# Perceived Risk Allocation in Public-Private-Partnered (PPP) Water Supply Projects in Indonesia

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#### Abstract

A Public-Private-Partnership (PPP) water supply project typically involves a plethora of risks. Because a PPP is nothing other than a transfer of project risks traditionally borne by the government to the private sector, proper risk identification and allocation is a key to successful PPP project implementation. This paper presents and discusses the industry's perception of the optimal risk allocation in the context of Indonesian PPP water supply projects. The paper has identified a total of 39 project risks, classified them into six categories. Qualitative assessments of individual risks were elicited from an industry survey of respondents' opinions via a mail-based questionnaire. The central tendency of risk allocation as measured by the mode value confirms the intuition and theory that risk must better rest with the party who has control or better manage it. However, the findings also suggest that balancing project risks remain elusive, which is indicated by a high disagreement level amongst respondents.

#### Keywords

Indonesia, public/private/partnership, water supply projects, risk allocation.

#### 1. Introduction

### 1.1 Background

Driven by acute fiscal problem and growing disenchantment with the performance of state-provided infrastructure services, more and more governments around the world are turning to private solutions for financing and providing telecommunications, energy, transport, and water services (Dailami and Klein, 1997). Ever since the mid-1990s, no discussion of urban infrastructure finance could be complete without discussing private participation in infrastructure (Annez, 2006).

Despite current debates about the validity of arguments (see, for example, Quiggin, 2004), the private service provision is still believed to be able to deliver a higher value-for-money than that of public provision. In this context, a number of empirical studies have attempted to quantify the efficiency gains derived from utilizing the private sector. A study by Arthur Andersen and Enterprise LSE (2000), for instance, claimed that the average percentage estimated savings against a public sector comparator (benchmarking tool of most efficient public procurement) was 17% for Private Finance Initiative (PFI)-implemented projects sampled.

Another study concluded that the total gain in the water sector privatization for the Asian and Pacific would be around US\$85 million per year, or every new concession would be on average of around US\$1.8 million per year (Estache and Rossi, 1999). With these empirical findings in mind, a total of 120 developing countries carried out 7,860 transactions between 1990 and 2003, generating close to \$410 billion in privatization proceeds, or 0.5 percent of a total developing country GDP during that period (Kikeri and Kolo, 2005).

In the broader context, private participation is often manifested in the form in public-private-partnership (PPP) to signify the pivotal role played by both public and private sectors, and to avoid misperception of the term of privatization. In some countries, the public tends to strongly oppose infrastructure privatization. The underlying coherent reason for this attitude is that the public is frequently burdened with additional payments, above what they currently pay. Such objections arise especially when the public have long enjoyed government subsidies for access to facilities that are managed and operated by the private sector. A PPP scheme can translate into various contracts, depending on the scope of defined tasks and responsibilities. The most popular PPP contract is the Build, Operate, Transfer (BOT) which also has a number of variants.

Water supply projects are typically characterized by large and lumpy increment capacity, high initial fixed cost and low marginal costs of supply, high sunk costs, and risk of assets stranding as conditions change, diverse users of services, and externalities not reflected in service charges, long lead times for installing new capacity due to scale and regulatory hurdle rates (Clough et al., 2004). These characteristics could lead water supply projects to a plethora of risks which can result in substantial project cost escalation if eventuated.

Technically, a PPP is nothing other than a long-term arrangement of transfer of risks which are traditionally borne by the public sector to the private sector for which the latter is financially compensated for the willingness to bear the risks. PPP is an effective approach to enhance project productivity by bringing in management efficiency and creative skills from business practice, and reducing governmental involvement by using private sectors in the provision of public services (Shen et al., 2006). A PPP contract apportions the project-associated risks mainly to public and private sector. Best practice suggests an optimal rather than a maximum risk transfer from the public to private sector. A problem may, however, occur if risk is inappropriately transferred; the government may pay a premium higher than necessary or jeopardize the long term sustainability of a PPP arrangement or is merely gaining the illusion of risk transfer, since it is likely that the risk will be transferred back to the government in the form of higher risks, risk premiums, and project problems (Partnerships Victoria, 2001; Ng and Loosemore, 2006). The issue of balancing project risks is more exuberated in the context of water supply projects where the potential for competition is much more limited than it is in other sectors (Clarke et al., 2004).

The present paper deals with the perceived optimal risk allocation in Indonesia's PPP water supply projects. The paper has identified a total of 39 risk factors to be shared between principal stakeholders. As with other governments, the government of Indonesia has also proactively encouraged PPP-fashioned public infrastructure development for years. However, empirical evidence suggests that these investments are growing at a very slow pace despite ample opportunities available, including those in the water supply sector. Understanding a proper risk allocation will certainly help the government to manage the project risks effectively to avoid the so-called "illusion of risk transfer" in the quest for more efficient service provision to the public.

## 1.2 Indonesia's Water Supply Sector

Water supply services have long been being dominated by local-government operated companies (*Perusahaan Daerah Air Minum* or PDAMs). However, the quality of services is far from being satisfactory. While the service level is considerably low, non-revenue water (NRW) rates are still

averaging at 35% (Ministry of Public Works, 2005). Such high rates mean consumers are paying for inefficiencies, water scarce resource and investment wasting (Asian Development Bank, 2006). The situation was exacerbated with the poor financial condition for most PDAMs. Without government bailout, many PDAMS would have financially collapsed.

The government's policy is to change this situation. In the frame of the Millennium Development Goals (MDGs), the government has set a target to improve water service level from 39% to 69% with a total of 150 million populations served, and to expand the connection from seven to twenty-five millions and double the production capacity level from 94 to 180 m³/sec by 2015. The anticipated total investments are in the order of IDR 43 trillion (approximately USD 4.6 million) from 2005 to 2015.

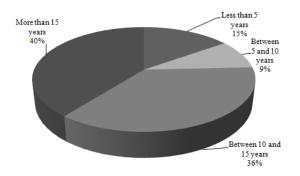
While the fiscal constraint only allows the government to manage to provide IDR 5 trillion, the government calls for private financing to make up the financial gap. At the time of writing this paper, the government is preparing a sizeable number of water supply projects in 40 cities to be concessioned under the BOT model with a total worth of IDR 4.84 trillion (Ministry of Public Works, 2005). In the meantime, the government initiates a restructuring program to help PDAMS out of financial troubles.

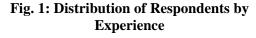
## 2. Research Methodology

The authors conducted an industry survey via questionnaires mailed out to selected respondents working with water services-related companies, including legal and management consultants, rating agencies, technical departments and water operators. The primary source of prospective respondent information was obtained from the Indonesian Drinking Water Companies Association or PERPAMSI's website (www.perpamsi.org). The sample for water operators was not a random one; only city-based operators with more than 10.000 connections were selected.

The survey was primarily aimed at soliciting industry opinions on who best retains a particular risk. The survey allowed the respondents to opt for more than one party to assume risk in case they believed that this was the best solution in handling the risk under investigation.

As recommended by Ramirez and Loney (1993), only one questionnaire was sent per organization to avoid receiving multiple responses from the same organization. The survey took place in July 2007. A total of 143 sets of questionnaire were mailed out. Each set had included self-addressed stamped envelope. Out of 143, a total of 34 valid responses were returned, representing a low but acceptable response rate of around 25%.





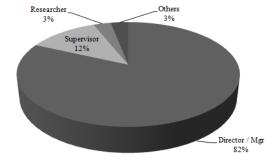


Fig. 2: Distribution of Respondents by Position

Figs. 1 and 2 present the distribution of respondents by experience and position, respectively. As shown, more than 75% of the respondents have industry experience for more than 10 years and the majority of

respondents (82%) hold managerial positions. These figures should enhance the validity of the responses concerning the issues raised in the questionnaire. Table 1 presents the cross tabulation of the respondents' organizations by their type and ownership. The limitation of this survey was the very limited number of collected industry data from the private sector (3). It is worth noting though that all water operators (despite their association with the public sector) are expected to operate as if they were private entities. The local water industry continues to move steadily towards privatization, PDAMs will need to rely less and less on government support, improve their technical capabilities, and most importantly be capable of managing the risks not being retained by the public sectors.

Table 1: Respondents' Organizations by Type and Ownership

Ownership	Type of Organization				
	Engineering /management consultant	Technical Ministry	Operator	Rating Agency	
(1)	(2)	(3)	(4)	(5)	(6)
Private	1	0	2	0	3
Public	0	13	17	1	31
Total	1	13	19	1	34

## 3. Project Risk Identification

The developed questionnaire comprised 39 key risks inherent to water supply projects in Indonesia, gathered through reviewing the extant literature. The identified risks coded as R1 through to R39 were classified into six categories; namely, political risk, macroeconomic risk, production-related risk, force majeure risk, project-related risk, and business risk. Fig. 3 depicts the fishbone or cause-effect diagram of structured project risks.

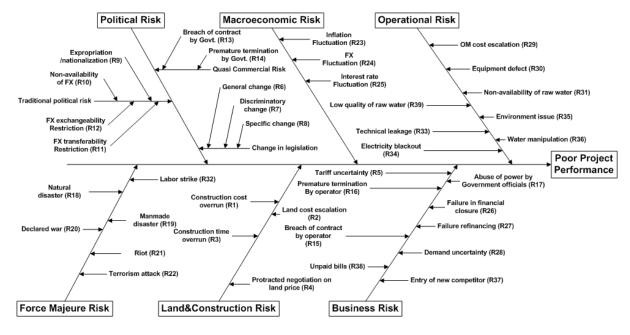


Fig.3: Cause-Effect Diagram of PPP Water Supply Project Risks

#### 3.1 Perceived Optimal Risk Allocation

The term 'risk allocation' refers to the determination of which party or parties should bear the consequence(s) of events identified as project risks. An optimal risk allocation dictates that a particular risk to be retained by the party who: a) is best able to assess, control, and manage the risk; or b) has the best access to hedging instruments, or c) has the greatest ability to diversify the risk, or d) assumes the risk at lowest cost (Kerf et al. 1998). However, the issue is not as simple as it appears, as will be demonstrated by this research study's findings.

Table 2 presents the relative frequency of responses for four stakeholders in PPP projects (government, operator, consumer, and insurance firm) to assume a particular risk. In this table, the central tendency is best measured with the mode value given in bold. As shown, overall mode values occur for either government or private operator and with the only exception of three risk factors (R19, R36, and R38).

**Table 2: Survey Results of Risk Allocation** 

Risk Code	Description	Best Party to Retain Risk*			Level of Agreement Measure		
		1	2	3	4	VR	ID
(1)	(2)	(3)	<b>(4)</b>	(5)	<b>(6)</b>	(7)	(8)
I	Political Risk						
R9	Nationalization/expropriation	51.7	31.0	10.3	6.9	0.48	0.62
R10	Non availability of FX	42.9	48.6	5.7	2.9	0.51	0.58
R11	Transferabilty restriction of FX	35.1	54.1	2.7	8.1	0.46	0.58
R12	Exchangeability restriction of FX	40.0	42.9	5.7	11.4	0.57	0.64
R13	Breach of contract by Government	51.4	32.4	0.0	16.2	0.49	0.60
R14	Premature termination by Gov't	48.9	35.6	4.4	11.1	0.51	0.62
R6	General changes in legislation	46.5	23.3	23.3	7.0	0.53	0.67
R7	Discriminatory changes in legislation	60.5	15.8	21.1	2.6	0.39	0.56
R8	Specific changes in legislation	62.5	20.0	17.5	0.0	0.38	0.54
II	Macroeconomic Risk						
R23	Inflation fluctuation	40.0	44.4	8.9	6.7	0.56	0.63
R24	FX fluctuation	35.7	50.0	7.1	7.1	0.50	0.61
R25	Interest rate fluctuation	43.9	43.9	9.8	2.4	0.56	0.60
III	<b>Production-Related Risk</b>						
R29	OM cost escalation	32.4	40.5	27.0	0.0	0.59	0.66
R30	Equipment defect-caused interruption	20.9	51.2	14.0	14.0	0.49	0.66
R31	Nonavailability of raw water	65.8	18.4	15.8	0.0	0.34	0.51
R33	Technical leakage during distribution	27.9	51.2	18.6	2.3	0.49	0.63
R34	Electricity blackout	29.5	40.9	25.0	4.5	0.59	0.68
R35	Env't protests causing interruption	46.0	34.0	20.0	0.0	0.54	0.63
R36	Water meter manipulation	16.7	33.3	50.0	0.0	0.50	0.61
R39	Low quality of raw water	44.1	32.4	23.5	0.0	0.56	0.65
IV	Force-Majeur Risk						
R18	Natural disaster	40.7	18.6	8.5	32.2	0.59	0.69
R19	Manmade disaster	30.8	19.2	11.5	38.5	0.62	0.71
R20	Declared war	<b>57.8</b>	8.9	11.1	22.2	0.42	0.60
R21	Riots	46.2	15.4	13.5	25.0	0.54	0.68
R22	Terrorism attack	49.0	14.3	12.2	24.5	0.51	0.66
R32	Labor strike	35.4	41.7	18.8	4.2	0.58	0.66
V	Project-Related Risk						

Risk Code	Description	Best Party to Retain Risk*			Level of Agreement Measure		
		1	2	3	4	VR	ID
R1	Construction cost escalation	39.5	42.1	5.3	13.2	0.58	0.65
R2	Land cost escalation	48.7	41.0	2.6	7.7	0.51	0.59
R3	Construction time overrun	20.5	59.0	7.7	12.8	0.41	0.59
R4	Protracted negotiation on land price	47.6	40.5	4.8	7.1	0.52	0.60
VI	<b>Business Risk</b>						
R5	Tariff uncertainty	48.8	30.2	20.9	0.0	0.51	0.63
R15	Breach of contract by operator	11.9	69.0	7.1	11.9	0.31	0.49
R16	Premature termination by operator	22.2	<b>57.8</b>	8.9	11.1	0.42	0.60
R17	Abuse of power by Gov't officials	71.4	17.1	11.4	0.0	0.29	0.45
R26	Failure in financial closure	17.6	73.5	0.0	8.8	0.26	0.42
R27	Failure in refinancing	10.8	<b>78.4</b>	8.1	2.7	0.22	0.37
R28	Demand uncertainty	34.1	41.5	22.0	2.4	0.59	0.66
R37	Entry of new competitor	38.9	47.2	8.3	5.6	0.53	0.62
R38	Unpaid bills by consumers	20.5	38.5	41.0	0.0	0.59	0.64

\*Note: 1=government, 2= operator, 3=consumer, 4=insurance

Overall, both regulators and operators equally share 36 out of 39 mode-based risk factors. The respondents, however, believe that risk associated with under-hand practices by the consumer needs to be borne by the consumer. In practice, the risk assumption might be reflected in cost charged to the consumer; or in other words, the operator is simply willing to assume the risk at the consumer's expense.

Mode-based party seems to confirm intuition and theory; that is, a party who better manages a particular risk is advocated to bear that risk. For example, land cost escalation risk and protracted negotiation on land price risk which can lead to project delays are considered best resting with the government, whereas construction cost- and time-overrun risks resting with the private operator who can at least mitigate these risks by entering into agreement with experienced construction contractors.

Under the business risk category, risks of tariff uncertainty and abuse of power by government officials are best borne by the government, with the remaining risks assumed by the operators. This situation is almost similar to those risks listed under the production-related risk category where the government retains only three risks; namely, non-availability and low quality of raw water and environmental issue which can interrupt the utility operation. Best practice also suggests that macro-economic risk to be retained by the private operators because dealing with the risk should have been integral to undertaking commercial business, not just specific to PPP water projects. It has been well accepted that every government reserves the political right to nationalize/expropriate private assets in the name of protecting national interests. Because the government has full control over this risk, the government is advocated to retain it. What is somewhat counterintuitive is the preference of respondents to opt for the private sector to retain foreign exchange FX-related risk. The respondents appear to believe that the private sector can deal with the risk although the government has control over it.

#### 3.2 Unanimities among Respondents

The statistical mode reflects the central tendency of respondents' preferences. Nevertheless, the meaning is less clear if the responses tend to equally scatter among available options. In this case, a consensus among respondents occurs whenever the majority respondents decide on a single party to bear a certain type of risk. To measure agreements, the authors employed additional statistics; namely, *variation ratio* (VR) and *index of diversity* (ID). *VR* is the proportion of responses which are not the statistical mode. It is a measure of how descriptive the modal category is of the data (Weisberg, 1992); it is also an appropriate

measure of the spread of ordinal data (Mohamed, 2005). Thus, *VR* could be equated to the extent of consensus in opinions (Thiagarajan and Zairi, 1998). It is simply calculated by subtracting the relative frequency of the mode value from one, or, mathematically:

$$VR_i = 1 - w_{im} \tag{1}$$

where  $VR_i = VR$  for project risk  $R_i$ , and  $w_{im}$  = relative frequency of mode value of risk  $R_i$ .

Given the four categories, VR value will fall within the range of 0 and 75%. A VR value of zero and a 75% mean reflect a perfect agreement and a perfect disagreement amongst respondents, respectively. Mohamed (2005) defined the majority consensus as the ratio equal or less than 50% and no majority consensus as the ratio greater than 50%. Given this definition, a total of 17 risk factors are successful in reaching majority consensus (see column 7 of Table 2).

The *ID* concept measures a dispersion based on the proportion in each category (Weisberg, 2002). Mathematically, it can be written as:

$$ID_{i} = 1 - \sum_{i=1}^{n} \left( w_{ij} \right)^{2} \tag{2}$$

where,  $ID_i = ID$  for project risk  $R_i$ ,  $w_{ij}$ =relative frequency of category j for project risk  $R_i$ . Mohamed (2005) argued that the index is a surrogate measure of agreement amongst respondents concerning the response distribution. A lower ID means a higher level of agreement and a higher ID means a higher level of disagreement. As with VR, the index is also confined at the interval [0%, 75%]. Column 8 of Table 2 provides ID values of individual risk. Given that the majority consensus is achieved for ID value less or equal than 50%, the 17 risk factors were filtered to only four namely; R15, R17, R26, and R27. This might further indicate that balancing risk properly between the two parties is a non-trivial task.

Our survey results also give insights into inter-group agreement confirming the normal practice of allocating certain project risks to the government. These include: traditional and quasi-commercial political risks, force majeure risks, and poor quality and/or quantity of raw water risks. However, even though both main groups of respondents (regulators and operators) appear to concur on some project risks, there exists the unresolved problem of allocating the remaining ones. The latter can be considered as 'grey' areas that require careful negotiations between the two parties before their allocation can be decided.

## 4. Concluding Remarks

As with other governments, the government of Indonesia strongly encourages participation in the water supply development projects, especially due to fiscal austerities. Under the PPP scheme, the project-associated risks are transferred from the government to the private sector. The central issue to address is who best bears what risk. Efficient risk allocation dictates that risk must rest with the most able party to retain. If the principle is violated, the government may face higher risk premium than necessary or illusion of risk transfer. This paper deals with the optimal risk allocation based on collected industry data. A total of 39 risk factors classified into six categories had been identified. Mode-based examination suggests that the risk allocation perceived by respondents seems to confirm intuition and theory; that is, risk rests with the party who has a control over or better manages it. Nevertheless, the issue of proper risk allocation remains elusive, which is indicated by a high disagreement level amongst respondents.

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