Design of Effective Regulatory System for Water Supply in Jakarta, Indonesia:

What type of regulatory system might work best in practice?

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The author is solely responsible for the contents of this report.
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Summary and Recommendations

Since 1995, Jakarta, Indonesia has developed one of the world’s largest public-private partnerships in the water sector. Involving a number of stakeholders, the privatization improved the water coverage in the city. However, there are risks – such as abuse of market power, corruption, and less access for the poor – hampering the effective operation of Jakarta’s waterworks due to the unique characteristics of the country and the business. As an implement to avoid such risks, the formulation of an effective regulatory system is discussed in this report from the three perspectives of economic regulation as an anti-market power mechanism, independent regulators as an anti-corruption instrument, and pro-poor policy. Through these perspectives, the report not only explores what type of regulatory system might work best in practice, but also creates a hypothetical arrangement of a regulatory structure in Jakarta’s water supply as the design of an effective regulatory system such as i) the independent regulatory body which reflects a broad range of interests, ii) the introduction of a competitive market structure to assure the appropriate price and quality of water, and iii) the establishment of the regulatory body before the privatization to have a preparation period.

This report is prepared for Public-Private Partnership, United Nations Development Programme/Yale University Joint Program.
## Abbreviations and Acronyms

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
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<tr>
<td>ADB</td>
<td>Asian Development Bank</td>
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<tr>
<td>DKI Jakarta</td>
<td>Jakarta municipal government</td>
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<td>GDS</td>
<td>PT Garuda Dipta Semesta</td>
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<td>JBIC</td>
<td>Japan Bank for International Cooperation</td>
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<td>Ofwat</td>
<td>Office of Water Services</td>
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<td>PALYJA</td>
<td>PT PAM Lyonnaise Jaya</td>
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<td>PAM Jaya</td>
<td>Jakarta municipal waterworks</td>
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<td>PKA</td>
<td>PT Kekarpola Airindo</td>
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<td>Suez</td>
<td>Suez Lyonnaise des Eaux</td>
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<td>Thames</td>
<td>RWE Thames</td>
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<td>TPJ</td>
<td>PT Thames PAM Jaya</td>
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<td>WB</td>
<td>The World Bank</td>
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Design of Effective Regulatory System for Water Supply in Jakarta, Indonesia:

What type of regulatory system might work best in practice?

I. Background

Since the privatization of its waterworks officially started in 1995 when then President Suharto issued orders, Jakarta, the capital of Indonesia, has developed one of the world’s largest public-private partnerships in the water sector\(^1\). The city was divided into two, east and west, along the Ciliwung River, and two joint venture companies including multinational corporations made 25 year concession agreements with the city’s water authority in 1998\(^2\). These agreements specify i) performance obligations in terms of water quality and volume, ii) investment programs to meet the obligations, iii) water tariffs to customers, determined by the Governor of Jakarta, and iv) water charges paid to the companies (Houston, Liesner, & Shore, 1999).

A number of stakeholders are involved in this privatization, and some of their roles are defined in the agreements (see Figure 1 for stakeholders’ relationships). The role of DKI Jakarta, a city government, is to monitor PAM Jaya, its waterworks, to guarantee water supply and to safeguard public interests (Lanti, 1996). According to the agreements, PAM Jaya delegates its function of operating waterworks to two newly established private companies: PT Thames PAM Jaya (TPJ) and PT PAM Lyonnaise Jaya (PALYJA). The agreements also describe that a regulatory body including PAM Jaya’s board of supervisors is established and undertakes monitoring and enforcement functions against the companies, though PAM Jaya itself acts as the regulatory body so far (Houston et al., 1999). TPJ is a joint venture between RWE Thames (Thames), a British multinational corporation owned by German Rheinisch-Westfälisches Elektrizitätswerk, and PT Kekarpola Airindo (PKA), a local company. PALYJA, meanwhile, is owned by French Suez Lyonnaise des Eaux (Suez) and Indonesian PT Garuda Dipta Semesta (GDS). The World Bank (WB) lent PAM Jaya $92 million for infrastructure improvements, while this loan was matched by Japan Bank for International Cooperation (JBIC) to build a water purification plant in eastern Jakarta (Harsono, 2003).

The privatization improved water coverage, while consumer satisfaction about water quality and service was still low. According to Anwar of Jakarta Water Supply Regulatory Body (2003a), the coverage was increased from 41% in 1996 to 52% in 2002 though the rate was lower than the targets

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\(^1\) See Appendix 1 for the location of Jakarta, Indonesia.
\(^2\) See Appendix 2 for the market areas.
set in the agreements by 18%. The companies attributed their shortage to the Asian economic crisis and the political instability in Indonesia (Asian Development Bank (ADB), 2002). In the meantime, a survey conducted in 2002 showed that consumers were not satisfied with the quality, continuity, and pressure levels of water they were getting (Alizar, 2003b).

Because of the characteristics of the country and the business, there are some risks hampering the effective operation of Jakarta’s waterworks: an abuse of market power/monopoly, that of political power/corruption, and less access to piped water for the poor. Generally, in countries such as Indonesia where there is a relatively short history of democracy, where the government is in a transitional period of decentralization, and where the poor account for a large portion of the population, issues such as corruption among the government and industry, limited resources available locally, and poverty prevailing nationwide are major social problems. These problems could arise in Jakarta’s water case. By exercising its market power, TPJ or PALYJA might exploit consumers and create inefficiency for the society as a whole. In the meantime, politicians or the government may harm the companies by preventing them from raising water prices to recover costs and to make reasonable profits. The companies may be threatened to have their assets confiscated arbitrarily. On the contrary, the industry and the government are so corrupt that a certain company might be given an illegitimate favor. Due to these potential or actual problems, then, a lot of the poor may not benefit from piped water. To avoid this undesired situation, regulations must be imposed. In other words, an “effective regulation is essential in order to successfully extract the full benefits of private sector participation in delivering water services” (Halcrow, 2002).

II. Conceptual framework

In this section, the conceptual framework for an effective regulatory system will be discussed from the three perspectives of economic regulation as an anti-market power mechanism, independent regulators as an anti-corruption instrument, and pro-poor policy.

Economic regulation under natural monopoly (anti-market power mechanism)

A monopoly tries to maximize its profits by reducing its production level; as a result, consumers are worse off and economic efficiency for society is not achieved. The industry of piped water supply is characterized as a natural monopoly where the cost of one firm’s supplying a whole market is less

\[3\] TPJ and PALYJA won the concession agreements without public bid. PKA, one of TPJ’s holding companies, was run by Suharto’s son. Meanwhile, the CEO of GDS, PALYJA’s local holding company, had a close link with the then President (Guerin, 2003).
than that of two or more firms doing so (ADB, 2000). Figure 2 shows cost in natural monopoly. Note that up to quantity $X_1$ (e.g., $X_0$), the average cost of one company is less than the aggregated cost of two or more companies ($C_i < C_{ii}$). Meanwhile, in a monopoly market, a firm provides less water than it would in a competitive market, and raises the price of water to maximize its profits. Due to this monopolistic behavior, consumers pay higher prices for less water, and the society as a whole becomes worse off (Pindyck & Rubinfeld, 1995). Figure 3 illustrates deadweight loss, economic inefficiency for the society.

Price regulation is imposed to limit the market power of a monopoly. Regulators set a price ceiling at the level of competitive market, so deadweight loss dissipates. In Figure 3, this regulated price is shown as $P_c$ where the company’s marginal cost (MC) intersects its average revenue (AR) or demand, and the amount of water provided at this price is $Q_c$. Note that if the price ceiling is set lower than $P_c$ (e.g., $P_r$), less water is supplied (i.e., $Q_r < Q_c$). When the ceiling is lowered below $P_w$, the firm loses money and goes out of business.

Regulators need correct information about the cost and demand of water supply to regulate the price. As described above, regulators set the price ceiling at the level where the regulated firm’s marginal cost equals to the demand. In other words, regulators must know these two parameters to implement the price regulation. However, it is difficult for regulators to recognize accurate numbers of these variables because regulators depend on the firm for such information and because the firm may provide false information purposely. The characteristic of this less ideal situation for regulators is known as asymmetric information: “some parties know more than others” (Pindyck & Rubinfeld, 1995, p. 593).

The so-called “yardstick competition” which was innovated in England and Wales helps regulators collect accurate information on monopolies’ cost and demand and makes them efficient. Assuming that two natural monopolies have a similar cost and demand condition, Office of Water Services (Ofwat), regulators in UK, compares the information collected from both companies and sets the tariff at the level known as $RPI+K$, where $RPI$ is the retail price index and $K$ is an allowable price increase above inflation to finance the planned investment (Day; Spulber & Sabbagi, 1998). In addition, assessing the efficiency of water companies through comparisons with yardstick, Ofwat demands and leads inefficient utilities to improve their performances (Berg, 1997).

Common carriage/franchise competition, another way to introduce competition in a natural monopolistic environment, could be the other regulatory instrument to avoid abuse of market power and to achieve economic efficiency. Although they are often discussed separately, the common
carriage competition and the franchise one have similarities and are implemented in other utility sectors such as electricity, gas, and telecommunications. Spulber (1989) illustrates the franchise competition in the water sector as the one that is similar to the “‘equal access’ program in the U. S. market for long-distance telecommunications” (p. 263). In this program, consumers select a single long-distance carrier to contract from a list of providers that serve their area. Then, the consumers may use several carriers to arbitrage differences in rates offered by various providers. In the meantime, Webb and Ehrhardt (1998) describe the common carriage competition as a condition where “several water utilities use a single network to supply customers, and customers can choose their water supplier” (p. 2). Figure 4 illustrates the design of common carriage competition. These two literatures point out common characteristics that carriage and franchise competitions have, i.e., i) consumers have more than one service providers from which to choose; ii) service providers use a common platform or network to serve customers. Spulber and Sabbagi (1998) further discuss that the:

separation of the distribution network (installation and maintenance) [distribution services] from water services activities [bulk water supply] would isolate the natural monopoly elements [see Figure 5 for a municipal water supply system] and. . . will provide much flexibility to consumers in assessing various price-quality packages over peak and off-peak periods and. . . thereby promoting competition and market efficiency. . . [T]he function of the regulatory authority is thus to set “market rules” under which bargaining between consumers and authorized producers takes place, and to establish criteria for determining winners. (p. 300)

**Independent regulators (anti-corruption instrument)**

Various arrangements can be made for the organizational structure and attributes of a regulatory body to be invulnerable to improper political and commercial influences.

In general, the organization of a regulatory body consists of two functions or strata: a decision-making body and a secretariat. A decision-making body might be made up of an individual, a chairperson, or a commission of a number of people. A secretariat, meanwhile, would consist of a professional staff who would support a decision-making body.

Decision-making by a commission of three to five members, rather than by an individual, is less vulnerable to improper influences. Decisions at a regulatory body are made either by an individual or by a commission, and “each approach has its strength and weakness” (Smith, 1997b). See Table 1. An individual decision-making is rapid, but would be partial whereas a collective one could
reflect a wider range of interests, though it tends to be bureaucratic (Houston et al., 1999).

The structure of a secretariat could be organized vertically either by function (e.g., technical, financial, consumer service) or by professional discipline (e.g., finance, law, engineering). Note that functions may loosely correspond to a professional discipline by natures such as finance (Houston et al., 1999).

Technical expertise and financial autonomy strengthen the independency of a regulatory body. According to Smith (1997a), “technical expertise can be a source of resistance to improper influences, and organizational autonomy helps in fostering (and applying) technical expertise.” Technical expertise required for regulators is a mix of skills and experiences in the fields such as public administration, industry, economics, finance, law, and engineering. Regulators should be selected on their expertise. Since those who have such expertise are scarce in many reforming countries, however, exempting regulators from civil service salary rules which commonly provide less competitive wages is important to attract and retain well-qualified staff (Smith, 1997b). Meanwhile, own source of funding ensures that the decisions regulators make are not influenced by their financial objectives (Houston et al., 1999). A regulatory body could obtain its income from levies on consumers directly, or indirectly by imposing a license fee on regulated firms which then pass the cost on to consumers through tariffs.4

Pressure from civil society could suppress political as well as commercial influences on a regulatory body. According to Narayan (2000), civil society refers to groups, networks, and relationships that are not organized or managed by the state and covers a wide range of formal and informal communities such as NGOs, community-based organizations, and networks of neighbors and kin (p. 129). There are many examples in which such communities act as pressure groups and achieve their goals. Mobilizing civil society and letting it function as a watch dog could help a regulatory body be free from improper interventions and implement fair regulatory work. Three steps might be suggested to incorporate civil society into the regulatory system: inform, network, and let civil society participate. First, a regulatory body should be accountable for their decisions, so the civil society knows the current situation and checks the potential for regulators to go beyond its brief (Houston et al., 1999). Second, each civil society has different objectives, norms, and constituents; therefore, networking groups are necessary to act uniformly. Third, a representative of civil society

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4 Smith (1997a) points out detailed arrangements for securing well-qualified staff and own funding as follows: “prescribing professional criteria for appointment; appointing regulators for fixed terms and protecting them from arbitrary removal; staggering terms [of regulators] so that they do not coincide with the election cycle, and, for a board or commission, staggering the terms of the members; exempting the agency from civil service salary rules that make it difficult to attract and retain well-qualified staff; providing the agency with a reliable source of funding, usually earmarked levies on regulated firms or consumers.”
might participate in the regulatory process as a member of a regulatory body so as to reflect public perspectives in waterworks.\footnote{Having representatives of civil society in the process of regulatory decision making requires careful consideration. Smith (1997b) argues not to include them on the decision-making body because identifying representatives of civil society is not feasible since there are diverse interests and groups, and because involving them might create a very large inefficient decision making body and reduce accountability of individual decision makers.}

Early establishment of a regulatory body not only enables regulators to prepare for the privatization well, but also protects consumers’ as well as investors’ interests. According to Smith (1997b), by establishing a regulatory body long before privatization, regulators have:

- time to familiarize themselves with their new responsibilities, to establish their offices, and to undertake any necessary training.
- It [early establishment] also provides assurance to consumers that their interests will be protected after privatization and gives potential investors an opportunity to assess the regulatory system before formulating proposals.

Analyzing the Jakarta’s case, Andrew McLernon, a consultant for the ADB’s project, points out that the lack of a project preparation period failed to build the consensus among the parties (2004).

**Pro-poor policy**

Cross-subsidy or increasing tariff structure charges poor customers less than rich ones and is widely used as a pro-poor policy instrument. There are two general forms for this price structure. One is a cross-subsidy between broad categories of consumers, for example, between non-domestic and domestic or between urban and rural. The other is one between customers consuming different quantities of water, for instance, between the rich and the poor. In the former case, charging non-domestic users more than domestic is nearly universal in developing countries (Sohail, 2004). The latter form is based on the assumption that the rich consumes more water than the poor. Figure 6 illustrates the mechanism of cross-subsidy. The current tariff structure may not benefit the poor in Jakarta. According to Anwar (2003a), the number of house connections for the poor more than doubled after privatization (from 29,958 in 1998 to 71,671 in 2002) and about a half of the poor living in Jakarta is served by the water utilities in 2002 (p. 2). The tariff for the poor (categorized in KI: public faucets and KII: very small house) is set low and such people are supposed to be heavily subsidized by a cross-subsidy mechanism. However, there is a pitfall. First of all, the other half of the poor, estimated roughly as 1.7 million, still do not have connection. They obtain non-network water from different sources such as groundwater of their own wells or water distributed by small-scale providers, which tends to be more expensive than piped water.\footnote{The price of vended water in Jakarta is 185 US cents per cubic meter whereas that of a piped one is 17 cents (ADB water utility data cited in Klein & Irvin, 1996).} Second, if the poor have connection, they may share the taps to save connection fees; as a result, they are
mistakenly categorized and pay a higher tariff (Rosenthal).

Although small-scale providers fill the gap between the demand of the poor for water and the supply of current network water, the quality of water they distribute is concerned. The service of small-scale providers varies in terms of source, scale, and method of water they vend: from cart/truck resellers of municipal water to private network suppliers with own treatment facilities (Solo, 2003). These providers play an important role to satisfy the need of the poor who have no network connection (Linares, 2003). Since such providers are diverse and lack official recognition or inspection, the quality of their water is a major concern.

Networking small-scale providers under the common carriage/franchise competition setting might ease the concern over the quality of water small-scale providers provide and reduce the price of it. As discussed in the previous section, the common carriage/franchise competition enables consumers to have several providers to serve while these competitors share the network of water distribution. By this arrangement, a franchisor (wholesaler, bulk water supplier) “can provide franchisees [distribution service providers] with support in all areas of professional expertise needed to run a utility, including: asset management, billing and collection, engineering (construction, operation and maintenance), human resources management and procurement” (Ginneken, Tyler, & Tagg, 2003, p. 7). In fact, a franchisor has a strong incentive to assure the quality of water its franchisees provide not only because inappropriate quality would harm the franchisor’s credibility or trademark and its entire business, but also because the financial success of the franchisor is directly linked to that of franchisees as royalty fees the franchisor receives is generally proportional to the franchisees’ gross sales (Ginneken et al., 2003). After all, the franchising could not only create a competitive market of water distribution so as to reduce the price of water, but also control its quality by giving a franchisor an incentive to do so. This setup benefits regulators as well because it is easier and less costly for them to monitor a franchisor rather than a number of small-scale operators.

III. Design of regulatory system

In this section, a hypothetical arrangement of a regulatory system in Jakarta’s water supply will be discussed, assuming that the arrangement could be applied as if it were made before the actual privatization in 1998. The purpose of this trial is to explore designing the system effective so as to work in practice. The concepts presented in the previous section are used as a framework for the design, and the basic assumptions are made as follows.

- Jakarta’s waterworks will be privatized in 1998 under the concession contracts.
- The market will be divided into two areas, east and west, along the Ciliwung River, assuming
that the city’s demand for water is too large and too costly for one company to serve.\footnote{See Figure 2. Note that if the quantity (the demand for water) is more than \( X_1 \) (e.g., \( X_2 \)), the average cost of one company is more than the aggregated cost of two or more companies (\( C_{\text{avg}} > C_i \)). According to Bernard Lafrogne, a consultant of PAM Jaya, “Jakarta’s demand for water is big enough for two companies [to serve]” (Harsono, 2003).}

- Two private contractors (bulk water supply wholesalers) will be awarded as concessionaires.
- Each market has only one bulk water supplier; therefore, the supplier is a monopoly in its wholesale market.

**DESIGN 1: Design the regulatory body to be independent and to reflect a broad range of interests including the poor’s.**

The regulatory body should consist of the three components: a decision-making body, an advisory committee, and a secretariat\footnote{Literatures such as Houston et al. (1999) were referenced to create the ideas in this section.} (see Figure 7). First, the decision-making body is a commission of three members including a chairman. The members should be those who demonstrate leadership, organizational ability, and good communication skills; who have expertise in one or more disciplines in economics, finance, law, and engineering; and who are not affiliated to PAM Jaya and water industries. A commission format makes the decision-making body invulnerable to improper influences from the government and companies. By limiting the number of its members to three, the commission could minimize the delay of decision-making. Second, the advisory committee comprises eminent persons or consultants from industry, government, and academia as well as representatives from civil society and media. The role of this committee is to provide the decision-making body with not only technical advice, but also a wide range of opinions. Third, the secretariat is composed of the three units such as technical, financial, and customer service. Each unit supports the decision-making body by function. The technical unit monitors the engineering aspect of concessionaires, assures the quality of water supplied, and enforces improvement measures on them if necessary. The financial unit is in charge of monitoring concessionaires’ cost structures, the water demand, the tariffs, and the water charges payable to concessionaires. The function of the customer services is more than just monitoring concessionaires’ service performance such as customer response times; in addition, the unit collects data about customer satisfaction, informs/educates consumers about the operation of privatized waterworks, and networks different communities in the civil society.

The selection of the regulatory body’s staff should be solely based on their skills and experiences. To attract and retain well-qualified staff, competitive wages should be provided by exempting the regulators from civil service salary rules.
The regulatory body should obtain its income directly or indirectly from levies on consumers and/or concessionaires.

**DESIGN 2: Introduce a competitive market structure to assure the appropriate price and quality of water.**

The regulatory body should implement the price regulation to set the water tariff at the level of a competitive market, where the market demand intersects the concessionaires’ marginal cost; as a result, the deadweight loss for the society as a whole dissipates. To induce accurate information from the concessionaires on their marginal cost as well as on the market demand, the yardstick competition should be introduced. Comparing one concessionaire to the other, the regulators can grasp such information and estimate the appropriate tariff to apply. In addition, the regulators enforce an inefficient utility to improve its performance as measured by cost efficiency and a quality standard.

The common carriage/franchise competition could be introduced to create a further competitive environment. Figure 8 shows a basic setup for such market. Note that the entire market of water supply is divided into three subgroups vertically: a bulk water supply market, a network distribution market, and a retail market. Company A, called concessionaire above, is a wholesaler which solely serves its market; therefore, it is a monopoly. To the contrary, the number of network distributors is two or more. The role of the network distributors includes operation and maintenance of existing networks and investment to expand the networks. The relationship between the wholesaler and the network distributors is defined in the franchise contracts; the former is a “franchisor,” whereas the latter is a “franchisee.” The franchisor provides its franchisees with water and professional expertise to run a utility in return for royalty fees it receives. Although the network distributors are labeled differently from the wholesaler in the figure (i.e., Company B and Company C as the network distributors, while Company A as the wholesaler), the wholesaler, Company A, could become a network distributor if it wishes. Likewise, a number of retailers exist, and a network distributor or even the wholesaler could become a retailer as it wishes. The network distributor or the wholesaler as the franchisor provides water and expertise to its franchisees in the retail market. Small-scale providers are organized as franchisee retailers in this way, keeping their water quality high. Consumers could benefit with safe, high quality water for a less expensive price from a number of retailers competing each other.

The increasing tariff structure should be designed carefully to benefit the poor. As discussed in the previous section, the cross-subsidy fails in Jakarta for a number of reasons. For example, if they...
are connected to the piped water network, the poor share the taps to save the connection fees; as a result, they are regarded as a large-scale consumer as a whole, classified in the different categories, and charged higher tariffs. To avoid this pitfall, the regulators should consider reducing the connection fees for the poor and check the water use by the customers thoroughly so as not to mistakenly categorize the poor.

**DESIGN 3: Establish the regulatory body before the privatization inaugurates to have a preparation period.**

The regulators should establish the regulatory body long before the privatization in order to prepare the upcoming reforms. In this preparation period, the regulators create a working relationship with related stakeholders, set up the office, and build the capacity of the staff. First, the newly assigned regulators contact stakeholders such as the government, politicians, private companies which are interested in the privatized waterworks, the donor agencies (e.g., WB and JBIC), civil society, and consumers. Through these interactions, the regulators clarify their roles and responsibilities to the stakeholders. Second, the regulators determine the physical setup of the office, such as a location and a size of the office, which reflects the number of staff, the information technology requirements, and the office equipments. In addition, recruitment activities of staffs as well as funding arrangements are implemented. Third, the training is provided for the staff in traditional disciplines such as engineering, finance, and law as well as in practical skills/knowledge: for example, practice of regulation, concession contracts, industry operations, negotiation analysis, and public relations. To train the staff effectively, various sources of expertise and experiences might be utilized; such sources include international/local consultants, experienced highly skilled regulators in other countries, and networks of regulators created by the international financial institutions such as the International Forum for Utility Regulation sponsored by the World Bank.

**IV. Conclusion and recommendations**

Since 1995, Jakarta, Indonesia has developed one of the world’s largest public-private partnerships in the water sector. Involving a number of stakeholders, the privatization improved the water coverage in the city. However, there are risks – such as abuse of market power, corruption, and less access for the poor – hampering the effective operation of Jakarta’s waterworks due to the unique characteristics of the country and the business. As an implement to avoid such risks, the formulation of an effective regulatory system is discussed in this report from the three perspectives

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9 Literatures such as Houston et al. (1999), McLernon (2004), and Smith (1997b) were referenced to create the ideas in this section.
of economic regulation as an anti-market power mechanism, independent regulators as an anti-corruption instrument, and pro-poor policy. Through these perspectives, the report not only explores what type of regulatory system might work best in practice, but also creates a hypothetical arrangement of a regulatory structure in Jakarta’s water supply as the design of an effective regulatory system such as i) the independent regulatory body which reflects a broad range of interests, ii) the introduction of a competitive market structure to assure the appropriate price and quality of water, and iii) the establishment of the regulatory body before the privatization to have a preparation period.
Note: PAM Jaya currently functions as a provider and a regulatory body.
(Source: Harsono, 2003; Houston et al., 1999)

**Figure 1. Relationships among stakeholders**
Marginal cost (MC) and average cost (AC) for a hypothetical natural monopoly market

** Aggregate marginal cost and average cost for a hypothetical oligopoly market

(Source: Edited from ADB, 2000)

Figure 2. Cost under Natural Monopoly
MR: marginal revenue; AR: average revenue; MC: marginal cost; AC: average cost; $Q_m$: quantity of monopoly; $P_m$: price of monopoly; $Q_c$: quantity of competitive market; $P_c$: price of competitive market; A+B: lost consumer surplus; B+C: deadweight loss
(Source: Pindyck & Rubinfeld, 1995, p. 342)

**Figure 3. Deadweight Loss from Monopoly Power**

**Figure 4. A city with common carriage competition**
Figure 5. Municipal water supply and sanitation system
Table 1. Decision-making structures (individual versus commission): Strength and weakness

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<tr>
<th>Characteristic</th>
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<th>Commission</th>
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<td>Speed of decision-making</td>
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<td>Accountability for decisions</td>
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<td>Resource demands</td>
<td>x</td>
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<td>Predictability of decisions</td>
<td>x</td>
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<td>Invulnerability to individual preoccupations</td>
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<td>x</td>
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<td>Invulnerability to improper influences</td>
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<td>x</td>
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<td>Potential to reflect multiple perspectives</td>
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<td>Potential to stagger terms to enhance stability and weaken links with particular governments</td>
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Note: The x indicates which structure is stronger on each characteristic.
(Source: Smith, 1997b)
Figure 6. Cross-subsidy/increasing block tariff structure
Figure 7. Proposed structure of a regulatory body

Note: Edited from Houston et al., 1999
Note: A wholesaler and a network distributor could be the same company (e.g., Company A = Company B). Likewise, a network distributor could be a retailer (e.g., Company B = Company D).

Figure 8. Proposed competitive market structure
References


Appendix 1. Location of Jakarta, Indonesia

(Source: MapQuest)
Appendix 2. Water market of Jakarta, Indonesia

(Source: Shofiani, 2003)