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Risk Factors of Public Private Partnership Projects in China

– A Comparison between the Water, Power and Transportation Sectors

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Abstract

With the growing economic development experienced in China, there is an urge for more and better public infrastructure. Public Private Partnership (PPP) is an innovative method for delivering these facilities and services. But along with this method there are certain risk factors that exist or are more severe when compared to the traditional delivery method. This paper considers three types of common public projects in China that are often delivered by the PPP method, including "Water and wastewater", "Power and energy" and "Transportation". For each type of project, experienced practitioners in China were asked to rank the severity of twenty risk factors sought from a comprehensive literature review. The top five most severe risk factors for each type of project were considered. Ranked severe for all three types of projects were "Government intervention" and "Public credit". The findings indicate that the most severe risks are Government related. It appears that the stakeholders have low confidence in the Government. These findings have highlighted the severity of risk factors for common types of PPP projects in China. With this information both the public and private parties can be more aware of which risk factors would be the most severe for certain projects. As a result, appropriate precautions can be made to avoid or minimize the likelihood and consequences of these risks. By doing so PPP projects can be carried out more successfully and the further use can be encouraged in China. PPP stakeholders from other countries can also use the findings presented in this paper to prevent potential risks from occurring. Furthermore, the methodology adopted in this paper can easily be adopted for other countries.

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Introduction

Public Private Partnership (PPP) has been used internationally in more than eighty-five countries as a procurement method for delivering public infrastructure (Regan et al., 2009). Its main characteristics include a competitive bidding process, appropriate balance of project risks, private sector innovation and expertise, and improved public services and facilities. In China, PPP projects have been introduced since the late seventies as an attempt to encourage the country's reform (Adams, 2006). With the increasing demand for more and better infrastructure, the Chinese Government started to apply PPP schemes at large scale since the nineties by introducing more foreign investment especially for water, power and road projects (Sachs et al., 2007). Although the PPP model may appear attractive for overcoming the large amount of infrastructure development currently being conducted in China, there is a need to structure the existing practices of PPP adopted in other countries to suit the local economic, financial, legal and regulatory environment. In order to do so there are many challenges which are foreseeable (Chen and Doloi, 2008).

China has already had some experience with PPP projects. Some of the more successful cases include Line 4 of Beijing Metro, the Beijing National Stadium (also referred to as the Bird's Nest), the Olympic Water Park project, the first sewage treatment plant of Shanghai Zhuyuan,

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the Hangzhou Bay Bridge, Line 4 of Shenzhen Metro, the sewage treatment projects in Canton Xilang, the ten water plants in Beijing etc. These cases have demonstrated that the PPP model is easier for financing in a shorter amount of time, reducing the financial burden on the local Government, investment diversification, and providing a reasonable amount of risk-sharing (Qu and Li, 2009). Consequently, PPP can be seen as beneficial to ease the financial pressure of the Chinese Government. In addition, with these projects normally being on a large scale the profits are particularly attractive to the private sector. The "win win" idea means that both the public and private parties are supportive of adopting the PPP arrangement for projects in China.

The Chinese Government believes that PPP is an effective way to ease their financial burden (Liu and Yamamoto, 2009). Furthermore, they also believe that it is more efficient than the traditional model of financing. Other benefits achievable include flexible management mechanisms, expertise and cost-awareness. However, the implementation of PPP in China requires certain conditions. For example, the investment system should be improved to facilitate further partnerships, the policy and legal environment should be more mature. There are underlying risks for all stakeholders involved with PPP projects. In order to be able to avoid these risks this paper indentifies the risk factors that occur in the three most common types of large scale public projects in China including "Water and wastewater", "Power and energy" and "Transportation". By highlighting and comparing the severity of different types of risks that occur in these projects they can be better avoided. The findings presented in this paper are useful for PPP professionals in China and other countries for preventing risks.

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Projects procured by PPP tend to be subjected to more risks compared to those projects that are procured traditionally due to the complexity of PPP projects. Ke et al.'s (2009) study confirmed that risk management (including risk identification, risk evaluation, risk allocation, risk management, financial risk, political risk, and market risk) has continued to be one of the main research interests of PPP in recent years. Furthermore, Khasnabis et al. (2010), emphasized the importance for future PPP studies to consider risk and uncertainties. Consequently, this section explores some of the studies which have been conducted by previous researchers in the area of PPP risks.

Unkovski and Pienaar (2009) considered the management and analysis of PPP risks. Their results showed that although there were many risks associated with PPP projects, the method is still considered to be advantageous in South Africa due to them being lower in cost and more manageable when compared to using the traditional method where the Government finances and delivers the project themselves. Three major types of risks were categorized in their study namely technical, financial and legal risks.

Cheng and Shi (2009) identified similar risks for PPP projects but also provided a different perspective on how they should be considered. They defined PPP risks according to two main groups: systematic risks and nonsystematic risks. Systematic risks refer to those that are caused externally and cannot be controlled by the concessionaire. They include political risk, legal risk, financial risk and contingent risk. On the other side, nonsystematic risks are those risks which

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are related to the project construction and operation. These can include completion risk, operation risk and market risk.

The Efficiency Unit (2008) of the Hong Kong Special Administrative Region in China classified in their guideline for conducting PPP projects the key types of risks, these include: demand risk; design and construction risks; operation and maintenance risks; technology / obsolescence risk; finance risk; legislative risk; approval risk; and hazard risk. Again, similar risks were identified by different researchers irrespective of geographical location.

Chen and Doloi (2008) conducted a comprehensive literature review looking at the factors holding back PPP projects in China and generally. They found that those factors specific to China include: opaque and weak legal systems; complex approval systems; regulatory constraints on market entry; low market prices for infrastructure products and services; creditworthiness of local utilities; no direct interests to local Government and its subordinates; and foreign currency administration difficulty. Unique about these PPP risks that were identified for China is that they are all related or affected by the local Government in one way or another. Previous research may indicate that the Government should take more responsibility for providing a suitable environment to engage PPP projects.

Li and Zou (2010) derived slightly different findings from their study. They presented a fuzzy analytical hierarchy process as a risk assessment technique for a PPP expressway project in China. The results showed that planning deficiency, low project residual value at the end of the

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concession period, lack of qualified bidders, design deficiency and long project approval time were assessed as the top five risks for the project.

Furthermore, Li and Liu (2009) suggested that to implement PPP projects in China the risks of the project needs to be considered at different angles, including in terms of curiosity, long-term, complexity, multi-levels and multi-goals of stakeholders. They firmly believe that the severity of the risks would differ depending on whether it is a traditional or PPP project being considered.

The effective handling of risks is often related to the appropriate risk allocation between the public and private sectors. Ke et al.'s (2010) study aimed to identify the preferred risk allocation of PPP risks in Mainland China, Hong Kong, the United Kingdom and Greece. The results of their study indicated that political, legal and social risks should be handled by the public sector in Mainland China and Hong Kong. Other researchers have also demonstrated different techniques to handle risk allocation. For example, Jin (2011) found that neuro-fuzzy models could be used to forecast efficient risk allocation strategies for PPP projects at a highly accurate level, which would be impossible by using multiple linear regression models and fuzzy inference systems. The same researcher conducted a previous study (Jin, 2010) which considers the features related to risk allocation in PPP projects, including partners' risk management routine, partners' risk management mechanism, partners' cooperation history, risk management environmental uncertainty, and partners' risk management commitment. These features were used as determinants in the decision-making process of efficient risk allocation.

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Duffield (2001) took another step forward to propose a risk evaluation technique to assess the severity of risks for different PPP projects. The likelihood and consequence of the risk would be represented by a risk index. Furthermore, the risk index would be defined according to four categories of severity which would suggest the approach for handling the risk. These categories include: 1) Rely on procedures and contract administration to manage risk; 2) Line management awareness and control; 3) Director awareness; and 4) Ministerial awareness. Similarly, Pantelias and Zhang proposed a methodological framework to evaluate the financial risk of transportation infrastructure projects delivered by PPP. They claim that the approach is simple to use and effective for considering investment options through scenario and sensitivity analyses.

Research Methodology

Data for this research study was mainly collected via interviews conducted with experienced practitioners in China. The respondents were asked to rank the importance of risk factors for the three types of projects: "Water and wastewater", "Power and energy" and "Transportation". Ranking and prioritization of risks in PPP projects is an important part of the risk management so that risks can be effectively allocated to the most appropriate party (Iyer and Sagheer, 2010). This section describes the design of the interview template and the background of the interview respondents. Furthermore, the analytical techniques adopted are explained. These include: mean score ranking, Cronbach's Alpha and Kendall's concordance analysis

Design of interview template

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In order to analyze the risk ranking and allocation for different types of PPP projects in China an interview template was designed and conducted with PPP experts. Respondents were asked to provide some simple background information related to their experience. They were also presented with a list of twenty PPP risk factors and asked to rate them according to their severity according to a Likert scale from 1 to 5, with 1 representing the least severe and 5 representing the most severe. The list of risk factors was derived based on a comprehensive literature review and also from findings of a previous questionnaire survey conducted by the authors and their research team (Xu et al., 2010). To prevent misinterpretation, the interview respondents were provided with the definition for each of the twenty PPP risk factors as shown in Table 1.

Insert TABLE 1 here.

Background of interview respondents

A total of thirty-eight interviews were conducted in major cities around China including Beijing, Shanghai, Nanjing and Dalian. These cities were selected based on their rapid development in infrastructure, their activeness in PPP projects and also the available contact points of the researchers. General information regarding the respondents' background was recorded including the number of years they have been involved with PPP projects, the number of PPP projects they have participated in, the type of sector they were working for and also the types of projects that they have been involved with. All respondents participated in the interviews have hands-on experience with PPP projects. The majority (63%) have five years or below working experience. Approximately a 30% of the respondents had six to ten years of working experience and the

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remaining had more years. This experience profile is considered acceptable given that PPP projects have only become more popular in China in recent years. All respondents interviewed were experienced with running PPP projects. All respondents had executed at least one PPP project. 66% of the respondents had executed one to three projects, a few had executed four to five projects and approximately 10% had executed six or above projects. A large proportion of the respondents (43%) represented the private sector, 34% represented other organizations and fewer respondents represented the public sector.

Seven types of projects that the respondents have been involved with were identified. In order of highest involvement these included fifteen in "Water and wastewater", eight in "Power and energy", seven in "Transportation", four in "Other" types of project, two in "Housing and offices", and also one in "Hospitals and medical services" and "Cultural and sport facilities" respectively. These projects represented proportions of 39%, 21%, 18%, 11%, 5%, 3% and 3% respectively. Considering that the first three types of projects were dominating in terms of participation level, they were selected for comparison purposes in this study based on their severity of risk factor.

Analysis Techniques

Mean score ranking

The mean is the most widely used and reported measure of central tendency (Lind et al., 2002). The mean score ranking technique is also a common technique used to analyze the results

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obtained by questionnaire surveys (Chan et al., 2009; Chan et al., 2010). In this study, the respondents were asked to assess the risks according to a Likert scale from 1 to 5, where 1 is the least important and 5 is the most important. The mean score for each risk was therefore calculated by the summation of the respective scores given by each respondent according to the Likert scale, divided by the number of respondents that assessed the risk. The formula can be represented as follows:

$$M = \frac{\sum s}{n} \tag{1}$$

Where M = Mean score for each risk factor;

s = Score given by respondents according to a Likert scale from 1 to 5;

n = Number of respondents that assessed the risk factor.

Cronbach's Alpha

Cronbach's Alpha was used to measure the reliability of the survey respondents. The value can range from negative infinity to one, where a score closer to one would indicate a higher degree of reliability (Cronbach, 1951). The statistic can be defined as (Develles, 1991):

$$\alpha = \frac{K}{K-1}\left(1 - \frac{\sum_{i=1}^{K} \sigma_{Y_i}^2}{\sigma_X^2}\right) \tag{2}$$

Where α = Cronbach' Alpha

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K = number of risk factors

σ_X^2 = variance of the total scores for the respondents

$\sigma_{Y_i}^2$ = variance of component i for the respondents

Kendall's Concordance Analysis

The projects were considered as one group. Kendall's concordance analysis was conducted to measure the agreement of different respondents on their rankings of risk factors based on mean values within this group. If the Kendall's coefficient of concordance (W) was statistically significant at a pre-defined significance level of say 0.05, a reasonable degree of agreement amongst the respondents within the group on the rankings of risk factors was indicated. The W for the risk factors was calculated by the following formula (Siegel and Castellan 1988):

$$W = 12 \frac{\sum_{i=1}^{n} (R_i - R)^2}{p^2 (n^3 - n) - pT} \quad (3)$$

Where W = Kendall's coefficient of concordance

n = Number of risk factors being ranked

Ri = Ranks assigned to the ith risk factor

R = Mean value of the Ri values

p = Number of respondents

T = Correction factor for the tied ranks

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According to Siegel and Castellan (1988), W is only suitable when the number of attributes is less than or equal to 7. If the number of attributes is greater than 7, chi-square is used as a near approximation instead. The critical value of chi-square is further achieved by referring to the table of critical values of chi-square distribution, which can also be found in Siegel and Castellan (1988).

Results and Discussion

Reliability of survey results

The value of Cronbach's Alpha was calculated to be 0.822 indicating that a high level of uniformity amongst the survey responses was received (Norusis, 2008).

Agreement of respondents

The Kendall's coefficient of concordance (W) for the ranking of risk factors was 0.406. The computed W was statistically significant with significance level at 0.000.

As the number of attributes considered were above seven, as mentioned previously the Chi-square value would be referred to rather than the W value. According to the degree of freedom the critical value of Chi-square was 30.144. The computed Chi-square value was found to be above this value at 115.852. Therefore, the assessment by the survey respondents on their

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rankings of risk factors is proved to be consistent. This finding ensures that the completed survey questionnaires are valid for analysis.

Ranking of risk factors

The twenty risk factors were rated by interviewees according to their severity of threat towards different types of PPP projects (Table 2). The results were ranked and studied for "Water and wastewater", "Power and energy" and "Transportation" projects.

Insert TABLE 2 here.

The ranking of the top five most severe risk factors for each type of project were identified and analysed. In total nine risk factors were studied. The following discussion aims to provide some reasons for why these risk factors are believed to be the most severe. In addition, the risk factors of the three types of projects were compared to draw similarities and differences.

Government intervention

The risk factor "Government intervention" was ranked in the top five amongst the twenty risk factors for all three types of projects. For "Power and energy" and "Transportation" projects this risk was ranked the most severe. For "Water and wastewater" projects this risk was ranked slightly lower at fourth position. Qi et al. (2009) conducted an analysis of sixteen PPP projects in China. These projects included those from the "Water and wastewater", "Power and energy"

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and "Transportation" sectors. From their analyses "Government intervention" was a primary cause of failure recorded. "Government intervention" would only be appropriate if unless so the general public would be substantially affected. For example, if unacceptably high toll fees or service fees are charged to the general public, the Government would probably consider stepping in to restrict the consortia. Obviously, "Government intervention" would only be feasible if it is also contractually viable. Otherwise, unreasonable "Government intervention" would ruin the relationship with the private sector and discourage their interest in future PPP projects. Zhong and Fu (2010) also reported that some of the early PPP projects in Guangdong failed because they were implemented solely by the local Government without professional advisers, showing a high level of "Government intervention".

Public credit

Also, ranked in the top five for all three types of projects was "Public credit". "Transportation" projects were ranked slightly higher at second position; whereas "Water and wastewater" and "Power and energy" projects were both ranked the fifth place. The findings are in line with Sachs et al. (2007) discussion regarding the credit worthiness of the local Governments in China. They highlighted that one of the main problems related to the application of PPP in China was the unrealistic and unreasonable guarantees made by Chinese local Governments. As a result, "Public credit" has become a concern. They further discussed that the Chinese local Governments usually make promises which they are incapable to fulfill in order to attract potential investors to carry out the projects. Unfortunately, contracts are breached frequently due to this common practice of the Chinese local Governments. As a result, both parties lose out.

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The private party may lose their investment or achieve unexpectedly lower returns than anticipated and achieve no compensation. Sachs et al. (2007) concluded that the Chinese local Governments have been known to pay more in order to resolve the damage which has been caused to the other parties or the project itself.

Financing risk

"Financing risk" has always been a major problem especially for "Water and wastewater" projects. For example, the Guangzhou Xilang project which was the first PPP wastewater treatment plant project in China was held back due to "Financing risk". It was initially planned in 1993 but took several years to take off due to the lack of financing source (Zhong and Fu, 2010). Another example occurred in 2004, where the Beijing Government introduced five small sized wastewater treatment plant projects. These projects aimed to improve the wastewater treatment capacity and control water pollution in Beijing. Unfortunately the awarded consortia withdrew from the project due to financial difficulties. Chinese banks are often reluctant to provide long-term loans which are required for PPP projects, or tend to restrict the credit policies to the private sector. These experiences have reflected the problems in the existing financing policies of China (Zhong and Fu, 2010). Consequently, "Financing risk" was ranked the most severe amongst the twenty risk factors for "Water and wastewater" projects. For the other types of projects studied this risk was ranked of medium severity only. It must also be noted that the financing model adopted for each project will vary its level of financial risk. This paper focuses primarily on comparing different natured PPP projects only. For further studies it would be

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worthy for researchers to consider how financing risk is affected by the mode of PPP adopted in projects.

Poor public decision making process

The risk factor "Poor public decision making process" was ranked similarly for the three types of projects. "Transportation" projects were ranked slightly higher at fifth position, possibly indicating that the Chinese Government is more prone to making poor decisions for these types of projects. In Sachs et al.'s (2007) study they reported that wrong decision made by the Chinese Government was another problem holding back the implementation of PPP. This was ascertained to the lack of knowledge in running PPP projects and also the unrealistic guarantees which would be made by the Chinese Government. As a result, there has been much complaint from the general public and key officials have stepped down (Sachs et al., 2007).

Subjective project evaluation method

"Subjective project evaluation method" was ranked third for "Water and wastewater" and "Power and energy" projects but only of medium severity for "Transportation" projects. The reason behind this difference is probably due to the fact that traditionally "Water and wastewater" and "Power and energy" projects have been handled by the Government. But since the 1990s the Chinese Government has started to introduce private financing for these projects (Zhong et al., 2008). With private financing as the target, proper evaluation of projects has been neglected. An all rounded evaluation should be conducted inorder to assess whether PPP would

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be the suitable method for delivering certain public projects. The evaluation criteria should focus on value for money, innovation, expertise, time, cost, general public satisfaction etc. Khansnabis et al. (2010) contended the importance to conduct a careful analysis before PPP projects are undertaken to assess the financial and economic implications of the project from each participant's viewpoint, with due regard to risks and uncertainties associated with such long-term investments. Unfortunately private financing has been a priority for adopting the PPP approach for those ex-government run projects. Consequently, all rounded evaluations of the projects have not been conducted adequately. The interviewees reflected in their ranking the importance of a "Subjective project evaluation method".

Completion risk

"Completion risk" was only ranked highly for "Water and wastewater" projects at the second position. Generally speaking "Completion risk" causes a project to go beyond the initial schedule. The consequences are a lack of cash flow to pay for the operating costs and subsequent debts, postponed length of maturity and increased interest from the loan (Li and Liu, 2009). As a result the whole project cost will be increased and the project will not be completed as planned. Furthermore, Pribadi and Pangeran (2007) analysed the risks that were associated with water PPP projects. Their study found that delay in completion for water PPP projects was often caused due to lack of coordination of contractors, failure to obtain standard planning approvals, failure to grant contractual land use rights or rights of way. These causes probably help to explain why "Completion risk" was ranked high for "Water and wastewater" projects.

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Government corruption

This risk factor was regarded as a potential threat for "Power and energy" projects by the interviewees at the second rank. Contrastingly for the other types of projects this risk factor was not regarded as threatening. Although, there is no evidence to support the reasons for this large difference in ranking between the projects, "Government corruption" has previously been suspected for "Power and energy" projects. The Laibin B power project was an example of successful PPP implementation and in future was adopted as a role model for similar projects (Sachs et al., 2007). In addition, it was revolutionary at the time for being awarded through international tendering and comprising of 100 per cent foreign ownership. Wang and Ke (2009) believe that although the Chinese Government had addressed the risk of "Government corruption" via warranties in this project, there was no confidence that the private party could walk away easily if it did occur. They further discussed their beliefs are due to several predictions: firstly corruption would not take place in the open, it is difficult to determine corruption using contract language, and also the enforcement of the contract terms would be doubtable.

Imperfect law and supervision system

The risk factor "Imperfect law and supervision system" was ranked fourth for "Transportation" projects. For "Power and energy" projects it was ranked of medium severity. And for "Water and wastewater" projects it was ranked low. In many Chinese PPP projects, it is not uncommon to find that the financiers undertake roles on both sides of the PPP arrangement and often they

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will also supervise the project as well. The effectiveness of this arrangement can be doubtable. Aware of the potential problems some projects especially those "Transportation" type ones have taken action to avoid overlapping roles. In the Guangzhou No. 2 underground line project, the supervision of all aspects related to the project were purposely passed to the public procuratorial service and the financing bank acted as a double check (Adams et al., 2006). Other measures which have been taken to improve legislation related to "Transportation" type projects include the establishment of specific laws such as the Highway Law (Chen and Doloi, 2008). It is obvious that these actions were resulted due to the riskiness of "Imperfect law and supervision system" for "Transportation" projects. In some situations the authors do not rule out the possibility that the laws are simply not enforced.

Inability of concessionaire

This risk factor was ranked fourth for "Power and energy" projects. For the other types of projects this risk factor was ranked relatively low. Previous studies (Braadbaart et al., 2008; Zhong and Fu, 2010) have shown that the lack of competition during the bidding process of PPP projects has meant that the wrong or inappropriate concessionaires have been selected. The result has meant that unable concessionaires have been selected. It is possible that for "Power and energy" projects they are technically more demanding than the other types of projects studied, hence the ability of the concessionaire would be more demanding.

Conclusions

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This paper has examined some of the most severe risk factors that could occur in PPP projects. A comparison was conducted looking at the risk factors of "Water and wastewater", "Power and energy" and "Transportation" projects in China. The results showed that "Government intervention", "Public credit", "Financing risk", "Poor public decision making process", "Subjective project evaluation method", "Completion risk", "Government corruption", "Imperfect law and supervision system", and "Inability of concessionaire" were the most severe risk factors for these projects, with "Government intervention" and "Public credit" being severe for all three groups of projects. It appears that the major risks of PPP projects in China are mainly related to the Government. Some of the lessons learnt and recommendations from these findings include:

- The consortium members should consist of non-government representatives to avoid government intervention.
- The Chinese Government should make realistic promises that they intend to and are able to carry out.
- Ensure a stable income to eliminate financing risk. Ideally the income should result from the services and facilities but if this is not feasible, government support should be considered. Special attention on this aspect should be given to "Water and wastewater" projects.
- The Chinese Government should understand the PPP process well and try to adopt the good practices of other countries where possible.
- Currently, there is no equivalent of the public sector comparator in China to assess whether the public projects are suitable to be delivered by PPP. It is important to introduce such a process to ensure that projects are not wrongly delivered by PPP.

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- Future "Water and wasterwater" projects in particular should consider implementing an early and structured plan to avoid completion risk.
- Avoid government corruption especially for "Power and energy" projects. The government should enforce prosecution to eliminate the occurrence of corruption.
- Ensure that laws are enforced especially for "Transportation" projects.
- Concessionaires for "Power and energy" projects in particular should be selected carefully and appropriately to avoid under qualified members.

This paper has provided an interesting perspective on procuring PPP projects especially for those practitioners and academics in Western countries. The study has highlighted those most common types of PPP projects in China and analyzed the differences between their risks. It is hoped that the results have enabled project stakeholders from other countries to be more aware of the potential risks in order to avoid or minimize them effectively. Furthermore, opportunities for conducting PPP projects in China will as a result be encouraged. This study also has its limitations. The main limitations of this study are that the interviews were conducted with only thirty-eight experts in Beijing, Shanghai, Nanjing and Dalian. Although these experts had conducted PPP projects across China, the results would have been more representable if a larger sample of respondents from different cities across China were interviewed.

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Table 1 Definition of PPP risk factors

Risk no.	Risk	Definition
1	Government intervention	Public sector interferes unreasonably in the facilities/services
2	Public credit	The reliability and creditworthiness of the government to fulfill obligations
3	Financing risk	Financial difficulties experienced by the consortium as a result of poor financial market or lack of financial income
4	Poor public decision making process	Government makes wrong or poor decisions due to lack of knowledge or interest
5	Subjective project evaluation method	Subjective evaluation at the beginning of a public project to decide the procurement method
6	Completion risk	Project takes longer than the predicted time to complete
7	Government corruption	Bribery of bureaucrats resulting in inappropriate privileges and benefits being offered to the private sector
8	Price change	Improper tariff design or inflexible adjustment framework leading to insufficient income
9	Operation cost	Operation cost overrun resulting from over priced

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	overrun	operation and slow operation
10	Imperfect law and supervision system	Lack of specific laws for PPP projects
11	Project / operation changes	The likelihood of unexpected changes and errors occurring during the project operation
12	Inability of concessionaire	The consortium not being able to perform its obligations as agreed
13	Inflation	Unanticipated changes to inflation rate
14	Conflicting or imperfect contract	Improper arrangements in the contract such as inappropriate risk allocation amongst stakeholders
15	Interest rate fluctuation	Unanticipated fluctuations to interest rate
16	Insufficient project finance supervision	The financial status and expenditures are not monitored and controlled
17	Delay in project approvals and permits	Delay or refusal of project approval or permit by government
18	Inadequate competition for	Lack of transparency and structure during tender, lack of

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	tender	opportunities for tenderers, few tenderers
19	Foreign exchange fluctuation	Fluctuation in currency exchange rate and/or conversion difficulties
20	Change in market demand (non-competition factor caused)	Demand change, the need for the services and facilities have changed, maybe not needed or less needed than before

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Table 2 Comparison of risk ranking amongst different project sectors

Risk no.	Name of risk factor	Types of project					
		Water and wastewater		Power and energy		Transportation	
		Ranking	Mean	Ranking	Mean	Ranking	Mean
1	Government intervention	4.14	4	3.98	1	4.00	1
2	Public credit	4.00	5	3.70	5	3.91	2
3	Financing risk	4.71	1	3.16	9	3.12	8
4	Poor public decision making process	4.00	6	3.33	7	3.49	5
5	Subjective project evaluation method	4.33	3	3.87	3	3.24	7
6	Completion risk	4.43	2	2.59	14	2.85	16
7	Government corruption	3.17	12	3.87	2	2.98	10
8	Price change	3.25	9	3.06	10	3.81	3
9	Operation cost overrun	3.29	8	3.64	6	3.05	9
10	Imperfect law and supervision system	3.00	13	3.31	8	3.61	4
11	Project / operation changes	2.83	14	2.12	18	3.35	6
12	Inability of concessionaire	2.60	16	3.81	4	2.96	11

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13	Inflation	3.33	7	2.50	15	2.53	20
14	Conflicting or imperfect contract	3.20	10	2.36	16	2.87	14
15	Interest rate fluctuation	3.20	11	2.61	11	2.69	18
16	Insufficient project finance supervision	2.75	15	2.60	13	2.88	12
17	Delay in project approvals and permits	2.57	=17	2.10	19	2.85	15
18	Inadequate competition for tender	2.57	=17	1.82	20	2.80	17
19	Foreign exchange fluctuation	2.57	=17	2.33	17	2.66	19
20	Change in market demand (non-competition factor caused)	1.88	20	2.61	12	2.88	13