- Environmental regulation	0.027	23	0.022	21	0.037 *
- Local resource availability	0.023	27	0.022	22	0.898
- Technical uncertainty	0.024	25	0.021	25	0.469
- Public acceptance	0.027	24	0.020	26	0.105
- Construction period	0.024	26	0.019	27	0.255
Country risk	0.244	2	0.226	2	0.372
- Country credit rating	0.041	9	0.053	7	0.112
- Political risk	0.042	7	0.048	8	0.734
- Legal/regulatory risk	0.038	11	0.031	14	0.042 *
- Economic growth risk	0.030	19	0.023	19	0.128
- Inflation risk	0.028	22	0.025	18	0.380
- Corruption risk	0.032	13	0.025	17	0.224
- Exchange risk	0.034	12	0.021	24	0.008 **

*: p-value < 0.05 which refers to statistically significant; **: p-value < 0.01 which refers to statistically highly significant

4.1.1. Stakeholder Risk

The risk perception gap between construction investors and financial investors exists in "Stakeholder risk" in the project selection phase (p = 0.047). FI (weight = 0.388) perceived the "Stakeholder risk" as more important than CI (weight = 0.338). Particularly, FI weight "Track record of EPC contractor" more than CI among level-2 risks (p = 0.050). The CI as an EPC contractor tends to overestimate capabilities to participate in the project, whereas the FI prefers to strictly evaluate the capability of an EPC contractor.

In spite of the difference in weight, both investors evaluated "Stakeholder risk" as most important in the first phase, since the capability of each stakeholder is critical to develop and implement the project and this capability is little improved over project development [10,47]. Among the level-2 risks included in "Stakeholder risk," "Track record of leading company" and "Risk allocation among stakeholder" were highly ranked by both the CI and FI. The leading company spends more money than others to develop a project without award guarantee with the major decision right to develop the project. Many studies have also identified the capability of the leading company as an important success factor of project development [5,11,35]. The well-allocated risk considering the strength and

weakness of each participant is a crucial success factor, because the ineffective allocation of risk and responsibilities decrease the project's viability [8,11,15,49].

4.1.2. Financial Risk

CI and FI do not differently perceive "Financial risk" at the project selection phase ($p = 0.385$). In the first phase, financial analysis inputs such as interest rate, escalation, end-user demand, and tariff, are not yet determined, which induces financial feasibility to be not very accurate. So, both investors do not strictly weight the value of financial risk until the due diligence at the proposal and bid phase. In this context, the level-2 risk perception gaps among "Financial risk" also do not exist except for "Project Internal Rate on Return (IRR)." CI perceived the "Project IRR" as more important than FI did ($p = 0.018$). IRR is usually proportional to the dividend rate of CI, whereas IRR is not proportional to the interest rate of FI. Therefore, the high-estimated IRR might be important criteria for CI to select the PPP project.

Both investors evaluated the "Financial risk" as the third rank among four level-1 risks. Among the level-2 risks, both investors importantly perceived "Uncertainty of project cost" and "Demand and Tariff" since the reliability of cost and revenue estimation is necessary to assess the cash-flow and to appraise the financial feasibility [25,44,58]. Both investors perceived that the "Multilateral Development Bank (MDB)/Official Development Assistance (ODA)/Export Credit Agency (ECA) assistance" and "Willingness of financial investor" were less important because project financing activities such as financing projection, financial advisor selection, and financial arrangement are carried out in the second or third phase.

4.1.3. Construction Risk

CI and FI do not significantly show the perception gap between "Construction risk" in the project selection phase ($p = 0.890$). Among the level-2 risks, only environment regulation is weighted more by CI rather than FI ($p = 0.037$). Korean CI experienced the long pending status of PPP project development in Laos due to environmental regulations [73,74]. Environmental and social impact assessment (ESIA) is increasingly important to approve the project development. MDBs also require the strict criteria for ESIA when evaluating the PPP project participation.

Both investors perceived that "Construction risk" is least important among level-1 risks in the project selection phase. Construction risk assessment is not yet completed in the first development phase and can be improved as the phase proceeds. "Local resource availability," "Technical uncertainty," "Public acceptance," and "Construction period" were perceived least important for both investors among the 27 level-2 risks in the first phase, though these risks were evaluated as critical factors that cause a schedule delay and cost overrun in the implementation phase [7,14,16,17,39].

4.1.4. Country Risk

CI and FI do not significantly show the perception gap between "Country risk" from the perspective level-1 risk ($p = 0.372$). However, there are some gaps among level-2 risks. CI significantly weight "Legal and regulatory risk" and "Exchange risk" more than FI ($p = 0.042$ and 0.008). If the legal and regulatory system is not well-established in the host country, the project development phase is usually prolonged to supplement the weakness of the legal and regulatory system. This situation is a big burden to CI rather than FI because CIs usually spend their money to develop the project from the first phase, whereas FIs start spending their money to scrutinize the project at the second phase or third phase. In the case of exchange risk, CIs as equity investors, usually earn their profit based on local currency revenue with a partial currency guarantee of the local government, whereas FIs usually receive the principal payback and interest based on the fixed contract currency.

Both investors evaluate "Country risk" as the second most important in the first phase. The host country's political, legal, and economic status could affect stable project development and sustainable implementation [5,15,39,61]. In contrast to financial and construction risk, "Country risk" can be

easily evaluated using the various information from the authorized consulting agency in the first development phase. Thus, "Country risk" is perceived as important for both CI and FI in the project selection phase. Among level-2 risks included in "Country risk," "Country credit rating," and "Political risk" are perceived as important factors from both investors. "Country credit rating" is important for the firm's international investment [13,16,44]. Both investors are unwilling to participate in an international project if the country's credit is below investment grade, such as BB from S and P and Baa3 from Moody's [75]. "Political risk" is also an important factor for stable project development and implementation to both investors. Especially, many projects in developing countries were suspended or terminated because of unstable political conditions [56,76].

4.2. Risk Perception Gap in Bid and Proposal Phase

Table 3 shows the weight and rank of risk factors at the first phase through the results of AHP analysis and the p-value of the Mann–Whitney U test that shows the significance of differences of weight (risk perception gap) between the construction investor and financial investor in the bid and proposal phase.

Table 3. Risk weight and rank of CI and FI in bid and proposal phase.

Risk Factors	Construction Investor		Financial Investor		*p*-Value
	Weight	Rank	Weight	Rank	
Stakeholder risk	0.256	2	0.334	1	0.002 **
- Track record of leading company	0.057	2	0.084	1	0.007 **
- Track record of EPC contractor	0.040	9	0.055	2	0.012 *
- Track record of O and M contractor	0.039	12	0.047	8	0.048 *
- Track record of public authorities	0.038	15	0.047	9	0.057
- Voting rights among stakeholders	0.040	8	0.049	7	0.089
- Risk allocation among stakeholders	0.040	10	0.052	5	0.222
Financial risk	0.325	1	0.270	2	0.030 *
- Uncertainty of project cost	0.060	1	0.052	3	0.538
- Demand and Tariff	0.052	3	0.049	6	0.505
- Stable feedstock	0.046	4	0.040	12	0.296
- MDB/ECA/ODA assistance	0.039	14	0.041	10	0.792
- Willingness of financial investor	0.041	6	0.035	14	0.105
- Project IRR	0.046	5	0.026	18	0.004 **
- Payback period	0.041	7	0.027	17	0.009 **
Construction risk	0.243	3	0.187	4	0.042 *
- Permit and license	0.040	11	0.039	13	0.930
- Land handover	0.039	13	0.032	15	0.064
- Environmental regulation	0.034	17	0.024	19	0.002 **
- Local resource availability	0.031	20	0.024	20	0.054
- Technical uncertainty	0.033	18	0.024	21	0.007 **
- Public acceptance	0.034	16	0.024	22	0.038 *
- Construction period	0.033	19	0.019	27	0.007 **
Country risk	0.177	4	0.207	3	0.078
- Country credit rating	0.028	22	0.052	4	0.001 **
- Political risk	0.030	21	0.040	11	0.042 *
- Legal/regulatory risk	0.027	23	0.028	16	0.910
- Economic growth risk	0.023	26	0.021	25	0.473
- Inflation risk	0.021	27	0.022	24	0.473
- Corruption risk	0.023	25	0.022	23	0.870
- Exchange risk	0.025	24	0.021	26	0.428

*: p-value < 0.05 which refers to statistically significant. **: p-value < 0.01 which refers to statistically highly significant.

4.2.1. Stakeholder Risk

FI (weight = 0.334) significantly perceived "Stakeholder risk" as more important than the CI (weight = 0.256). This perception gap becomes stronger in the third development phase (p = 0.002) rather than in the first development phase (p = 0.047), and this tendency is stronger in level-2 risks. FI significantly weight "Track record of the leading company," "Track record of EPC contractor," "Track record of operation and maintenance (O&M) contractor," more than CI (p = 0.007, 0.012, and 0.048).

FI perceived "Stakeholder risk" as most important (weight = 0.334), but CI perceived it as the third most important (weight = 0.256) among four level-1 risks. Among level-2 risks, CI weighted "Track record of leading company," "Voting rights among stakeholders," and "Track record of EPC contractor" in sequence, whereas FI weighted "Track record of leading company," "Track record of EPC contractor," and "Risk allocation among stakeholders" in sequence. These results imply that FI prefer transferring risk to CI and CI would like to respond to this risk transfer through voting rights as a stakeholder.

4.2.2. Financial Risk

CI slightly perceived "Financial risk" as more important than the FI in the proposal and bid phase (p = 0.0307). In the third phase, CI as a project developer, should persuade many other stakeholders to positively invest on the project. The CI as an equity investor prefers as much financial profit as possible, whereas the FI as a loan investor prefers more stable financial soundness, including stakeholder's capability. In these contexts, CI also significantly weighted "Project IRR" and "Payback period" more than FI (p = 0.004 and 0.009).

CI weighted the "Financial risk" as most important (weight = 0.325), whereas the FI perceived it as the third most important (weight = 0.270) among four level-1 risks. Among level-2 risks, both CI and FI perceived the "Uncertainty of project cost" as an important factor, which is basic reliability to assess financial feasibility [25,44,58]. Both investors perceived "Demand and Tariff" as important factors to determine the reliability of cash-flow for financial viability [43,44,55]. The rankings of "Stable feedstock," "MDB/ECA/ODA assistance," "Project IRR," and "Payback Period" in the third development phase rise compared to their rankings in the first development phase, which also explains how financial risk evaluation becomes more important as the development phase proceeds.

4.2.3. Construction Risk

The risk perception gap between CI and FI exists in "Construction risk" in the third phase (p = 0.042). The CI (weight = 0.243) perceived "Construction risk" as more important than the FI (weight = 0.187) in the third phase. If project delays or performance cannot meet the requirements, the CI as EPC contractors lose the construction profit and might pay to liquidate damages. Furthermore, CI as equity investors could not earn the dividend profit in their plan if liquidated damage is too low when compared to actual damage. Particularly, CI significantly weighted "Environmental regulation," "Technical uncertainty," "Public acceptance," and "Construction period" more than FI (p = 0.002, 0.007, 0.038, and 0.007).

CI weighted the "Construction risk" as third most important (weight = 0.243), but the FI perceived it as least important (weight = 0.187) among four level-1 risks. Among level-2 risks, both investors perceived "Permit and License" and "Site handover" as important factors in level-2 risks. The approval of the required permit, license, and land-use in the host country are a crucial starting point of project preparation work for international construction projects. Especially in developing countries, these risks have frequently delayed the construction project [11,25,59].

4.2.4. Country Risk

FI weighted "Country risk" more than CI, though this does not satisfy the probabilistic significance (p = 0.078). Particularly, the risk perception gap significantly exists in "Country credit rating" and "Political risk" (p = 0.001 and 0.042). FI perceived the "Country credit rating" and "Political risk" as more important than CI, who frequently sell their equity after the construction operation. However, FI pursue a stable profit for decades; thus, FI as loan investors are usually longer exposed to country risk rather than CI as EPC contractors.

Both CI (weight = 0.177) and FI (weight = 0.207) perceived that "Country risk" in the third phase is less important compared to the first phase. Since "Country risk" is not easily changed throughout project development, both investors investigate the country condition in the first phase, and if it is acceptable, both investors need not consider it much in the third phase. Both investors perceived "Economic growth risk," "Inflation risk," "Corruption risk," and "Exchange risk" as least important among 27 level-2 risk factors for a similar reason.

5. Discussion

5.1. Time-Dependent Risk

Some risk varies as PPP projects develop, but some risk does not change much over the project's development. Some risk can be more accurately assessed as PPP projects develop but some risk is easy to assess regardless of the project development phase. "Stakeholder risk" and "Country risk" do not significantly vary as the project develops and can be easily assessed regardless of the project development phase. Stakeholder risk is usually assessed from objective information such as the track record of PPP projects and financial status. Stakeholder risk is also difficult to improve over several years, even though voting right and risk allocation among stakeholders can be adjusted to some degree over project development. Country risk is also easily investigated by authorized institutions such as the World Bank, S and P, Moody's, and Fitch, and changes little over several years. This study shows that CI and FI weight stakeholder risk and country risk in the project selection phase, which rarely improve much until bid and proposal. However, "Financial risk" and "Construction risk" have a different, time-dependent attribute. Financial risk and construction risk are difficult to analyze accurately in the project selection phase. These risks can be increased or decreased as the project develops. This study shows that CI and FI perceive financial and construction risk as more important in the bid and proposal phase rather than in the project selection phase. The risk perception of stakeholders varies as time proceeds. The results of this study are consistent with previous studies. South [30] stated that the level of involvement of each stakeholder varies according to the development phase of the PPP project. Thus, their perception, objective, and relationship also change throughout project development. For sustainable project delivery, risk perception depending on the phase should be considered.

5.2. Risk Exposure Period

In previous studies, private stakeholders were usually treated comprehensively as one group. However, CI and FI have clearly different needs and objectives of participation, and accordingly, a risk perception gap exists. CI and FI have different cash flow as a PPP project proceed. CI must spend their own budget until the award contract, obtain the profit from EPC construction, and earn the dividend profit from project operation. The planned profit from EPC construction is usually similar to the amount of a CI's equity. So, CI cash flow usually changes from negative to positive around construction completion. Even more, many CI prefer to sell their equity after construction completion. For these reasons, CI is more exposed to short-term, related risk rather than long-term related risk. However, FI usually do not lend their money before the equity investor spends all theirs. FI start lending their money to project owners under the construction phase and receive the principal and interest decades after completion. So, an FI is generally more exposed to the long-term related risk than the short-term related risk. FI generally pursue low risk and stable return because they are exposed

to the several decade loan period [25]. In these contexts, this study shows that CI weight technical uncertainty, construction period, and environmental regulations more than FI in the proposal and bid phase. This study also verifies that FI perceive country credit rating and political risk more considerably than CI. Particularly, FI are reluctant to be exposed to the uncontrollable risk of an under-developing country since these countries' investments occasionally suffered from political reneging, withdrawal of support, termination of concession, expropriation, and nationalization of infrastructure [10,16,60].

5.3. Risk Transfer and Responsibility

De schepper [38] stated that the likelihood a stakeholder influences a focal stakeholder is higher, the greater the power of the stakeholder. Understanding these kinds of stakeholder contexts and dynamics is important to manage the stakeholder. FI usually have more bargaining power than CI in PPP projects and FI generally transfer the construction cost, schedule, and quality risk to the CI or EPC contractor through financial agreements or EPC contracts. FI tend to transfer or hedge risks as much as possible. CI as EPC contractors are burdened with many kinds of construction risk. This study shows that CI perceive construction risk more than FI. This study also verifies that CI are more sensitive to environmental risk, technical risk, public acceptance, and construction period than FI. However, FI experience difficulties in transferring country risk to others. Some country risk, such as exchange rate, inflation, and escalation can be hedged or transferred through the insurance or the contract. This study also shows that FI weight inflation risk and exchange risk less than other risks. However, some country risks, such as country credit and political risk, are difficult to hedge or transfer through the insurance or the contract. This study also indicates that FI perceive country credit and political risk as higher than other country risks.

6. Conclusions

This study analyzed the risk perception gap between CI and FI in the project selection phase and bid and proposal phase. The results and discussions contribute to help us to understand the major concerns of each leading investor and to reduce the perception gap for aligning the goals. In the project selection phase, CI and FI show few risk perception gaps. CI and FI rank stakeholder risk and country risk higher than financial risk and construction. FI significantly perceive stakeholder risk, particularly, track record of the EPC contractor than CI. CI significantly perceive project IRR and environmental regulation rather than FI. However, in the bid and proposal phase, CI and FI perceive many risks differently according to their expectations. CI tend to weight construction risk and financial risk as more important, whereas FI perceive stakeholder risk and country risk as more significant. CI significantly perceive the project IRR, payback period, environmental regulation, technical uncertainty, and construction period as more important than FI. Whereas FI significantly perceive track record of stakeholders, country credit rating, and political risk as more important than CI. To decrease the perception gap and aligning their objective is key to the sustainability of project development.

These perception gaps stemmed from three reasons. First, time-dependent risk impacts risk perception. Financial risk and construction risk are gradually specified as the development proceeds whereas stakeholder risk and country risk can be evaluated relatively-accurately at initial development phase. So, stakeholder risk and country risk are more important at the project selection phase and financial risk and construction risk become more weighted at bid and proposal phase. Second, the risk exposure period induces risk perception gaps. The CI is more interested in the short-term such as construction risk, and the FI is more interested in long-term risk, such as country risk. Last, risk transfer and responsibility enable the CI and FI to perceive different risk weight. The FI transfer construction risk to the CI by contract. FI are less sensitive to construction risk, whereas FI cannot hedge all country risk.

This study contributes to the sustainability of project development by cultivating an understanding of how and why CI and FI differently perceive risk. As reported from previous research,

effective communication regarding the benefits and negative impacts among stakeholders is crucial for setting up common goals, objectives, and project priorities [34,35]. The findings could be the starting point to reduce the risk perception gap, improve the quality of communication and negotiation, and build strategies that sustain project development. For example, when CI choose the target PPP project at project selection phase, CI frequently tend to prefer high profit and low risk project even if country risk is high and stakeholders look less reliable. However, CI had better select the PPP project of low stakeholder risk and country risk even if the financial risk and construction risk are high. FI concerns more stakeholder risk and country risk than financial risk and construction risk. After persuading FI to be involved in a project, CI should make an effort to improve the financial risk for the satisfaction of FI until the bid and proposal phase, whereas CI relatively do not need to concern themselves with satisfying FI much from the construction risk perspective.

However, several limitations also exist in this study. First, this study targeted only CI and FI which are specific forms of project investors in Korea. So, these results cannot be fully generalized to all cases. Second, the sample size is small, since the available international PPP projects are not many. Last, this study applied to only two major project investors. However, other stakeholders such as host country governments and O and M contractors are very important. Future studies will analyze the relationships between expanded stakeholder groups with more available data on development phases, which will improve the body of knowledge of stakeholder management in PPP projects. Furthermore, the decision-support framework and model can be developed using risk weight in this study and the case-based risk score of international PPP projects from further data collection.

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Appendix A Questionnaire Examples for Evaluating Perception on Risk Importance (AHP)

Appendix A.1 Respondent Information

Respondent name; Affiliation (CI or FI); Total Work experience; Work experience in the PPP.

Appendix A.2 Pair-Wise Comparison Matrix for Risk Importance

Table A1. Pair-Wise Comparison among Level 1 Risks.

Project Selection	**Stakeholder Risk**	**Financial Risk**	**Construction Risk**	**Country Risk**
Stakeholder Risk	1			
Financial Risk	N/A	1		
Construction Risk	N/A	N/A	1	
Country Risk	N/A	N/A	N/A	1
Bid and Proposal	**Stakeholder Risk**	**Financial Risk**	**Construction Risk**	**Country Risk**
Stakeholder Risk	1			
Financial Risk	N/A	1		
Construction Risk	N/A	N/A	1	
Country Risk	N/A	N/A	N/A	1

Table A2. Pair-Wise Comparison among Level 2 Risks (Examples of Stakeholder risk).

Project Selection	Track Record of Leading Investor	Track Record of EPC Contractor	Track record of O and m Contractor	Track Record of Public Authorities	Voting Rights among Stake.	Risk Allocation among Stake.
Track record of leading investor	1					
Track record of EPC contractor	N/A	1				
Track record of O and M contractor	N/A	N/A	1			
Track record of public authorities	N/A	N/A	N/A	1		
Voting rights among stake.	N/A	N/A	N/A	N/A	1	
Risk allocation among stake.	N/A	N/A	N/A	N/A	N/A	1
Bid and Proposal	**Track record of leading investor**	**Track record of EPC contractor**	**Track record of O and M contractor**	**Track record of public authorities**	**Voting rights among stake.**	**Risk allocation among stake.**
Track record of leading investor	1					
Track record of EPC contractor	N/A	1				
Track record of O and M contractor	N/A	N/A	1			
Track record of public authorities	N/A	N/A	N/A	1		
Voting rights among stake.	N/A	N/A	N/A	N/A	1	
Risk allocation among stake.	N/A	N/A	N/A	N/A	N/A	1

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