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ANALYSIS OF EFFECTIVITY SCHEME BASED ON RISK MANAGEMENT AND EFFICIENCY FOR THE ACCELERATION OF CLEAN WATER FULFILLMENT IN INDONESIA

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Abstract

The Indonesian government has a target to provide 100% clean water through its “100-0-100 Urban” scheme. The objective is based on its Medium-Term Development Plan (RPJMN) 2015–2019 and the ambition to achieve the United Nations Sustainable Development Goals (SDGs) by 2030. The realization of a clean water supply, as of 2018, reached just 73%, and that in the cities, with only 2% growth per year. The cost needed to achieve the target of 100% clean water in Indonesia is Rp253 trillion. Currently, there are two mechanisms to meet the needs of clean water in Indonesia, namely Public–Private Partnerships (PPP) and Conventional Government Procurement (CGP). The best scheme is the implementation of risk management and risk efficiency. This paper will analyze and compare CGP and PPP for their abilities to provide clean water with a risk efficiency approach, while still considering environmental sustainability and balance. The results of this study show that the PPP scheme is one of the most effective and sustainable, compared to others available in Indonesia. Via PPP, 43.8% of the allocated risk would be transferred from government risk to the project company, and some 25% would become shared risk. By this mode, it is predicted that using a PPP scheme could mitigate the risk of increased construction costs by approximately 71.6%, and 56.9% of the O&M cost. A PPP scheme for the water supply project in Indonesia is workable, bankable, and has the potential to finally fill in the water supply gap in Indonesia.

Keywords: CGP; efficiency; risk; PPP; sustainability; water.

1. Introduction

All living things need water to survive. Human beings need water for hygiene services and hydrating the body. Plants need water for photosynthesis to generate food and energy for growth and cellular respiration. The importance of water resources is one of the reasons underlying Article 33(3) of the 1945 Constitution of the Republic of Indonesia, which reads, “The lands, the waters, and the natural resources within shall be under the powers of the State and shall be used to the greatest benefit of the people.” Hence, the sustainability resource of

water is guaranteed by the state. Clean water and decent sanitation are basic human needs that must be fulfilled. The critical role of clean water is one of the eight goals defined by the UN Sustainable Development Goals (SDGs).

Besides reaching the SDGs, the achievement of meeting drinking water needs is also stated in the National Medium-Term Development Plan 2015–2019 (RPJMN 2015–2019). The RPJMN dictates the principal target of national development, which includes fulfillment of 70% clean water by 2014, rising to 100% in 2019. According to the [Central Bureau of Statistics in 2018](#), known as the BPS, the proportion of the population with access to sustainable clean water according to residency was 80.82% for urban areas and 62.10% for rural areas. the [Ministry of Public Works and Public Housing \(2019\)](#) noted that the scope of clean water service only reached 73%, while it was targeted to be 75% in 2019, meaning that there was a rising gap of 2% per year. Thus, the principal target outlined in the National Medium-Term Development Plan 2015–2019 could not be fulfilled.

National water use is concentrated in Java and Bali, with the intended use of clean water for households, cities, industries, agriculture, etc. Based on Water Balance Year 2003, water needs during the dry season in Java and Bali is about 38.5 billion m³, of which only 66%, or 25.3 billion m³, was achieved ([Direktorat Pengairan dan Irigasi Bappenas, 2006](#)). The study of global water conditions delivered at the World Water Forum II in Den Haag Year 2000, projected that by 2025 there would be a water crisis in some countries. Although Indonesia belongs to the 10 water-richest countries, it is facing a water crisis. This prediction is due to water mistreatment that reflects its significant water pollution levels, inefficient water use, huge fluctuations in river water discharges, weak institutions, and inadequate laws and regulations.

In order to objectify the fulfillment of 100% clean water for all homes, IDR 253.8 trillion in funding will be required ([Portal Informasi Indonesia, 2019](#)). This number is enormous and very difficult to fulfill within the state budget. Therefore, alternative financing will be required. A common constraint in infrastructure development are investment costs, so that the initial effort to generate fund sources here is key. Currently, there are only three financing schemes in Indonesia: Conventional Government Procurement (CGP), Public–Private Partnership (PPP), and third-party grants that are a basically charities connected to Corporate Social Responsibility (CSR). Of all three schemes, CSR funds are the most flexible and not predicted in terms of implementation. Therefore, it is hard to gage its achievement, method of execution, and control. The government is better off with the CGP and PPP schemes for reaching its goal of providing clean water efficiently and effectively. The problem that occur during the

provision of infrastructure in addition to the limited budget are over budgeting, weak operational and maintenance implementation. As a result, risk mitigation related to construction, operation, and maintenance remain primary concerns.

This paper will analyze and compare the CGP and PPP schemes for the provision of clean water using risk management and efficiency approaches. Third-party funding of a charitable nature, such as grants and CSR, are not measured because there is no government intervention or help from the state budget. Therefore, it is challenging to provide a comparison with the two other schemes. By analyzing the best method for the provision of clean water, the government can determine the proper funding mechanism to fulfill the shortage.

2. Methods

The method used in the current study is a risk-based evaluation. Primary and secondary data are used. The primary data pertains to risks in the water supply project. The secondary data are related to the change and impact of the rising construction, operations, and maintenance costs of the existing infrastructure projects.

The stage of the study is (1) conduct analysis on CGP and PPP to obtain information on the business process and philosophy of the two schemes; (2) identify the incremental risks; (3) analyze the change and impact of the risks based on the literature; and (4) effectively scheme for acceleration of clean water. The flowchart of the methodology can be seen in Figure 1.

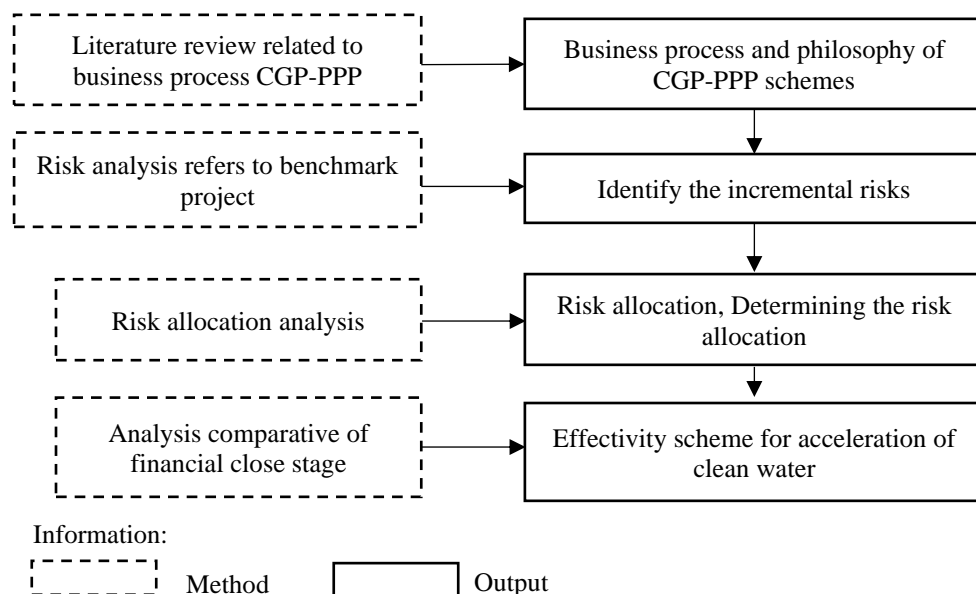


Figure 1. Research Stages

Source: Author (2019)

3. Results and Discussions

The obstacles that mainly occur during infrastructure development, including the provision of clean water, are the investment limitations. Therefore, alternative financing is needed to achieve 100% clean water provision in Indonesia. Several financing schemes can be used to reach that goal, the most common of which are CGP and PPP. The selection of the proper scheme will ensure the acceleration of clean water effectively and efficiently, while mitigating the risks that might occur.

3.1. Business process and philosophy of CGP-PPP Scheme

Identification and analysis of business processes and the philosophy of the CGP and PPP schemes are needed to assess the character of each to identify the risks and typologies of the business processes. The business process of those schemes is:

1) CGP scheme

CGP scheme is a conventional goods and services procurement commonly used by the government, where every national institution conducts a procurement according to its annual approved budget. Based on the CGP scheme, the overview of government responsibility includes construction, implementation, and management of public services. The government is assumed to perform the construction of all facilities and infrastructure relevant to the project and holds operational control of same, as well as their services, in order to make sure that risks related to the project become government risks. According to [APM Group \(APMG\), 2016](#), CGP or Schemes commonly used on traditional procurement are:

- a. Build (B) Contract. In this contractual scheme it is only arrange in infrastructure asset development;
- b. Design and Build (DB) contract. In this contractual scheme, design and construction are merge into one contract;

On Infrastructure provision using convention mechanism, the procuring authority will pay the provision corresponding to the agreed progress and stages. In this mechanism, contractor is responsible for the funding used and provides security for occurring risks such as bank guarantee and insurance ([APMG, 2016](#)).

The challenge of the CGP scheme is commonly related to maintenance following its budget. Therefore, the risk of failure in service and damage sustained by the infrastructure is

high. The current CGP scheme refers to Presidential Regulation No. 16/2018, concerning government procurement of goods and services.

2) PPP scheme

Policy of PPP is available in some developed and developing countries (Osei-Kyei & Chan, 2015). PPP is a procurement option that has been used by many countries in order to provide infrastructure and public service (Chou & Pramudawardhani, 2015). Although many governments are interested to implement PPP concept, but it is still limited in term of information regarding the motivation to use PPP concept (Osei-Kyei, Dansoh, & Ofori–Kuragu, 2014).

PPP is believed to provide benefits to the public sector, private sector, and consumers by involving the participation of the government and the private financing initiatives (Yuan et.al.,2012). One can see that PPPs represent a means of contracting services, using innovation and experience in the private sector, and often using private finance. In addition, PPPs are best seen as a special type of contract in infrastructure provision, such as building and equipping schools, hospitals, transportation, water and sewer systems (Della Rocca, 2017). A common driver is the claim that PPPs allow the public sector to use the experience and efficiency that the private sector can bring to the supply of certain facilities and services that have traditionally been provided and offered by the public sector (Himmel and Siemiatycki, 2017). Throughout the world, PPPs are often perceived as a means of contracting for the development and maintenance of infrastructure services, using the innovation and skills of the private sector to manage activities that often use private finance (Carbonara and Pellegrino, 2018).

Since 1990, the global water industry has seen a marked growth in PPP water supply projects (Ameyaw E.E and Chan A.P.C, 2015). PPP advantages include value-for-money through optimal risk allocation, managerial and technical expertise and innovation, reduced life-cycle costs, and improved service levels, efficiency, and performance (Marques and Berg, 2011).

In PPP, private party will be tied with a long-term contract to provide public infrastructure. The private sector agrees to undertake the following:

- a. DB or upgrade the public infrastructure;
- b. Risks of financial, technical, and operational;
- c. Financial return through payments over the life of the contract from users, public sector, or a combination of the two;

- d. Usually return the infrastructure to public sector ownership at the end of the contract ([APMG, 2016](#))

In Indonesia, PPP for public infrastructure provision refers to specifications set by the Minister/ Head of Government Institution/ Head of Municipality/ State Owned Enterprise (SOE)/ Municipality Owned Enterprise (MOE), that partially or wholly using the resources of the Project Company with attention to risk allocation between the stakeholders ([government of Indonesia, 2015](#)). There are PPP definitions other than that covered in Presidential Regulation No 38 / 2015, namely:

- a) Based on the definition provided by the Public–Private Partnerships Reference Guide, V 2.0, as a broad concept to be applied both to new or existing infrastructure and services, a PPP may be defined as A long-term contract between a public party and a private party 2 for the development and/or management of a public asset or service, in which the private agent bears significant risk and management responsibility through the life of the contract, and remuneration is significantly linked to performance, and/or the demand or use of the asset or service ([World Bank, 2014](#)).
- b) PPP model is the collaborative form between the public and private sectors with the goal of traditional provision of public goods and services ([Liu and Hiraku, 2009](#)).
- c) PPP is an activity of public service or private economic activity, with joint funding and operation by private and public entities based on the contract that arranges the funding and the operation ([Koschatzky, 2017](#)).
- d) PPP is an institutional and organizational alliance from government authority and private business that aims to realize social projects with the scope of activity: from the development of strategically important economic sectors to the provision of national public service. ([Akhmetshina et al, 2017](#)).

Regulations being used as PPP framework in Indonesia are as follows: Presidential Regulation Number 38 of 2015 and Minister of National Development Planning/Head of National Development Planning Agency number 4 of 2015. The PPP process is based on the Regulation of the Minister of National Development Planning/Head of the National Development Planning Agency of the Republic of Indonesia Number 4 of 2015, as follows:

1. Planning phase

The planning phase includes (1) Preparation of the PPP funding budget plan, (2) Identification and determination of the PPP, (3) Budgeting of the PPP planning stage funds, (4) Preparing PPPs action plan, (5) Preparing PPP Pipeline, and (6) Categorizing PPPs.

2. Preparation stage

The preparation phase includes (1) Preparation of Feasibility Pre-study including a review of the return on investment of the Implementing Business Entity, (2) Submission of Government Support and/or Government Guarantees, and (3) Submission of PPP location determination.

3. Transaction phase

The transaction phase includes (1) Market Sounding, (2) Determination of the location of the PPP, (3) Procurement of an Implementing Business Entity which consists of the preparation and implementation of Implementing Business Entity, (4) Signing of the PPP agreement, and (5) Financial Closure ([government of Indonesia, 2015](#)).

For a clean water PPP scheme, the government acts as a Contracting Agency (CA). Its responsibility is the development of the facility and infrastructure with the form of funding, partial construction of the distribution system, and land acquisition. The Project Company is responsible for financing and constructing the facilities that include the bulk water unit, water treatment plant (WTP) main distribution channel, and part of the tertiary distribution channel as well as the operational and maintenance of the bulk water unit and WTP. The government is responsible for the operation and maintenance of all distribution channels needed by the project. The partnership pattern in clean water provision needs to consider the policy of the clean water provision sector in Indonesia that is regulated by Government Regulation No. 122/2015 concerning Clean Water Provision System and PPP limited to the scope as follows:

- 1) Development investment and/or bulk water unit and units of production;
- 2) Units of distribution investment operated and managed by a SOE/MOE; and/or
- 3) Technological investment of operational and maintenance but with merit-based contract.

Parameters used to assess PPP implementation of water project developing countries are access, quality of service, operational and tariff efficiency ([Marin, 2009](#)). Clean water access in many countries are still very low and not all of the received clean water has appropriate

quality hence the increase in quality is also needed. Operational efficiency is needed to mitigate the frequent problem, that is the loss of produced water (non-revenue water). The ability to conduct operational efficiency and managing the loss of water produced will affect the water tariff (Hatmojo, J. U. D and Susanti Riza, 2012).

Government of Indonesia has many variants of business that involve private sector, however as of today the involvement is relatively low. The main issue that is concerning the private sector are the risk and the uncertainty on the long term contract. Therefore, the ability to conduct risk management will be the key for a successful PPP implementation in Indonesia. Since the objective of project risk management is to identify and manage significant risks, several important factors and their mitigation options by project stakeholders have been explored (Pribadi S.P and Pangeran M.H, 2015).

3.2. Identify the incremental risk

Every form of partnership contains risks, whether in a CGP or PPP scheme. Preferably, the scheme is one that can mitigate the risks based on their chances and impacts. Problems that could arise from the infrastructure of clean water provision, other than funding, are unplanned construction and its costs and weakness in the operational and maintenance process. Specifically, the construction, operational, and maintenance risks of clean water provision in Indonesia can be classified as follows:

1) Construction risks

Construction risks related to clean water provision process: (a) environmental contamination/pollution, (b) third-party claims, (c) insufficient design, (d) location hazards, (e) contractor performance, (f) changes in financial indicators, such as foreign exchange, inflation, and interest rates, (g) work quality, (h) changes in policy and regulation, (i) force majeure, (j) failure of the project development.

2) Operational and maintenance risk

Risks associated with operations and maintenance: (a) inaccurate accounting or unexpected rise in O&M costs, (b) failure or inability of the private sector to administer the project, (c) disruption of utility supplies, (d) bulk water insufficiency, (e) water leak(s)/contamination in the distribution channel, (f) prominent defect in the equipment, (g) changes in legislation, regulation, and taxation, (h) failure to access project location.

The risks need to be measured to calculate the magnitude of chance and impact arising from construction, operations, and maintenance. Risk measurement is conducted by using secondary

data related to the probability and impact of those elements on the existing infrastructure project. The analysis using secondary data can be seen as follows in Tables 1 and 2:

Table 1. Studies on the Probability Rise of Construction and O&M Costs

No.	Study/Project	Probability
1.	<i>Policy and Planning for Large Infrastructure Project: Problems, Causes, Cures</i> , Flyvbjerg (2015)	90 %
2.	<i>Cost and Time Overruns of Projects in Malaysia</i> , Endut, Akintoye & Kelly (2005)	53.2%
Average		71.6 %

Table 2. Studies on the Impact of Rising Construction and O&M Costs

No.	Studies/Projects	Impact
1.	<i>Policy and Planning for Large Infrastructure Project: Problems, Causes, Cures</i> , Flyvbjerg (2015)	
a.	Rail Projects	44.7%
b.	Bridges & Tunnels	33.8%
c.	Roads	20.4%
2.	<i>Should We Build More Large Dams? The Actual Costs of Hydropower Megaproject Development</i> , Ansar, Flyvbjerg, Budzier, & Lunn (2014).	96.0%
3.	<i>Cost and Time Overrun in Public Sector Projects</i> , Morris (1990).	82.0 %
4.	<i>How Common and How Large are Cost Overruns in Transport Infrastructure Projects</i> , Flyvbjerg, Holm, & Buhl (2003)	64.6 %
Average		56.9%

The percentage of risks due to the rise in construction and O&M costs is 71.6%. The percentage impact of the risk due to the rise in construction and O&M costs is 56.9%. The percentage shows that risk associated with escalation development costs could lead to disruption of the service and even potentially halt the project.

3.3. Risk allocation

Therefore, proper risk management should be allocated to relevant stakeholders who are technically capable and can absorb the risk. Risk management relies on the precision of the risk allocation. The risk allocation is different for CGP and PPP schemes. Those differences can be seen in Table 3:

Table 3. Risk Allocation of CGP and PPP

Risk Components	CGP		PPP	
	Government	Private	Government	Private
1. Risks Related to Construction Costs				
Environmental				
Pollution/Contamination		✓		✓
Third-Party Claim		✓		✓
Incompetent/ Incomplete Design	✓			✓
Failure to Preserve Location Safety		✓		✓
Bad Performance/Negligence of Contractor or Subcontractor	✓			✓
Foreign				
Exchange/Inflation/Interest Rate Risk	✓			✓
Interface Risk				
Changes in Legislation/Regulation and Taxation Risk	✓		✓	✓
Force majeure (includes natural disasters and political force majeure)	✓	✓	✓	✓
Failure to Develop the Facility Following the Project Scope	✓	✓		✓
2. Risks Associated with O&M Costs				
Inaccurate Cost Estimate(s) and Unexpected Rise in O&M costs	✓			✓

Risk Components	CGP		PPP	
	Government	Private	Government	Private
Failure or Incompetence of the Project Company to Administer the Project	✓			✓
Disruption in Utility Supplies	✓			✓
Bulk Water Insufficiency	✓		✓	
Water Leak/Contamination in the Distribution System (after the guarantee period)	✓		✓	
Prominent Defect in the Equipment	✓		✓	✓
Contracting Agency Failure to Develop and Construct Main and Tertiary Distribution	✓		✓	
Changes in Legislation/Regulation and Taxation	✓		✓	✓
Failure to Access Project Location	✓		✓	

Source: Author (2019)

Referring to the risk allocation mapping of CGP and PPP, there are several observations to be made. In the PPP scheme, there is a 43.8% transfer of government risk to the private sector, while 25% risk is shared by both parties. The more risk allocated to the private sector from the government during the operational period, the more sustainable clean water will be provided. PPP scheme payments to the private sector are based on availability. For instance, when the water quality produced by the private sector is not in accordance with the agreed standard, then it will not receive full payment and may incur a penalty. This is different from the CGP scheme, where the payment will be received by the private sector when project construction is completed. The government can prioritize the PPP scheme to provide clean water in Indonesia, considering that the risk is more manageable by the private sector and the sustainability of the water provided can be affirmed.

3.4. Effectivity Scheme for Acceleration of Clean Water

The large number of risks transferred to the private sector can make a PPP project's water supply unattractive to the private sector and financial institutions. The attractiveness to

investors and financial institutions of PPP water supply projects in Indonesia can be seen from the achievements of the project stages. Until 2019, three PPP water supply projects had entered the construction stage. These were the Umbulan SPAM (estimated project cost: USD 140.7 million), the Bandar Lampung SPAM (estimated project cost: USD 82.6 Million) and the West Semarang SPAM (estimated project cost: USD 34 Million). For the projects to enter the construction stage means that they are closing in on another milestone, the financial close.

Financial close is a stage with a high degree of variation in market practice among jurisdictions. It means that not only have the financing documents been signed, but that the prior conditions for the availability of financing have been fulfilled (APMG, 2016). As project finance, the PPP is run by an Implementing Business Entity with sourced funding from equity and debt. In general, the average ratio between debt and equity is 70% sourced from debt and 30% sourced from equity. Therefore, the success of a PPP project is highly dependent on achieving the financial close. One of the keys to financial close success is the convenience of lenders, which can be seen from how the risks of the project can be controlled. In this case, the three PPP projects' water supply reached financial close between 162 days and 180 days, from contract signing to financial close. The time periods from signature to close can be seen in the following Table 4:

Table 4. Time Periods Between Contract Signature and Financial Close of PPP Project's Water Supply

Project	Contracting Agency	Contract Signing	Financial Close	Time Period (Days)
SPAM Umbulan	Governor of East Java Province	July 21, 2016	December 30, 2016	162
SPAM Bandar Lampung	PDAM Way Rilau	February 14, 2018	August 14, 2018	180
SPAM Semarang Barat	PDAM Tirta Moedal	December 12, 2018	May 22, 2019	167

Source: Wardhana (2019)

Based on the data in Table 4, the financial close of the water projects did not exceed 180 days. This shows that PPP water supply projects were workable and bankable in Indonesia. One of the causes of financial closure is the existence of government guarantees through the Indonesia Infrastructure Guarantee Fund (IIGF). According to Wardhana, Y.M.A (2018), PPP projects' water supply guaranteed by the government of Indonesia through IIGF is 100% financially closed. It can be concluded that IIGF's guarantee is a determining factor for lenders in providing financing. IIGF guarantees increased creditworthiness, especially bankability of PPP projects for investors or creditors. Besides being workable and bankable, the current PPP projects' water supply has also helped provide clean water for 1,957,500 people from three projects, The projects' water supply has an economic impact in the form of GDP growth of Rp6 trillion-plus and has increased the workforce by 241,341 people. Refer to the benefit of water supply projects by PPP schemes. The schemes directly contribute to achievement goal #6 of the UN's Sustainable Development Goals about clean water and sanitation (Wardhana, Y.M.A, 2019).

4. Conclusion

The conclusions of this research, "Analysis of Effectivity Scheme Based on Risk Management and Efficiency for the Acceleration of Clean Water Fulfillment in Indonesia," are:

1. PPP schemes for water supply projects in Indonesia are workable and bankable, so that they can be a major solution for bridging the clean water gap there. Their advantages include manageable construction and low operational and maintenance risks. Their service and sustainability of water provision can be guaranteed, with 43.8% of government risk allocated to the Project Company and 25% shared between both parties. The risk allocated from the government to the Project Company will mitigate potential failure and continuity of clean water projects in Indonesia.
2. The current PPP projects' water supply has also helped fulfill clean water for 1,957,500 people from three projects. The PPP scheme makes a direct contribution to achievement goal number 6 of SGDs for clean water and sanitation.

Author Contribution

Yuki M.A Wardhana as author are fully handling the whole article.

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