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Critical Risk Factors of PPP Water Supply Project in Indonesia
(Case Study: West Semarang Drinking Water Supply Project)

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Abstract

The increasing need for water cannot be denied, given the growing population and standard of living. Therefore, the Government seeks to involve the private sector through the Public-Private Partnership (PPP) scheme in the West Semarang Drinking Water System project to overcome the cost of providing a significant investment. In 2012 the West Semarang Drinking Water Supply Project (WS-DWSS) was developed by the Government. But in 2015, the project was stopped due to changes in the Law of the Republic of Indonesia Number 7 of 2004 concerning Water Resources. PPP schemes in the water sector are relatively new in Indonesia and often face many challenges in their implementation. Through the lens of a theoretical framework and by taking a qualitative and quantitative approach based on primary and secondary data, this thesis assesses the critical risk factors during project implementation in the perception of the public and private sectors. This thesis shows that the both sectors agree that there are 3 most critical risks for drinking water projects: availability of raw water (continuity/quantity), natural disasters, tariff setting & demand projection error. However, the two sectors also have different perceptions of critical risk factors. This difference shows that the two sectors have distinct views and goals as part of a collaborative project. By knowing the similarities and differences, mitigation efforts can be made to minimize the risk of drinking water projects with the PPP scheme.

Keywords: critical risk factors; public-private partnership; risk perception; Semarang; water supply

1. Introduction

The service level of water supply and wastewater in several cities like Indonesia is still relatively low compared to most cities in Asia. Based on data from the 2018 National Socio-Economic Survey, it was recorded that access to safe drinking water nationally only reached 61.29 percent. In Central Java itself, households' access to clean water, in this case, protected drinking water sources, was 82.10 percent. It increased by 0.61 percent compared to 2017 *(BPS Provinsi Jawa Tengah*, 2019).

As a country participating in the SDG agenda, the Government of Indonesia places its priorities on providing essential services for national development. Accordingly, it includes plans for increasing access to safe and sustainable sanitation and drinking water in the 2020-2024 National Medium-Term Development Plan. The target set is 100 percent access to safe drinking water through the construction of 10 million household connections. However, fiscal deficit budgetary pressures, demand-supply gaps, and inefficient public services for infrastructure remain a challenge in infrastructure delivery. The Government

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of Indonesia adopted a strategy to improve the water supply sector by involving private sector participation and reforming the water law (*BPS Provinsi Jawa Tengah*, 2019).

Water supply projects are typically characterized by high initial costs, low marginal supply costs, asset risk due to diverse service users, and long lead times on the installation of new capacity (Clough et al., 2004, cited in Wibowo & Mohamed, 2008). Therefore, failure to manage water effectively and efficiently can lead to crises if not handled properly. Even it leads to social and political problems. This situation often occurs in less developed countries with no adequate financial and managerial capacity resulting in low coverage and poor quality of water provided to the community (Wibowo & Mohamed, 2010).

Therefore, the public sector as the project owner needs to understand and manage risks properly during the concession period. This study aims to identify what risks are perceived between the government and private and analyze the most dominant risks and their impact on project implementation. It is useful to formulate policies that make PPP projects attractive to both parties, primarily the private sector. The West Semarang - Drinking Water Supply System Project (WS-DWSS) is Indonesia's second drinking water PPP project located in Semarang City. This project uses water from the Jatibarang Dam water. The project provides drinking water to 31 villages in 3 sub-districts with an estimated 60,000 households connected to the water supply system network in West Semarang, Tugu, and Ngaliyan. This project is a pilot project of a drinking water supply system with a PPP financing scheme which is expected to overcome the problem of the clean water crisis and land subsidence due to groundwater use in Semarang City. Currently, the project is operational. Due to its successful implementation, the government takes this project as a role model for other drinking water supply system projects (or SPAM). Water supply services have long been dominated by local-government-operated companies. However, the quality of services is far from satisfactory, and the service level is considerably low (Wibowo & Mohamed, 2010). Moreover, many waters supply companies would have financially collapsed without a government bailout. Therefore, as part of sector reform, several related laws and regulations have been revised and launched on Water Resources and Government Regulation that legalizes private sector investment in infrastructure through PPP schemes (Husnullah & Suryanto, 2010).

Currently, the PPP mechanism is used as an alternative and an effective method to mobilize additional sources of funding and benefit from the efficiency of the private sector. Although PPP is not the only financing mechanism, if it is used in the right projects, it provides good benefits for all parties. For example, most PPP mechanisms are used in the water sector and toll roads (because these two sectors guarantee financial benefits). Even though, PPP is also adopted in other infrastructure sectors. However, The drinking water sector is a sector that is quite difficult to finance and the riskiest investment for the private sector (Vives et al., 2006 cited in Ameyaw & Chan, 2015). Moreover, external uncertainties and multidisciplinary participative character involved in the process compound the PPP project's complexity (Chan et al., 2015). Considering that the success of the PPP project cannot be separated from the risk management capacity of the Government Contracting Agency (GCA). By knowing the critical risk ratings that affect the performance of drinking water projects in Indonesia and examining differences in risk perceptions between the public and private sectors. Then the results will be helpful for the development of future PPP water supply projects in Indonesia.

1.1 Public-Private Partnership in Indonesia

PPP development in Indonesia began in the early 1990s, through Presidential Decree number 7 of 1998, concerning cooperation between the Government and Private Business Entities in the development and Management of Infrastructure (Djunaedi, 2011, cited in Adam, 2014). However, due to the social, economic, and political instability that loomed over the country, the private sector did not interest to involve in the PPP program. Then in 2005, along with improving conditions in Indonesia, the government re-implemented PPP. This was seen very clearly when the government held the Indonesia Infrastructure Summit several times, which aimed to invite the private sector to cooperate with the government through the PPP scheme in the infrastructure provision.

Subsequently, Presidential Regulation number 67 of 2005 was issued concerning Government and Business Entity Cooperation in Infrastructure Provision which revoked Presidential Regulation number 7 of 1998 (Adam, 2014; Pribadi & Pangeran, 2007). However, the event was not enough to attract investors, so amendments were made in 2010 the last update was in 2015, with the issuance of Presidential Regulation number 38 of 2015 (Adiyanti & Fathurrahman, 2021). The government has also implemented institutional and PPP arrangements by providing project support (Project Development Facility, Availability Payment, Viability Gap Fund, and Land Acquisition) and project guarantees. In addition, efforts to accelerate PPP implementation are also carried out by establishing several supporting institutions such as PT Sarana Multi Infrastructure and PT Penjaminan Infrastruktur Indonesia, PT Infrastructure Finance Facility, a non-bank infrastructure company under the Ministry of Finance (Adam, 2014; ADB, 2021). PPP in Indonesia is led by the Ministry of National Development Planning/Bappenas, which is incorporated in the PPP Joint Office.

PPP Joint Office is a gathering place for PPP implementing stakeholders, which consists of 7 (seven) Ministries/Institutions consisting of the Coordinating Ministry for Economic Affairs, Coordinating Ministry for Maritime Affairs and Investment, Ministry of Finance, Ministry of Home Affairs, Ministry of National Development Planning/BAPPENAS, Ministry of Investment/BKPM, and Indonesia Procurement Agency. This Joint Office was formed in 2020, which was agreed upon in a memorandum of understanding to optimize government and business entity investment and resolve obstacles to implementing PPP projects. According to the PPI Bank's World Database, from 1990 to 2019, 135 PPP projects with an investment value of $63.5 billion reached financial closure, although some were cancelled (ADB, 2021).

The PPP structure for the drinking water sector in Indonesia refers to Government Regulation number 122 of 2015. The responsible Agency for the Cooperation Project (GCA) for DWSS development is State-Owned Enterprise (SOE) or Regional-Owned Enterprise (ROE) based on the applicable laws. The cooperation is carried out with the principle that state/regional-owned enterprises hold ownership of the Water Intake Permit. The implementation of DWSS is based on considering the ability to pay of communities. This cooperation can be in the form of investment in DWSS development, management of raw water units and production units, investment in distribution units, and investment in technology development for the operation and maintenance of DWSS through performance-based contracts to achieve effective and efficient services. Meanwhile, the general PPP structure that can be applied is an availability-based structure with a Build–Operate–Transfer (BOT) scheme (PT PII, 2020). Figure 1 shows Build-Operate-Transfer (BOT) scheme of PPP water supply.

1.2 Drinking-Water Supply System

Water is a valuable economic resource for vital human needs – a resource essential for life but irreplaceable (Qian et al., 2020) Sources of proper drinking water include piped drinking water and protected non-piped drinking water originating from decent and quality water sources, including piped water, public taps, drilled or pumped wells, protected wells, and protected springs, as well as rainwater (Enggraini, 2021). The obligation to provide piped drinking water services lies with the PDAM (Regional company in the drinking water sector). PDAM Kota Semarang was established in 1911 and became part of the regional public works department in the 1960s, while the central government was only involved in the 1970s (Hadipuro, 2010).

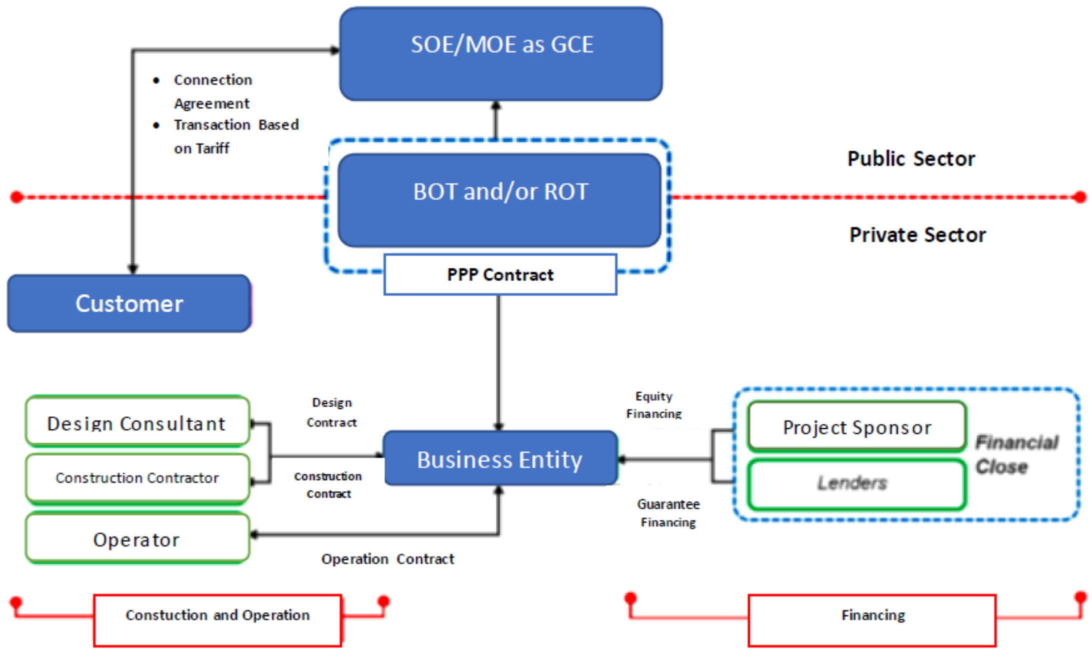

Figure 1. Build-Operate-Transfer (BOT) scheme of PPP Water Supply (PT PII, 2020)

Since the issuance of Law Number 22 of 1999 concerning regional government, the role of PDAM management has been dominated by the local government rather than the central government. From 2006 to 2007, the Minister of Public Works established the National Drinking Water Agency (BPPSPAM) to support and provide assistance for expanding water supply piping. In addition, BPPSPAM has an important role in fostering Public-Private Cooperation and monitoring PDAM companies' performance (ADB, 2021). Meanwhile, the Drinking Water Supply System is a unified drinking water supply facility and infrastructure that supplies the community's needs to achieve a healthy, clean, and productive life (Government Regulation of the Republic of Indonesia Number 122 of 2015).

DWSS is divided into pipeline network DWSS and non-pipeline DWSS. DWSS is not a piping network consisting of shallow wells, pump wells, rainwater reservoirs, water terminals, and spring catcher buildings. Instead, for DWSS, the piping network includes water intake and supply units, production units, distribution units, and service units (Regulation of the Government of the Republic of Indonesia Number 122 of 2015). DWSS implementation activities include new construction, improvement, expansion of existing facilities, operation and maintenance, human resources, and institutions. The implementation activities are the local government's responsibility and are carried out by SOE/ROE and the Integrated Service Unit (UPT). The implementation of DWSS must obtain a business license in the field of water resources or a permit to take and use water, both from community groups outside the service coverage area by the PDAM and the Integrated Service Unit as well as from the State/Regional Owned Enterprises at the provincial or district level/city (Ministry of Public Works, 2016, cited in Hansen, 2019). In return for the availability of DWSS implementation, the local government sets the drinking water tariff set for each customer as a cost for drinking water services. The calculation of drinking water rates considers the following components: operational costs, maintenance costs, depreciation or amortization costs, loan interest costs, other costs, and profits within reasonable limits (Hansen, 2019).

1.3 Risk Identification

Risk identification aims to determine what risks can affect project objectives and document their characteristics. Risk identification is also intended to determine what things can happen, why, and how they happen (Cooper, 2005). Identification is a cyclical or iterative process because some risks may not be known until later phases. In addition, re-identification of risks may vary from project to project, so it must be looked at on a case-by-case basis (Pangeran, 2012). In identifying risks, Grimsey and Lewis (2002) state that there are at least nine risks faced in infrastructure projects, namely: (1) technical risk; (2) construction risk; (3) operation risk; (4) income risk; (5) financial risk; (6) the risk of force majeure; (7) political risk; (8) environmental risks; (9) project failure. However, each infrastructure project certainly has its own characteristics that are not found in other infrastructure projects such as water projects that have risks in the form of raw water availability or distribution/transmission networks (Rafaat et al., 2020). For this reason, the researcher tries to study some of the literature from previous studies which also examines risks in drinking water projects from various regions/countries, as shown in Table 1.

Table 1: Risks of Drinking Water Projects from Several Researchers

Rafaat et al (2020)	Wibowo & Mohamed (2008)	Hatmoko & Susanti (2017)	Ameyaw & Chan (2015)
Political and government policy (7 SR*)	Political Risk (9 SR)	Location (12 SR)	Location (2 SR)
Legal (1 SR)	Macroeconomic Risk (3 SR)	Design and Construction (5 SR)	Tender and Construction (3 SR)
Economic (3 SR)	Production-Related Risk (8 SR)	Sponsor (2 SR)	Financial (3 SR)
Unforeseen (4 SR)	Force-Majeure Risk (6 SR)	Financial (4 SR)	Operation (8 SR)
Nature (1 SR)	Project-Related Risk (4 SR)	Operation (12 SR)	Revenue (5 SR)
Tendering and Contractual (5 SR)	Business Risk (9 SR)	Revenue (6 SR)	Political (10 SR)
Regulatory (2 SR)		Connectivity (7 SR)	Force Majeure (2 SR)
Engineering and construction (8 SR)		Interface (3 SR)	Asset (1 SR)
Technical (3 SR)		Political (9 SR)	
Operation (6 SR)		Force Majeure (4 SR)	
Market (2 SR)		Asset (2 SR)	
Financial (3 SR)			
Relationship (3 SR)			

**) SR: Sub-Risk*

Risk factors in each area have differences that can be influenced by local conditions and culture. such as the example of (Rafaat et al., 2020). who tries to compare risks in Egypt with findings in China as a mature water sector PPP market. Rafaat (2020) tries to identify risks into 13 categories, meanwhile, Wibowo & Mohamed (2008), tries to summarize them into 6 categories and specializes risks to macro economy, production, and business. Then, Hatmoko & Susanti (2017), complete the risks related to planning/construction, sponsorship, connectivity, and interfaces. Furthermore, Ameyaw & Chan (2015), is more concerned with issues related to construction & tenders. In this study, the researcher tried to identify and complete the risk categories and their sub-risks from the four studies. In terms of risk category, there are similarities with Hatmoko's research, which also refers to PT PII's risk allocation guidelines but differs in sub-risk. Researchers added several sub-risk factors that are considered important.

Each potential risk has a risk level, which is determined by the level of possibility of the risk occurring and the level of impact it causes. Risk analysis can be defined as a system that uses information on the level of probability and the level of risk impact to determine how often certain events can occur and how significant the consequences are. Risk analysis in this study was carried out by processing data with a questionnaire survey of risk probability and risk impact with a Likert scale to determine the level of risk. Knowing the level of risk that occurs will make it easier to categorize the level of risk and respond to existing risks. Risks can be prioritized for further quantitative analysis and planning risk responses based on their risk rating (PMI, 2013).

Evaluation of the importance of each risk and priority of concern is usually carried out using a probability and impact table or diagram (see Figure 2). Each risk is assessed based on the likelihood of its occurrence and the purpose if it occurs (PMI, 2013). In this case, the risk level results for each risk are ordered by the largest average of the Public, Private, and Overall Sectors, as well as for the probability and impact of each risk. The results of the Risk Level for each risk are ranked based on the largest average of the public, private, and overall sectors. The limited experience of the public and private sectors with projects using PPP schemes affects project success. It is therefore important to assess risk perceptions so that the government can establish appropriate policies and frameworks (Abednego & Ogunlana, 2006).

After all the risks are ranked into three categories (high, medium, and low). Then the critical risk factors (CRF) of both public and private partners are measured by the Spearman rank correlation coefficient. If the correlation is close to 0, this indicates no linear relationship between the two groups of variables. Suppose it is significant under the correlation test. If the hypothesis (=null), there is no significant correlation between the two groups on the ranking, and can be rejected (Sy et al., 2017). In this study, T-Test was used to evaluate how closely or related two different groups were. T-Test aims to determine whether there is a significant difference between the means of the two unrelated groups. In other words, the analysis of the different perceptions of each sector wants to prove that there are different points of view as a result of experience or the objectives of each sector in assessing risk.

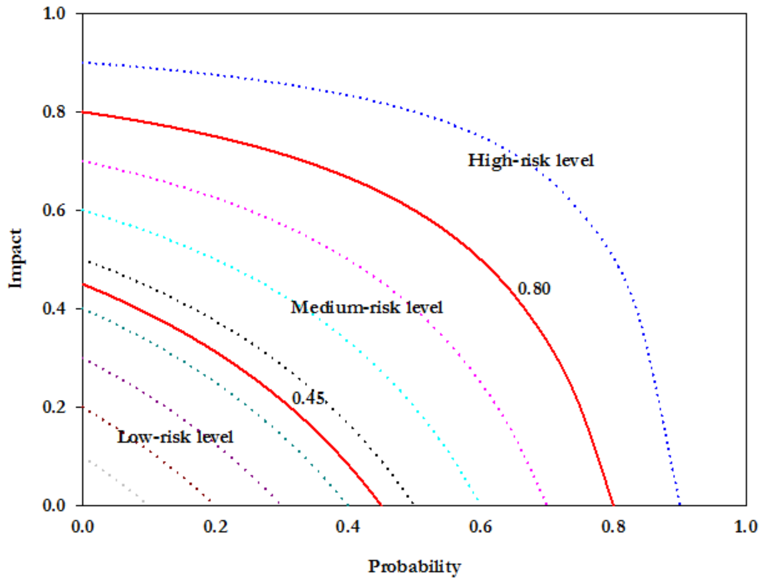

Figure 2. Risk Level Diagram
(Likhitruangsilp, Do, & Onishi, 2017)

2. Research Method

A thesis is based on a qualitative and quantitative approach to identify and analyze risks from the opinion of the public and private sectors involved in the government-private partnership project of the WS-DWSS project from its start in 2012 until its commercial operation in 2021. The data obtained include primary and secondary data. Preliminary data will be obtained from interviews, questionnaires, and document reviews.

The interview was conducted in order to obtain information on the background of the project, the role of stakeholders, status, issues/constraints faced in the WS-DWSS project from the beginning, and how the roles of stakeholders and the interactions in it were. The list of interview questions is structured so that the questions are more focused and do not deviate from the goal. In addition, additional questions were developed from interactions with resource persons in order to obtain more in-depth answers. Meanwhile, the determination of respondents is done by identifying the duties and functions of the agencies related to the implementation of the WS-DWSS project in accordance with the laws and regulations. The selected respondents included seven relevant agencies representing the government and the private sector. Four interviews are planned with representatives from Indonesian government agencies, namely from the Ministry of National Development Planning (Bappenas), the Ministry of Finance, the Semarang City Regional Planning Agency, and PDAM Tirta Moedal Semarang (Regional Owned Enterprise) as the company responsible for the drinking water project in Semarang city. In addition, three interviews are planned with representatives from the business entity sector, namely PT Sarana Multi Infrastruktur (PT SMI) as a consultant for FBC preparation, PT Indonesia Infrastructure Guarantee

Agency/PT IIGF (or PT Penjaminan Infrastruktur Indonesia/PT PII) as infrastructure guarantee and PT Air Semarang Barat (Moya Holding Group) as the Implementing Business Entity (IBE) for the WS-DWSS project. Information obtained from interviews is then used as input in the chapter overview and discussion.

Questionnaire data includes questions from several risks that have been collected through previous literature and expert validation processes. This questionnaire is an assessment by actors of their perception of the probability and impact value of a number of risk factors on a drinking water supply project. The questionnaire (see Appendix 1) consists of 11 types of risk with 67 sub-risks. Meanwhile, the probability and impact assessment use a Likert scale (1 - 5). The Likert scale is a psychometric scale that has several categories that respondents choose based on their opinions, attitudes, or feelings about something (Nemoto & Beglar, 2014). Data collection using interview and questionnaire methods in this study was carried out simultaneously. A document review was conducted to describe the PPP framework in Indonesia, exploring the risk factors for a drinking water project from various existing studies. Complete the analysis with articles or related documents that explain the PPP West Semarang Water Supply Project.

The results of the assessment are analyzed and classified based on the probability of risk and the level of impact (PMI, 2013) and compiled to indicate the risk classification (low, medium, or high). The risk factors from the two sectors are then sorted based on the value of the largest risk level so that the most critical risk factors are obtained as a whole. Then verification is carried out using the Spearman correlation test to determine the consensus between the two groups of respondents, how public and private respondents view the probability, impact, and level of risk of PPP project risk factors. In this study, an analysis of the most significant risk possibilities and impacts of the 67 risk factors was also carried out. Furthermore, an analysis of differences in perceptions was carried out to find out what risk factors were the most different by knowing the average difference using a T-test analysis with the SPSS application.

3. Result and Discussion

3.1 Critical Risk Factors

The risk factor (RL) concept was adopted to determine the risk factors that influence the West Semarang DWSS PPP project. Table 2 is a ranking of 28 overall critical risk factors with a very high category (RL≥0.8) which is the opinion from the overall, public, and private sectors of the 67 risk factors. Overall, in the Table 2, 28 risk factors out of 67 risk factors are in the very high category (RL≥0.8), which are ranked according to their value. However, based on respondents from the public sector, there are 50 risk factors with a very high category (RL≥0.8), while the remaining 17 risks are in the medium type (0.45≤RL<0.8). While on the private side, only four risk factors are seen as the most critical (Very High). Fifty-seven risk factors are in the medium category, and the remaining 6 are low-risk factors (RL<0.45). Interestingly, the public sector's understanding of the critical risks of the West Semarang DWSS Project is riskier (see Table 2 and Figure 3) than the private sector. However, both sectors agree that the availability of raw water (input) factor either continuity/quantity (O5) is the biggest risk factor (see Table 2), followed by natural disaster (FO1), and Tariff setting & demand projection error (I1).

From Table 2, the availability of water (continuity/quantity) is the largest contributing risk factor with risk level about 0.94. Water availability is an important factor in the project, ensuring continuity and quality of project operation. It is necessary to anticipate preventive measures by preparing raw water from other sources and supplying facilities. For example, the water scarcity incident at PDAM Tirtawening, Bandung City, West Java Province, can only supply raw water from Dago intake of around 200-300 liters/second from its normal capacity of 550-600 liters/second. Because at that time, the water reserves from the river in the north of Bandung City, West Java Province, experienced a crisis, and it was very worrying for the company to maintain the raw water entering the Badaksinga Water Treatment Plant (Naviandri, 2021).

The natural disaster became the second largest risk factor with the risk level about 0.89, although the probability is quite small, it is only 0.39, but the impact is 0.82. When physical infrastructure faced natural phenomena such as extreme weather, earthquakes, and landslides, it can cause major disruptions to the flow of goods and services. Moreover, Indonesia is located in an earthquake-prone area; even on a small scale, it can cause serious damage. For example, cases of natural disasters occurred in September 2018 in the cities of Palu, Sigi, Donggala, and Parigi Moutong, Province of Central Sulawesi. An earthquake with a magnitude of 7.4 on the Richter scale shook the region and caused great losses to the community due to the difficulty of getting clean water. There was damage to the Donggala PDAM pipe network, such as broken and leaking pipes, which reached 270 meters from a total length of 28 km of pipes serving the Tanamodindi sub-district with a fairly large percentage of pipe damage around 0.962% (Anasiru & Tahir, 2020). According to sources from PDAM, the risk of force majeure is quite large because the position of the raw water pipeline network is on land prone to landslides. The potential for pipe damage is very large there, considering that the Manyaran area experienced a landslide in 2018. Based on the results of survey studies from the geology of the soil layer, the vulnerability of soil movement is medium to high (Diskominfo Jateng, 2017).

In preventing the risk of failure of initial tariff setting, it is to establish regulations related to tariff mechanisms, incentives, and commitments in implementing regulations then in addition to anticipating delays in tariff adjustments on a regular basis, it can be done by establishing regulations that regulate the level and period of tariff adjustments as well as commitments in implementing regulations. Several incidents often arise because the process of socialization to residents does not work so in its implementation there are protests from residents. In addition, according to Yun et al. (2015, cited in

Sutantiningrum & Utami, 2019) to fulfil the implementation of periodic tariff adjustments by improving operating performance so that customers are satisfied with the service and are willing to pay according to the agreed rates.

Table 2: Critical Risk Factors of PPP West Semarang Drinking Water Supply System

Code	Risk Type	Overall	Rank	Public	Rank	Private	Rank
O5	Availability of raw water (continuity/quantity)	0.94	1	0.98	1	0.86	2
FO1	Natural disaster	0.89	2	0.93	7	0.85	3
I1	Tariff setting and demand projection error	0.88	3	0.91	11	0.80	4
IF1	Standard/service method differences	0.88	4	0.93	8	0.74	9
O6	Raw water quality (input)	0.88	5	0.96	2	0.72	10
N2	Distribution network connectivity and connecting facilities	0.88	6	0.81	49	0.94	1
O7	Water loss and quality in transmission and distribution network	0.87	7	0.94	4	0.72	11
D3	Inappropriate cooperation model or bad contract	0.85	8	0.93	9	0.69	17
D6	Design Error	0.85	9	0.91	12	0.67	24
I2	Periodic fare adjustment delays	0.84	10	0.91	13	0.72	12
L8	Presence of contamination/pollution to the site (environmental risk)	0.84	11	0.94	5	0.63	30
O1	Quality of service	0.84	12	0.89	18	0.75	7
I7	Abuse of authority (Corruption, etc.)	0.83	13	0.86	31	0.78	5
D10	Changes in the scope of work after signing the contract	0.83	14	0.91	14	0.69	19
FO2	Man-made disasters (hazardous material spills, fires, land water contamination, structural failures, explosions, and acts of terrorism)	0.83	15	0.89	19	0.72	15
O8	Availability of bulk water (output) either continuity/quantity	0.82	16	0.89	20	0.60	38
P7	Replacement of officials/stakeholders in the regions	0.82	17	0.88	23	0.60	40
F4	Delay in government support (incentives, subsidies, disbursement of VGF, land bailout funds, etc.)	0.82	18	0.88	26	0.72	14
O2	Availability/reliability of supporting facilities and utilities (electricity, etc.)	0.82	19	0.89	21	0.69	18
D9	Increase in construction costs	0.82	20	0.86	34	0.63	32
L9	Unexpected land conditions (geotechnics, weather, etc.)	0.81	21	0.88	24	0.69	21
L1	Land availability	0.81	22	0.94	6	0.51	54
D2	Poor performance (consultant/contractor/subcontractor)	0.81	23	0.95	3	0.50	57
A2	Asset condition after completion of the agreement	0.80	24	0.86	32	0.60	41
L3	Increase in land acquisition costs	0.80	25	0.92	10	0.56	45
O4	Error estimation of operating and maintenance costs	0.80	26	0.84	35	0.72	13
D7	Poor quality of human resources, materials, equipment, and technology	0.80	27	0.82	46	0.67	25
O9	Bulk water quality (output)	0.80	28	0.89	22	0.63	31

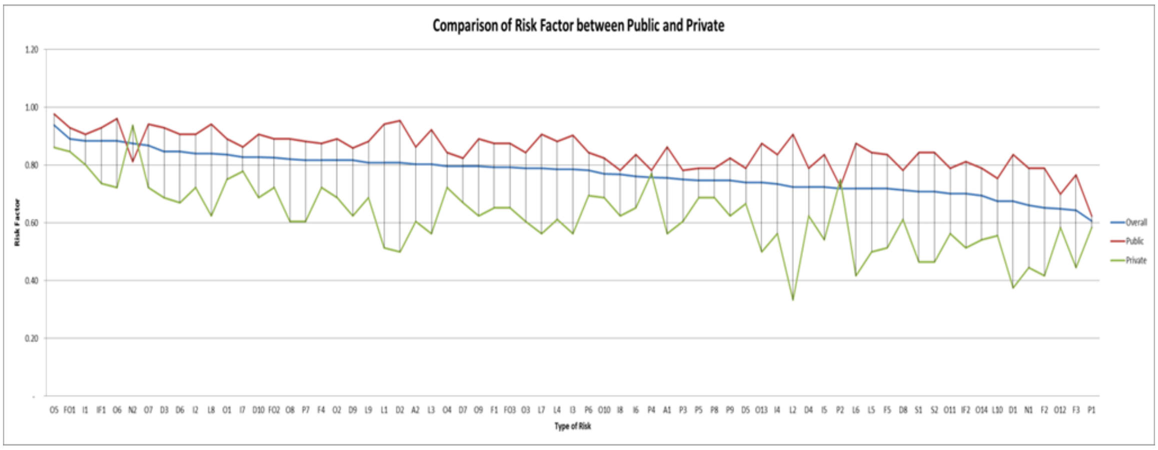

Figure 3. Comparison Risk Factor between Public and Private

According to sources from Indonesia Infrastructure Guarantee Fund (PT PII), the risk factor for demand projections is reflected in the magnitude of the deviation in the customer absorption target. If it is not analyzed properly, it can result in ineffectiveness of the Capital Expenditure of the GCA on the Service Distribution Network that was built, the suspension of transactions due to the inability of the GCA to fulfill the agreed Take or Pay, and the failure to pay the GCA to the Implementing Business Entity who cannot be paid within the deadlines period.

3.2 Different Risk Perception

Based on the analysis using the T independence test, 14 Critical Risk Factors (out of 28 Risk Factors) were obtained between the perceptions of the public sector and the private sector. The 14 risk factors below have significance (Sig 2-tailed <0.005) and have been ranked based on the largest average. Furthermore, the 14 risk factors are grouped based on the risk factors that have the closest relevance (see Table 3).

Table 3: Critical Risk Factors (CRF) with The Largest Mean Difference

Code	Risk Type	Sig. (2-tailed)	Mean Difference
L1	Land availability	0.004	0.45333
D2	Poor performance (consultant/contractor/subcontractor)	0.003	0.41917
A2	Asset condition after completion of the agreement	0.001	0.36250
O7	Water loss and quality in transmission & distribution network	0.022	0.32417
D9	Increase in construction costs	0.003	0.31917
O9	Bulk water quality (output)	0.008	0.31667
L8	Presence of contamination/pollution to the site (environmental risk)	0.009	0.29250
IF1	Standard/service method differences	0.021	0.25833
O6	Raw water quality (input)	0.012	0.25000
O8	Availability of bulk water (output) either continuity/quantity	0.015	0.23000
I2	Periodic fare adjustment delays	0.027	0.22250
D3	Inappropriate cooperation model or bad contract	0.026	0.21750
L3	Increase in land acquisition costs	0.044	0.21750
D10	Changes in the scope of work after signing the contract	0.012	0.16750

3.2.1 Cooperation contract-related risks

Construction projects are complex, unique, dynamic jobs and are full of risks and uncertainties because they are related to cost, time, and quality. Issues that cause changes in the scope of work after signing the contract (D10) or Inappropriate cooperation model or bad contract (D3), due to several factors such as contractor problems, physical field conditions, problems with internal supervisory consultants/supervisors and errors/omissions in design, project location issues, project owner policies, security and safety constraints, and project financing issues. According to Sy et al (2017), The most dominant cause that affects the change in scope based on the government's perception of water projects is the problem of contractors. Several things are factors that cause contractor problems to be the most dominant cause, namely the lack of knowledge of the contractor workforce in understanding working drawings, lack of coordination with other related elements, and not having a permanent workforce. Most of the project area contractors are subcontracted back to other parties. The second factor that is very influential is the physical condition of the field, such conditions as landslides at the site, soil shifting, soil hardness, erratic river discharge, etc.

Meanwhile, the private sector thinks otherwise. Often the variation order/change order instructions on government projects are limited by the absence of an addition to the total contract price so that if there is an order for additional work there must also be a reduction in several jobs so that the total contract price is fixed, this causes the contractor/service provider to have problems in project financing. According to Martanti (2019), the causes of changes in the scope of the project contract include requests from the project owner for optimization of building functions, discrepancies between drawings and field conditions, design errors/drawings from planning consultants, significant volume differences between drawings, field conditions and bill of quantity, and articles concerning The change order is not clearly stated in the construction contract. This of course results in the availability of materials, disruption of cash flow, availability of labor, funding/capital that must be issued by service providers/contractors, and availability of work equipment.

The factor of increasing construction costs (D9) caused quite a large loss for the private sector (ranked 32) compared to the public sector (ranked 34). This risk can be caused by rising material prices, high equipment prices/rental, material damage, fluctuations in labor wages, poor cost control in the field, inaccurate cost estimates, and new financial policies from the government. The risk of increasing construction costs is indeed allocated to the business entity that bears it, although for the WS-DWSS project, not all construction is carried out by the private sector, some constructions such as Intake, Main Distribution Network, Secondary and Tertiary Network, and Switching are still borne by the government.

In Indonesia, contractor performance greatly affects the quality and timeliness of construction. Project delays can occur due to several factors due to contractor performance such as contractor experience and lack of project management and supervision; standard/service method differences (IF1); inaccurate time and cost estimates; improper project planning and scheduling; incompetent project team; use of outdated technology; contractor's financial difficulties; poor coordination of contractors, consultants, and project owners; lack of worker productivity; lack of equipment; lack of workforce; work accident; unreliable sub-contractor (Haseeb et al., 2001; Abedi, et.al., 2011; Toor dan Ogunlana, 2008; El-Razek et.al., 2008 cited in Chendra & Chandra, 2014). This is why the public sector sees that the contractor's performance factor is very significant for project completion. The PPP scheme was chosen because of the involvement of several parties and the existence of risk sharing with the business entity to bear the risk of the contractor's performance on their own.

The asset condition factor after completion of the agreement (A2), is one of the risks that also considered important by the public sector because in Indonesia, asset management is not carried out with optimal utilization, and many shifts in ownership of state assets result in state and regional losses. Therefore, the anti-corruption agency in Indonesia also reviews a number of contracts that have the potential to harm the local government and controls problematic assets, both those controlled by third parties and assets that are not optimally utilized. One of them is related to the extension of the Cooperation Agreement between PAM Jaya and PT Aetra Air Jakarta regarding the management of drinking water in the DKI Jakarta area with a span of 25 years from the end of the contract in 2023 (Anhari, 2021).

3.2.2 Operation-related risks

It is undeniable that the quality of raw water (O6) is still a problem in its utilization which must comply with the required specifications. Although the two sectors combined pay attention to this factor, the public sector considers the quality of raw water to be riskier because the water produced will be consumed as a source of drinking water for the general public. Currently, the utilization of the Jatibarang Reservoir, which will be used as a raw water provider for the West Semarang DWSS project, is still being used for various purposes such as tourism and fishery activities. Improper use of this reservoir can reduce the quality of raw water. For example, tourism activities are considered to have an effect on pollution that occurs in the Jatibarang Reservoir, especially in the pier area because in that area there are tourist attractions that existed before the Jatibarang Reservoir was built. The number of speed boats leaning, oil spills or speed boat fuel can pollute the reservoir waters. In addition, capture fisheries activities are added (Melinda et al., 2019). However, according to information from sources at PDAM Tirta Moedal, this has been corrected by reducing the use of motorized machinery and capture fisheries because they will affect water quality. Then the issue of Water loss and quality in transmission & distribution network (O7), according to the chairman of BPPSPAM in 2019, the rate of water loss in Regional Drinking Water Companies (PDAMs) throughout Indonesia was an average of 33.16 percent. This figure still has to be suppressed because it has not met the determined national target, which is less than 20 percent. Indeed, the rate of water loss in recent years has increased. In 2015, PDAM lost water by 32.47 percent. Then, an increase in water loss also occurred in 2017 as much as 32.80 percent. This is due to physical losses due to leaky pipelines and commercial losses due to inaccurate water meter measurements to customers. Risks in the transmission and distribution network in drinking water projects are allocated to the private and public sectors respectively.

Meanwhile, the issue of availability of bulk water (output) either continuity/quantity (O8) and Bulk water quality (output) (O9) has also become a public sector concern, marked by risk assessments ranked 20 and 22 respectively. Reduced quantity and quality of output (bulk water) can occur for several reasons, including: The quantity of output (bulk water) at the delivery point is not as promised, the volume provided by the Implementation Business Entity (IBE) is below what has been agreed in the contract, and the IBE receive water according to specifications but the water has a quality that cannot be consumed. The issue of quantity and quality of bulk water is the responsibility of the private sector as a provider of bulk water to the GCA (Ditjen PI PUPR, 2010). If there is a risk in the processing or distribution of bulk water (IBE) fails to supply bulk water exceeding 10 percent of the order volume for 3 consecutive months) then the IBE is obliged to pay a penalty for failure to perform as agreed in the cooperation agreement. Then if the IBE fails to supply bulk water in accordance with the bulk water quality specifications (which can result in harm to the environment and health) then the IBE is obliged to pay a performance failure penalty to the GCA (Wibowo, 2021).

3.2.3 Payment-related risk

Drinking water PPP projects will usually make tariff adjustments to take into account the inflation rate and take into account the principles of affordability and equity, quality of service, cost recovery, efficiency, protection of raw water, as well as transparency and accountability. However, the risk factor for Periodic fare adjustment delays (I2) is still a concern for the private sector. The private sector assesses that the certainty of tariff adjustments significantly influences their decision to invest. Because, like other infrastructure PPP projects, the tariff will have an impact on the company's return on investment and cash flow during the concession period. This adjustment process requires a long time in socializing the increase in tariffs and improving services to customers first. Moreover, there are still many complaints from customers who experience water that often dies (Yolandha, 2021).

3.2.4 Location-related risks

The risk of land availability (L1) and the increase in land acquisition costs (L3) are high-risk factors that can hinder project completion, the impact of this risk is of great value which is likely to affect the time or increase in project expenditure by 15-20% (Sutantiningrum & Utami, 2019). In the West Semarang SPAM land acquisition, there has been a delay due to constraints in land acquisition for the West Semarang WTP construction site. Even though at that time the Regional Regulation from the DPRD for development had already been completed as the legal basis for the construction of IPA. But the release process is still ongoing until March 2019 (target). Of the land requirements of 5 hectares in Jatibarang or as many as 46 plots of land in Jatibarang, there are still 5 parcels of land that have not been acquired. There are five parcels of land that are not yet free. The five fields belong to 4 people. The provision of this land is the responsibility of the city government through the Semarang City Public Works Service (DPU), which will immediately continue the acquisition process through a consignment route at the Semarang District Court (Sigijateng, 2019). Although the risk of availability and delay remains the responsibility of the public sector, the risk of the Presence of contamination/pollution to the site (environmental risk) (L8) is borne by the private sector.

4. Conclusion

The success of projects with PPP schemes cannot be separated from the participation of stakeholders involved in the cooperation. This study succeeded in identifying 67 risk factors in the drinking water project distributed in 11 risk groups. Of the 67 factors through a survey with stakeholders and further analysis, 28 critical risk factors were obtained which were in the very high category (RL≥0.8) based on the overall answer. Both sectors agree on the most critical risk factors of this project: availability of raw water (continuity/quantity), natural disaster, tariff setting, and demand projection error. Water availability is the most important factor considering the need for continuity and adequate quantity as the main source of the project. Second, natural disasters are also factor that cannot be predicted but can be mitigated and anticipated through careful site selection planning. The third factor is undeniable, the project requires capital in the context of investment recovery and future maintenance. In addition to the critical risk factor from the similarity of opinion between the two sectors, different perceptions also arise as part of two different parties. From 67 risk factors, only 4 risk factors are considered very critical by the private sector compared to the public sector, which sees more critical factors that may occur in this project. The risk factors of both sectors also have differing opinions on assessing the probability and impact of risks on the project. The difference in understanding of critical risk factors between the two sectors is through an independence test which produces 14 critical factors. Then in this study grouped into 4 categories: 1) Risks related to cooperation contracts: Increase in construction costs (D9), inappropriate cooperation models or contracts poor (D3), Changes in scope of work after signing the contract (D10), Poor performance (consultant/contractor) (D9), Differences in service standards/methods (IF1), Condition of assets after completion of the agreement (A2); 2) Operation-related risks: Quality of raw water (input) (O6), Loss and quality of water in the transmission & distribution network (O7), Availability of bulk water (output) both continuity/quantity (O8), Quality of bulk water (output)) (O9); 3) Payment-related risk: Delay in periodic tariff adjustments (I2); 4) Location-related risks: Land availability (L1), Increase in land acquisition costs (L3), and Presence of contamination/pollution at the site (environmental risk) (L8). It can be concluded that this difference in perception is caused by the different objectives of each sector as part of a cooperation project. The private sector pays more attention to several factors related to investment costs and returns. On the other hand, the public sector pays more attention to the sustainability of the project and the performance of the private sector in managing the project during the concession period. The results of this study can be used as input by the Government to manage the risks of the PPP project in the drinking water sector. In addition to the implementation of good risk management, the ability of the GCA also plays a key role in the success of a PPP project.

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