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A Systematic Approach for the Selection of Contract Strategies for Water Projects

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This paper describes the use of the 'Pendulum Obligation Diagram' (POD) and a set of 'Assessment Criteria' (AC) assisting decision-making process in selecting contract strategies for construction, operation and maintenance of new water supply projects in Padang City, Indonesia. The use of POD and AC are useful in comparing the relative merits of alternative contract strategies in the financing and developing of water supply projects. Various options were developed, it was summarized that a full concession contract will best meet most of the project requirements on fresh capital investment and is also attractive to investors as the projected IRR is relatively high (14.27%) and CPBT is relatively short (12.99 years) and a BOT contract strategy could meet partial project requirements with the IRR is 14.42% and CPBT is 10.41 years.

Key words: POD, AC, private sector participation (PSP), stakeholders, requirements, project, and economic parameters.

Overview

The investments required to develop water infrastructure to cover 72.5% of Indonesian population by 2015, would be Rp. 50 trillion (approximately US\$ 5.56 billion) (ADB report, 2008). This level of financial commitment will only be achieved if the investment conditions and environment are improved to the extent that the private sector will participate in the development of water supply facilities. The private sector participation (PSP) would significantly reduce the burden on governments currently presented with the need of project financing.

The National Planning Agency (BAPENAS) of Indonesia estimated that approximately 50% of the total infrastructure investment (including urban water supply, UWS projects) from 1999 to 2015 should be financed through alternative resources such as the private sector and non-governmental budgets otherwise UWS project development will be failure achieving it's objectives (Sutjahjo, 2000). Private Sector Participation (PSP) has been promoted as necessary for obtaining financial resources for the development of the water supply sector in developing countries for improving both service coverage and performance quality (Owen, 2001; Steklov, 2001; Wolfe, 2001; Sandhyavitri and Young, 2000, and Janssens, 1997).

Subject Matters

This paper highlighted that the service coverage of water supply project in Padang City, Indonesia was limited to cover of 54% of the population in 2000, and it was not significantly improved up to 2007, hence it is a need to find out an appropriate contract strategy to meet stakeholder objectives in terms of project financing, sustainability of operation and maintenance the water scheme.

Methodology

Pendulum Obligation Diagram (POD, Figure 1) and Assessment Criteria (AC, Table 1) (Sandhyavitri, 2002) were use to assist decision-making process in selecting contract strategies for development (construction), operation and maintenance of the water supply project in Padang. To what extend these approach may assist the selection process of contract strategies suit to a water supply project was demonstrated in this paper.

Pendulum Obligations Diagram (POD)

POD was a simple diagram that describes key requirements of a water supply project (Figure 1).

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These requirements are grouped under the categories of: (i) capital investment; (ii) working capital for O&M; and (iii) efficiency requirements:

- Capital investment. It is necessary to identify whether the project principal and promoters have adequate capital to finance the construction or development of the projects.
- Working capital for the operation and maintenance (O&M) of projects. Working capital is used here in its widest sense to mean financial, technical, human resources, equipment, and managerial capabilities. O&M activities may include: conservation of catchments, transport of bulk water, distribution of treated water to the customers, maintenance of network systems and overall facilities, administration and billing, and quality management.
- Efficiency. The most sensitive activities within the project life cycle occur in the project O&M phase as these activities have longer duration and involve high costs. There is a need to improve efficiency of the following O&M activities: cost saving in the treatment of water, reduction of leakage rates, improvement of billing efficiency and revenue collection rates, improvement of service quality, and quality control.

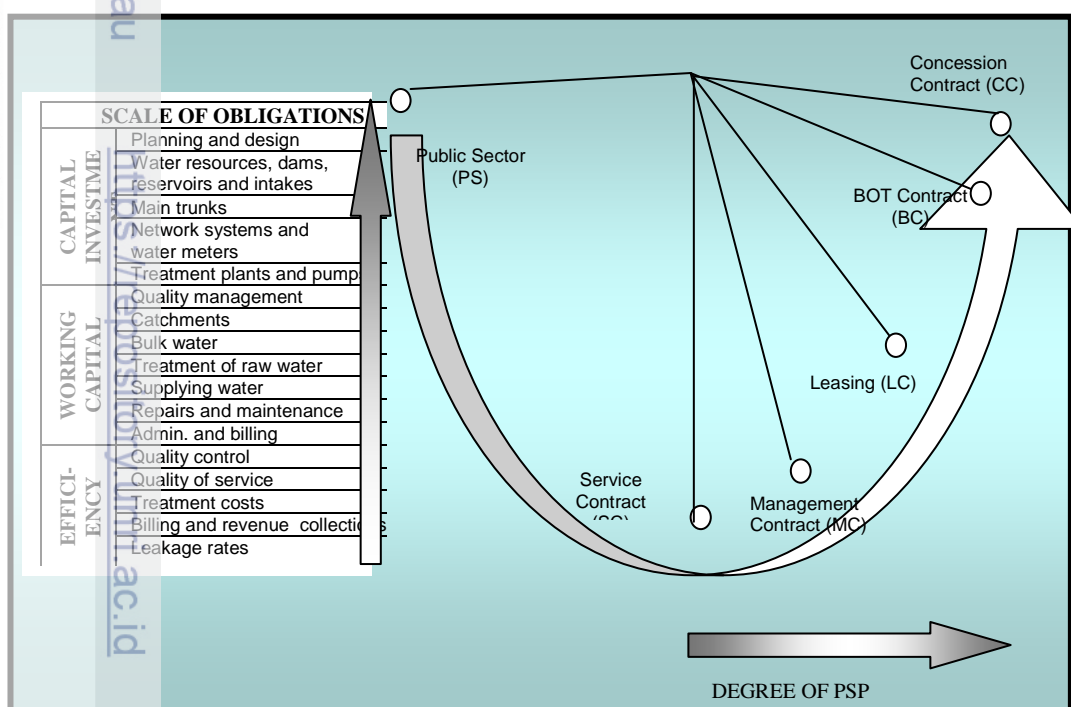


Figure 1. Pendulum Obligation Diagram (Sandhyavitri, 2002)

PSP will involve the transfer of at least some of these obligations from the government to the private sector. The extent to which this is necessary is shown by the degree of swing of the pendulum. As the pendulum swings progressively from left to right more project obligations are transferred from the government to the private sector, and the pendulum's progress indicates the corresponding contract strategy.

Assessment Criteria

Seven assessment criteria, which may be used to assist the process of: (a) identification of strengths and weaknesses of PSP contract strategies; and (b) selection of appropriate PSP contracts for water supply projects are identified. These criteria are as follow: (i) Capital investment– identifies which parties are responsible for providing capital investment; (ii) Financing O&M – indicates the allocation of O&M costs for water treatment plant, distribution systems and management offices; (iii) Obligations – These may include overall descriptions of the private sector company's responsibilities in either financing, operation or management of a water scheme; (iv) Efficiency of O&M – The project operators have as their main objective to improve efficiency of the O&M activities, such as efficiency in using electricity, chemical materials, equipment, staff, and reducing leakage; (v) Commercial risk – Commercial risk is inherent in any privately funded water project, thus the project principal or promoters should appreciate the degree of commercial risks, which have been passed to other parties, or indeed how risks have been shared between their organisation and other parties; and what risks have been retained in order to minimise the risk premium



paid; (vi) Economic parameters - These are illustrated by the IRR, NPV, cash pay back time (CPBT) and Maximum investment requirements of a project; and (vii) Contract duration - Different contract lengths for different PSP options are identified as being between 2 to 30 years (Table 1).

Case Study

This paper undertaken a study of the development of a water supply scheme planned for Padang city in Indonesia, which had the main objectives of: (i) increasing service coverage from 54% of the population in 2000 to 67% of the population in 2007; (ii) maintaining uninterrupted supply of 150 litres per capita per day (lcd) by 2005; and (iii) complying with the World Health Organisation (WHO) water quality standards.

The main requirements of specific stakeholders are identified as follow: (a) **Principal** (Municipality) had to identify the financial resources from the private sector; (b) **Lenders** (PSP) require a punctual loan repayment schedule, and high commercial viability for the project (i.e. commercially attractive project IRR and NPV performance); (c) **Promoter and operator** (water companies) have three main requirements: (i) generation of adequate revenue to cover O&M, service debts and yield profits; (ii) efficiency improvement; and (iii) gaining public esteem; and (d) **Consumers** have the main requirements: (i) obtaining adequate water quality; (ii) reliability of water quantity (no disruption); and (iii) reasonable water bills.

Main Findings

Based on the analysis using POD and AC criteria, the following table was drawn.

Table 1 Summary of the possible PSP features for the case study project based on the AC Table

Sub-criteria	Type of Contract Strategies			
	Lease	BOT	Concession (partial)	Concession (full)
Source of investment	Shared between public and private sectors	Private sector	Private sector	Private sector
Scale of capital investment	Small (Public sector Rp. 2.20 billion; Private Rp. 2.4 billion)	Medium Rp. 8.30 billion or US\$ 1.19million	Large Rp. 31.71 billion or US\$ 4.53 million	Large Rp. 31.71 billion or US\$ 4.53 million
Size of project	Small (water treatment plant facilities, WPs)	Medium (WPs)	Large (Overall new water supply facilities)	Large (Overall facilities (new and the existing ones))
Financing O&M	Operate WPs and develop its capacity	Finance and operate several WPs	Finance and operate new water supply facilities	Finance and operate overall facilities
Obligations of the private sector	Limited to operate, manage and develop the existing WPs	Limited to finance, build and operate new WPs.	Complex (Finance, build, operate and management of water supply facilities on a partial basis)	Complex (Finance, build, operate and management of the overall water supply schemes within the city)
Efficiency in O&M	Limited to water treatment plant facilities (WPs)	Limited to several WPs	Overall new water supply facilities	Overall water supply facilities (new and the old ones)
Leakage rate reduction	n.a.	n.a.	Partial network systems	Overall network systems
Billing and rev. collection	n.a.	n.a.	Limited customers	Overall customers
Quality	Improved water quality	Improved water quality and quantity	Improved water quality and quantity as well as service performance	Improved water quality and quantity as well as the overall service performance
Commercial risks	Public sector (pays the private operator using fixed rate basis)	Public sector (pays the private sector using fixed rate basis)	Private sector	Private sector
IRR	10.15%	14.42%	6.12%	14.27%



NPV	Rp. 3.11 billion US\$ 0.47 million	Rp. 21.48 billion or US\$ 3.07 million	Rp. 36.65 billion or US\$ 5.24 million	Rp. 102.76 billion or US\$ 14.68 million
CPBT	11.83 years	10.41 years	17.97 years	12.99 years
Contract period	20 years	20 years	25 years	25 years
Recommendation	Not recommended	Possibly recommended (as second option)	Not recommended	Recommended (as first option)

The Author has demonstrated the relative attributes of the application of each contract strategy in a case study of a water project in Padang. This case study illustrates the benefits that can be derived from the systematic collection of revenue. It also demonstrates that the chances of meeting stakeholders' objectives can be identified by using these tools.

Conclusions

For this case study the recommendations are that the **first option** would be a full concession contract as such a contract will best meet most of the project requirements (on fresh capital investment and efficiency). This contract may also be attractive to investors as the projected IRR is relatively high (14.27%) and CPBT is relatively short (12.99 years). **The second option** would be a BOT contract as this contract could meet partial project requirements on financing and operation of new water treatment plant facilities. Such a contract may also yield good economic parameters (e.g. the IRR is 14.42% and CPBT is 10.41 years). On the other hand, lease and partial concession contracts were not recommended to the project implementation.

It is realised that the political and social environments would probably result in strong opposition if full management of water assets was given to the private sector. Based on a willingness to pay (WTP) survey carried out in the city in 2000 the Authors identified that only 20% of the water users were happy to have a fully privatised water utility. Hence it is likely that a compromise recommendation is made that the project principals and project promoters follow a BOT contract strategy for this project.

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References

- ADB report in mandaazzahra.wordpress.com, 2008,
<http://mandaazzahra.wordpress.com/2008/06/10/krisis-ari-bersih-di-indonesia/>
 Janssens, J. G. and Djerrari, M. F., 1997, "The Water Utility Partnership for Africa", National Conference on Water Sector Reform: Policy Options in the Water Supply and Sanitation Sector, Abuja, 1997.
 Owen, 2001, "Public Sector Participation Crucial to Financial Support", Water and Wastewater International, February 2001, pp. 11-13.
 Sandhyavitri, Ari., and Young, R. J., (2000), "Sustainability Urban Water Supply: Major Constraints in Urban Water Supply in Selected Countries", One Day Workshop, Manchester, pp. 29-40.
 Sandhyavitri, Ari, 2002, "Fundamental Elements of Sustainability in Urban Water Supply: Case Studies in Indonesia", PhD Thesis, Manchester Centre for Civil and Construction Engineering University of Manchester Institute of Science and Technology, UMIST, UK.
 Steklov, Y., 2001, "Asia's Wastewater Management Needs major Funding", Water and Wastewater International, February 2001, pp. 14.
 Sutjahjo, 2000, "Kebijakan Kemitraan Pemerintah dan Swasta dalam Penyediaan Air Minum Perkotaan", Journal of Air Minum, No. 87/Th. XXI, ISSN No. 0126-2785, Perpamsi, Jakarta.
 Wolfe, P., 2001, "Savings "Lost" Water in Asia", Water and Wastewater International, April 2001, pp. 3.

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