Investment in Indonesia's Water Sector:
Evidence of Financing, Capacity, and Governance Effects

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Abstract

This paper examines piped water supply in Indonesia to answer the questions: (1) Is there under-investment in piped water supply in Indonesia, and (2) How much can under-investment be explained by measures of financial capacity, technical and managerial capacity, and local governance?

We rely on unique data that combines primary field research with financial and technical data available from national agencies and published governance indicators. We find that that there is considerable, systematic under-investment in water in Indonesia. Financial and capacity constraints are not the main determinants of under-investment, but rather governance has a very strong impact. Local governments that are unresponsive to customers' underlying demands for expanded and improved water service are characterized by institutional constraints, such as poor accountability and poorly managed utilities with limited cost recovery.

Acknowledgements

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1 Introduction

Investment in infrastructure is an important determinate of economic growth and improvements in human development indicators. Attempts to increase investment in infrastructure are made by providing financing, such as concessional finance from donors, and capacity building, through technical assistance, for instance. In recent years, there has also been a move to consider how governance impacts development outcomes (such as Acemoglu, Johnson and Robinson 2001 and Kaufman and Kraay 2002). The consensus is that governance—as measured by indicators of institutional quality—is strongly positively correlated with economic growth. The topic of governance at the sector level has also gained attention, with a number of researchers examining how governance specifically impacts investment decisions in the water sector and other sectors (such as Faguet's work on decentralization, 2003).

This paper aims to add to the existing literature by using a rich, comparative data set within one country, and—through econometric analysis and case studies—examining the impact of governance on water sector performance through a clear theoretical framework. This paper also examines other factors that affect water sector performance—financial capacity and technical and managerial capacity—to examine the relative importance of these factors and make conclusions on policy implications for efforts to improve performance in the sector. The data set was designed specifically to measure the quality of local-level governance in the water sector in cities and towns in Indonesia, and to measure the effects of financial capacity and technical and managerial capacity. The paper analyses piped water supply in Indonesia to answer the questions: (1) Is there under-investment in piped water supply in Indonesia?, and (2) To what extent can under-investment be explained by measures of financial capacity, local governance, and other local factors?

Indonesia is a large, diverse, lower middle-income country. The case of Indonesia may generate conclusions that are relevant to other developing countries that have decentralized responsibilities for providing water services—such as the Philippines, Mexico, and Colombia.

The rest of this paper introduces our methodology and data (section 2), presents a brief literature review (section 3), provides a background on Indonesia's water sector (section 4), presents our results (sections 5 and 6), and discusses policy implications (section 6.5).

2 Overview of Methodology and Data

The central government, as well as donors and other stakeholders, want to know why local governments in Indonesia do not seem to be investing enough in piped water supply. However, little rigorous, quantitative evidence is available on the nature, extent, and location of under-investment in water. It is necessary to know more about what the level of under-investment is and where it occurs before analyzing why it happens or how to fix it. Then, it is important to understand why under-investment occurs, so that interventions meant to increase investment in the sector can have their desired effect. We examine conventional approaches to under-investment—such as providing finance and increasing capacity—as well as governance.

2.1 Is there under-investment?

This paper first tests the extent of under-investment. Our first research question is: Based on quantitative evidence, is there under-investment in piped water supply in Indonesia?

To answer this question, we take two approaches. The first is a common, "top down" approach that looks at national goals and targets to see whether enough investment is

happening to keep pace with the targets. The government of Indonesia has set urban and rural coverage targets for 2015 in its National Action Plan (NAP). Using nationally-available data on 42 local governments and water utilities, we test whether the utilities are investing enough to reach these targets. We also briefly examine other ways to apply a "top-down" approach, such as by measuring whether or not the number of connections is keeping pace with population growth, and whether water utilities are investing at least an amount equal to depreciation, to maintain their existing assets, and, correspondingly, service quality. We expect to find that these measures indicate there is under-investment.

However, a failure to satisfy these "top-down" indicators of underinvestment, particular the ability to meet national targets, does not necessarily mean that the level of service is inadequate. National targets cannot take into account all local conditions, and therefore are not always representative of local demand. There is a possibility that despite ambitious national targets, what the citizens truly demand in terms of water service is lower than these targets because citizens have other priorities and limited resources.

This leads to our second, local or "bottom-up", approach to answering the question of whether there is under-investment. We examine whether cost-benefit justified investments are proceeding in local government areas. Under-investment happens when investments that are economically justified—that is, their benefits to the community are higher than their costs to the community—are not made. National targets cannot tell us about this; local level research is required. This is one of our paper's unique contributions.

To test under-investment using this second approach, we rely on local data collected by our team, including household surveys and city-specific estimates of investment needs.

2.2 What can explain under-investment?

After understanding the degree of under-investment in piped urban water supply, we then examine what can explain it. First, we test whether conventional explanations can fully account for the lack of investment—we examine whether lack of financial resources and a lack of technical and managerial capacity can fully account for the observed under-investment. Then we examine to what extent governance can explain under-investment.

We test whether local governments' investment decisions are responding to local needs. If water is a high priority for citizens, and governance is good, the local government will invest in water. If water is not a high priority for citizens—where, for example, piped water service coverage is low but people have sufficient alternatives such as abundant, good-quality groundwater—the government will invest in sectors that are higher priorities. In either case, the local government and the entities it controls (including water utilities) will make investments in projects that are cost-benefit justified. In areas with bad governance, local governments will not respond to citizens' priorities, and we expect to see greater under-investment. We expect to see that the quality of governance emerges as a very important driver of investment decisions—a role that has been under-estimated in the past.

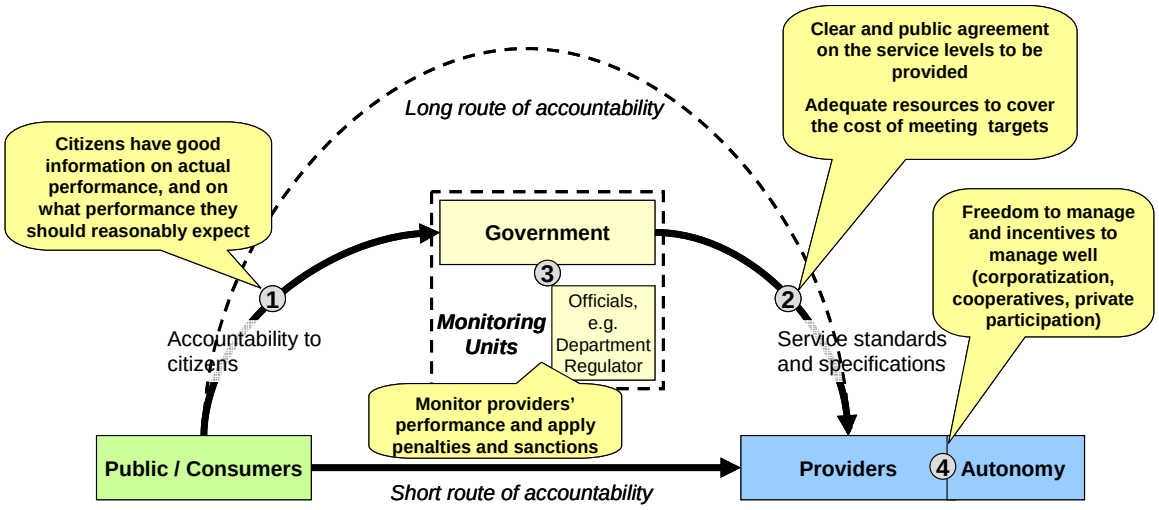
Framework for Evaluating Governance in the Water Sector

This work draws on a governance framework that is specific to the water sector, which was developed by the World Bank with assistance from Castalia. The World Bank defines governance as encompassing three broad areas, one of which is "the capacity of the government to effectively manage its resources and implement sound policies."[2] In a well-

[2] The full definition is "the traditions and institutions by which authority in a country is exercised for the common good. This includes (i) the process by which those in authority are selected, monitored and replaced, (ii) the capacity of the government to effectively manage its resources and implement sound policies, and (iii) the respect of citizens and the

governed water sector, consumers will demand a level of service that is consistent with their priorities and scarce resources, and will elect politicians who promise to respond to their demand. Politicians then will make the water utilities deliver the services required, and invest in them if necessary. Consequently, the water utilities will deliver the services consumer demand. Consumers, should they be satisfied, would likely re-elect the politicians that responded to their demands. In other words, good governance gives water sector officials and managers incentives to be responsive to citizens' demands. Figure 2.1 below illustrates a system for good governance in the water sector, and highlights the key principles for achieving good governance. We use this framework to test the quality of local-level governance in the water sector.

Figure 2.1: System and Principles for Good Governance in the Water Sector



Source: Jonathan Halpern, Charles Kenny, Eric Dickson, David Erhardt and Chloe Oliver, "Deterring Corruption and Improving Governance in the Water Supply & Sanitation Sector: A Sourcebook," Washington DC: The World Bank. September 2008

state for the institutions that govern economic and social interactions among them." (The World Bank, "What is our approach to governance?" Available at: http://go.worldbank.org/MKOGR258V0. Accessed September 14, 2009.

Hypotheses for Explaining Under-investment

Based on this approach, this paper tests several hypotheses to examine drivers of under-investment in piped water supply in Indonesia:

- Hypothesis 1: Local governments and water utilities lack financial resources to invest
- Hypothesis 2: Local government and water utilities do not have the managerial or technical capacity to identify or carry out investments that would be economically justified
- Hypothesis 3: Governance structures do not exist or are not working well, and therefore local governments and water utilities are unaware of citizens' demands, unresponsive to them, or both.

2.3 Data

To answer these questions, we rely on two unique data sets. The first is data from water utilities (*Perusahaan Daerah Air Minum*, or PDAMs) and local governments (PEMDAs) in a sample of 42 cities (*kota*) and districts (*kabupaten*). This data set includes technical and financial data drawn from 2007 audited reports of each PDAM and local government. The regional offices of the national audit agency, BPKP (*Badan Pengawasan Keuangan dan Pembangunam*), performed the audits and published the reports. All reports were published in 2009. This data set also includes Census data and governance measurements from the Local Economic Governance in Indonesia 2007 Index, produced by The Asia Foundation in conjunction with the Indonesian Regional Autonomy Watch.

This sample of 20 cities and 22 districts is fairly representative of Indonesia's geography and population distribution among regions (Sumatra, Java and Bali, Kalimantan,

and eastern Indonesia). The sample represents 9% of the 465 local governments in Indonesia and 16% of Indonesia's population of 240 million. The sample includes.

Our second dataset draws from primary field research in six cities and districts. These areas were chosen as part of the WASAP I project mentioned in the acknowledgements to this paper, which funded much of the research presented here. The areas are: the cities of Bukittinggi, Malang, Makassar, Palembang, Yogyakarta, and the district of Ciamis. (For simplicity, we refer to all six as "cities" in the remainder of this paper.) The methodology used for selecting these cities is explained in Appendix A. Key characteristics of the cities are presented in Table 2.1.

Table 2.1: Key Characteristics of Case Study Cities

	Makassar	**Bukittingi**	**Yogyakarta**	**Palembang**	**Ciamis**	**Malang**
Region (Province)	South Sulawesi	West Sumatra	Central Java	South Sumatra	West Java	East Java
Population	1,255,230	100,000	523,000	1,342,258	1,700,000	800,000
% of households with PDAM service	49.7%-72%*	43.5%	30.4%	50%63.7%*	19.6%	50-%65%*
Local coverage targets (year)	80% (2015)	81% (2013)	50% (2013)	80% (2013)	35%-60% (2014)**	84% (2013)
Current average PDAM tariff (Rp/m^3)	3,249	1,348	2,440	3,300	2,070	2,694

* The PDAMs in Palembang, Makassar, and Malang reported higher coverage figures than the ones we calculated. We calculated our figures using the number of domestic connections, the average household size obtained through the household survey, and the population of the city. A plausible reason for the difference between the two figures is that PDAMs usually base their figures on a household size of six people (per domestic connection) while our survey shows that the average size is around five in these cities.

** The local government of Ciamis states that its target is 50,000 connections and 61% coverage. According to our calculations, 50,000 connections serving purely residential connections would cover only 35.4 percent of urban households in the kabupaten. The government emphasizes the 50,000 figure, and it is the more realistic target.

In each city, the research team conducted household surveys of existing PDAM customers and non-customers. These surveys measured respondents' perceptions of the

quality of their existing water services, and their willingness to pay for a good-quality piped water supply (defined as a reliable, 24-hour, supply of drinking water quality water with adequate pressure). The survey also tested the strength of governance mechanisms, such as whether the household had information on how their service and its cost compares to service and cost in other cities and districts, and whether the PDAM had responded to any complaints the household had made.

The research team calculated city-specific estimates of investment needs. These calculations were based on each local government's and PDAM's existing plans and local conditions. The research team also conducted focus group discussions, meetings with local government and PDAM officials, and gathered other data from the PDAM. The data sets are described in Appendix A.

3 Literature Review

The recognition that institutional arrangements matter was first widely introduced into mainstream economics in Coase's seminal paper *The Problem of Social Cost*.[3] Since that time, and especially since the 1990s, the role that institutions play in determining economic outcomes has received increasing attention from researchers, theorists and policy-makers. This is particularly true for economic growth theory. Douglas North summarized the importance of institutions to economic and development outcomes in making his case for New Institutional Economics:

> *"Successful development policy entails an understanding of the dynamics of economic change if the policies pursued are to have the desired consequences."*[4]

[3] Coase, R. The Problem of Social Cost. Journal of Law and Economics. October 1960

[4] North, D. New Institutional Economics and Development. 1993 working paper

In development policy, the quality of institutions is reflected in measures of good governance. In this context, the term "governance" is meant to capture the way in which institutional arrangements and authority are used to allocate resources and coordinate activity. The World Bank divides good governance into the following categories in creating the World Development Indicators: voice and accountability, political stability and lack of violence, government effectiveness, regulatory quality, rule of law, and control of corruption.[5]

There is a growing body of evidence that these and other measures of good governance and the quality of institutions are strongly correlated with positive growth and development outcomes. Among the stronger findings is Kaufman and Kraay's *Growth without Governance* (2002).[6] The authors provide recent evidence from Latin American countries showing a strong causal relationship from quality of governance to per capita income. Acemoglu, Johnson and Robinson (2001) look further back in history to find similar effects on income from the differences in institutions among colonies of European countries.[7] This and other evidence has helped to shift the emphasis toward prioritizing improvements in governance to achieve development goals.

If governance is important to economic growth and development, then how does it directly affect people's lives through the provision of public services? For the purposes of this paper, we are chiefly interested in relationship between governance and infrastructure services, specifically water supply. Recent evidence has shown that democratization and the perception of quality regulation in a country can improve access to clean water and

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[5] World Bank Governance Indicators, 1996-2008. http://info.worldbank.org/governance/wgi/index.asp

[6] Kauffman D. and Kraay. Growth without Governance. The World Bank. 2002.

[7] Acemoglu D., Johnson and Robinson. The Colonial Origins of Comparative Development: An Empirical Investigation. American Economic Review, v91, 1369-1401. 5 December 2002.

sanitation.[8] Following this theme of democratization, decentralized public management approaches and customer-orientation have demonstrated potential to improve the performance of water utilities in low- and middle-income countries.[9] In these cases, good governance is achieved through the process of decentralization and increasing the responsiveness of decision makers to local needs. This can have a considerable impact on the allocation of resources to their best use. Faguet (2003) shows that decentralization can significantly increase public investment in water and sanitation, as well as in education, agriculture, urban development and other public services.[10] The increases in investment tend to be larger where the local needs are greatest.

This paper follows the theme of this recent research on quality institutions and good governance as determinates of economic growth, development, and particularly investment in public services. While we also have focused our attention on good governance in the context of democratic decentralization, this paper makes a contribution by looking at more dimensions of governance and related factors that may affect investment in water supply. Only a few papers in the literature consider the relative importance of various interventions to improve water sector performance,[11] such as financing, capacity-building, and now governance strengthening. Moreover, there are few examples of empirical work that uses case studies to measure governance at a local level and combine this with national data, as we have in looking at governance and the determinates of water sector investment in Indonesia.

[8] Whitford, A., Smith and Mandawat. Disparities in Causes to Clean Water: Institutional Causes. Working paper

[9] Schwartz, K. Managing Public Water Utilities: An Assessment of Bureaucratic and New Public Management Models in the Water and Sanitation Sector. UNESCO-IHE Institute for Water Education. 2006.

[10] Faguet, J. Does Decentralization increase Government Responsiveness to Local Needs? Evidence from Bolivia. Journal of Public Economics, 88, 867–893. 2004.

[11] Schwartz 2006 and Whitford, Smith and Mandawat are among those that do.

4 Background to Indonesia's Water Sector

In Indonesia's urban areas, only 32% of households have a piped water service connection.[12] The national target is to increase this to 69% by 2015.[13] However, investment in infrastructure has been slow in coming. The September 2006 World Bank Country Assistance Strategy (CAS) Progress Report notes that inadequate infrastructure remains a major impediment to investment and poverty reduction in Indonesia. Infrastructure investment fell from 5-6% of GDP before 1997 to 1-2% in 2000, and as of the mid-2000s was 3.4 percent. The World Bank estimates that an additional 2 percent of GDP must be invested into infrastructure to sustain 6 percent medium-term economic growth.[14]

After the Asian Financial Crisis, there was a dramatic decrease in infrastructure investment, from an average of US$400 million in the 1990s to under US$45 million in 2005.[15] This is not only the result of the crisis, but also reflects changes over the period in which responsibility for most infrastructure spending was transferred away from the Ministry of Public Works, historically the main source of new investment, to the local governments. The World Bank states that government spending for the water sector is about one tenth that needed to achieve 2015 MDG targets, which have been incorporated in Indonesia's development program for water and sanitation.[16]

Constitutionally, water services are a local government responsibility. Decentralization reforms were carried out in 1999–2001, when Indonesia instituted

[12] Indonesia Public Expenditure Report, 2007, published by the United Nations Development Program and the Asian Development Bank.

[13] The central government's National Action Plan targets for piped water supply coverage by January 2015 are: 69% in urban areas, 54% in rural areas, and 58% nationally.

[14] Terms of Reference for the Indonesia Water Supply and Sanitation Financing Initiative (WASAP I), January 2008.

[15] Ibid.

[16] Ibid.

"decentralized democracy"—putting spending decisions in the hands of locally-elected officials. Local governments also control the municipal water utilities (PDAMs)—mayors appoint PDAM directors and supervisory boards. The logic of "decentralized democracy" is that local governments should respond directly to local needs. In other words, mayors and other local officials should be driven to do the right thing because democracy creates incentives for them to deliver what citizens want.

5 Is there Under-Investment?

First, we look to see if the evidence shows that there is under-investment in piped urban water supply in Indonesia. We start with the common, "top-down" approach that looks at national goals and targets to see whether enough investment is happening to keep pace with the targets, population growth and depreciation. We then take the local, "bottom-up" approach by examining whether economically justified investments are proceeding.

5.1 Is investment sufficient to meet national targets?

The Government of Indonesia's National Action (NAP) plan sets out the following targets for the water sector:

- Piped water coverage in urban areas: 69% by January 2015
- Piped water coverage in rural areas: 54% by January 2015
- National piped water coverage: 58% by January 2015.

The first approach to answering the question "Is there under-investment?" involves testing whether investment is sufficient to meet these targets. To check progress meeting national targets, we used the national-level dataset on 42 local governments and PDAMs across the country. This includes data on coverage levels in 2007 and fixed assets in 2006 and 2007. From this data, we calculated the number of additional connections required to

meet the NAP targets in 2015, considering population growth.[17] We applied the urban coverage target to kota (by definition, cities) and the rural coverage target to kabupaten (by definition, districts that are at least partly rural but may also include urban areas).[18] We applied an average investment cost per connection to calculate the investment that would be necessary to reach the NAP targets by the end of 2014.[19] To account for the physical depreciation of the PDAMs' assets over this period, we added depreciation in 2006 to the average annual investment requirements.

To calculate actual investment in 2007, we subtracted the book value of assets in 2006 from the book value of assets in 2007, and added in depreciation. No more detailed data on investment was available.

We compared actual investment in 2007 to the average annual investment that would be needed from 2008 through 2014 to meet the NAP targets by January 2015. Clearly, few local governments could be expected to meet the targets in a short period of just a few years, and would likely need to be investing consistently in order to meet the targets.

Our findings show that in 71% of cases (30 out of 42 local government areas), actual investment was below that needed to reach the NAP targets. More specifically:

- **A few areas have met the NAP targets, but many are quite far behind**—The average service coverage level in our sample of 42 cities and districts in 2007 was less than 39%. However, some areas had relatively high coverage. Five cities had

[17] The only data available on population growth in each kota or kabupaten is the difference between population in 1990 and population in 2000 (the years of national census). We assumed that the average annual population growth rate until 2015 would be equal to the average annual population growth rate from 1990 to 2000. We did not find a compelling reason to believe this would not be the case.

[18] Data on coverage levels in urban and rural areas of kabupaten is not available. We applied the rural targets to all kabupaten because applying the urban target would grossly over-estimate the investment required.

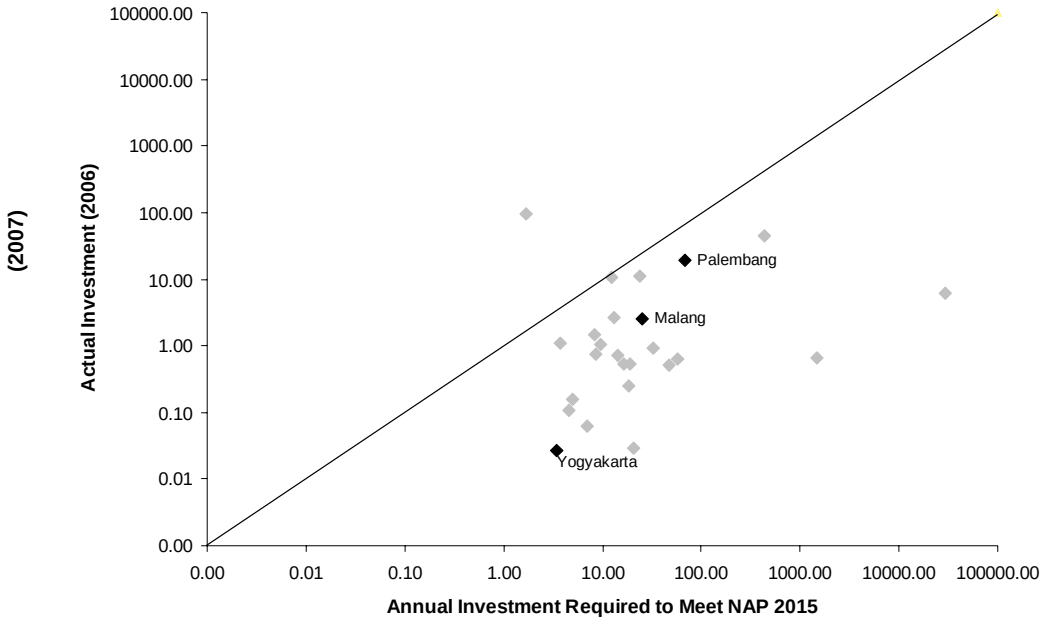
[19] We estimated the total investment each local government would have to make to meet the NAP targets. We assumed that each new connection, including associated headworks, would cost Rp8 million (US$780). This is the figure currently being used by the Department of Public Works for planning. Our team's senior water engineer, who has over 20 years of experience in the water supply and sanitation sectors in Indonesia, confirmed that this was a reasonable number to use.

already met the target for urban coverage, and four districts had met the target for rural coverage. This means that 21% of the areas in the sample had met the corresponding national target, but that 79% had not. For those local governments that require investment to meet coverage targets, the average investment needed as was US$61 million

- **Very few of the governments in areas needing investment are investing enough to meet the targets**—Only 9% of local governments that require investment (three local governments) were investing enough to meet their targets. This means that 91% of local governments were not investing enough to meet the targets. Two of the three local governments that were investing enough are atypical cases—in Banda Aceh and Aceh Tengah, investment is high because of reconstruction after the tsunami of December 2004.

Figure 5.1 compares annual investment required to meet the 2015 NAP targets to the level of investment in the PDAM in 2007. The 45 degree line represents a 1:1 ratio of actual investment in 2007 to average annual investment required. Any local government falling below that line is not investing enough to meet national targets. Three of the six cities studied in depth are highlighted on the graph.

Figure 5.1: Is Actual Investment Sufficient to Meet NAP 2015? (log scale)



Source: Castalia calculation and BPKP, "PDAM Performance Audit Results Report (Laporan Hasil Audit Kinerja) for FY2007," published in 2009.

Fifteen of 42 PDAMs had negative values for actual investment in 2007. Because the graph is on a log scale, they do not appear. This includes three of the case study cities.

Clearly, a substantial investment will be required for many local governments to reach the NAP coverage targets, and most local governments and PDAMs are not investing enough to reach these targets. This approach shows that there is under-investment in piped water service in Indonesia.

Other ways to examine under-investment using a "top-down" approach based on nationally-available data include:

- Testing whether investment is keeping pace with population growth, in the sense that coverage levels stay constant or improve as the population grows?
- Testing whether investment is enough to keep up with depreciation.

These calculations also show that investment in the 42 cities and districts is insufficient. To summarize, the data shows that:

- Investment in new connections was not keeping pace with population growth in 93 percent of the 42 cities and districts in the sample
- The majority of the 42 PDAMs were not investing enough to keep up with depreciation. For 60 percent of them, depreciation in 2007 was greater than investment in the same year.

The detailed data and findings are available upon request to the authors.

5.2 Are economically-justified investments not proceeding?

A more rigorous way to test whether there is under-investment is to examine whether there are projects that are economically justified but local government and its PDAM have not made the investment to implement these projects. This is a "bottom-up" approach that requires analysis of the costs and the benefits of investments at the local level. We applied this approach in the six cities studied in depth.

A project is economically-justified if its benefits to the community are higher than its costs to the community. We carried out a cost-benefit analysis of investments in each of the six cities by comparing households' willingness to pay for piped water service (for households without a connection) or improved water services (for households with a connection) to the cost of providing that service. Then, we examined whether there were additional circumstances that would bias the willingness-to-pay or otherwise affect the benefits (such as the presence of obvious externalities).

The results are shown in Table 5.1 and Table 5.2. "WTP" refers to willingness to pay. Expressed willingness to pay refers to the amount survey respondents said they were willing to pay when asked by the interviewer. Revealed willingness to pay is the household's

current water expenditure, based on the data gathered by the survey. We look at average willingness to pay as well as the willingness to pay of certain groups, such as middle- and high-income areas. Because we are testing whether there are economically-justified investments that are not proceeding, to test our hypothesis we do not have to find that investments to serve all households or improve service to all customers would be justified; we only have to identify that there are substantial investments within areas of the city that would be worthwhile to do.

Table 5.1: Evidence of Under-investment in Service Improvement

City	Average WTP (Rp/m3)	Full Cost of Service (Rp/m3)	Is there under-investment? That is, would further investment in improving service to existing customers be economically justified?
Makassar	5,451	4,947	**Yes**. Average WTP is greater than the full cost of service. 64% of all PDAM customers, and 81% of middle- and high-income customers, in the sample are willing to pay more than this cost.
Bukittingi	3,622	3,400	**Yes.** Average WTP is greater than the full cost of service. 70% of all PDAM customers in the sample are willing to pay more than this cost. Most customers complain about unreliable service, and levels of satisfaction with the reliability, availability and pressure are the lowest of the 6 cities
Yogyakarta	3,728	3,791	**Yes.** Although average WTP is slightly below the cost of service, people are not fully aware of risks related to the contaminated groundwater. Tests have reported e-coli counts of 2,500 MPN (mean probable number) per 100 mL for some wells.[20] The negative health consequences of using contaminated water impose a cost to society. The benefit of avoiding this cost increases the economic benefits of the investment scenario. Also, 48% of PDAM customers are willing to pay an amount greater than the full cost of service. This indicates improvements to some areas would be justified.
Palembang	4,451	4,081	**Yes**. Average WTP is greater than the full cost of service, and 73% of all PDAM customers in the sample are willing to pay more than this cost. Water is a high priority for citizens. The city has limited ground water, and it is of poor quality.
Ciamis	3,733 *	4,633	**Probably.** Average WTP is lower than the full cost of service, but consumers' willingness to pay is likely biased downward because: ▪ The improvement scenario may not be credible. The PDAM's

[20] According to the PDAM Director, groundwater has shown a rapid rise in coliform counts. A level of 1,000 MPN e-coli/mL is the European Union (EU) water quality standard for bathing water quality. This EU water quality standard is for recreational activity such as swimming. In other words, the water in some people's taps in Yogyakarta is so polluted that in Europe people would not even be allowed to swim in the water.

City	Average WTP (Rp/m3)	Full Cost of Service (Rp/m3)	Is there under-investment? That is, would further investment in improving service to existing customers be economically justified?
			performance has been poor for a long time. The PDAM and local government announced that they would expand coverage and improve service, but then waited for a new decree on soft financing terms for the sector to be issued. Citizens saw that plans were not moving forward ▪ Customers are used to paying low water bills. Consumption is low, at 17m^3/month because of supply restrictions, and monthly water bills are the lowest of the six cities
Malang	4,598 *	4,139	**Yes.** Average WTP is greater than the full cost of service. Customers are generally satisfied with the service that they are receiving, but if an improved service were available (such as the potable water service offered to 15,000 residents in pilot areas), 58% of customers would be willing to pay for it.

* In Ciamis and Malang, we report revealed willingness to pay, as this is greater than expressed willingness to pay

In 5 out of the 6 cities, there is clearly under-investment in improving service to existing customers. In the remaining city, under-investment of this type is also likely. Table 5.2 presents evidence of under-investment in expanding service to new customers.

Table 5.2: Evidence of Under-investment in Service Expansion

City	Average WTP (Rp/m3)	Full Cost of Service (Rp/m3)	Is there under-investment in service expansion? That is, would further investment in expanding service to new customers be economically justified?
Makassar	3,962	4,947	**Yes**. Although average WTP is less than the full cost of service, there are likely some justified investments in specific areas of the city. Groundwater is limited and of poor quality. Water is a high priority. 64% of middle- and high-income households, and 42% of all households, are willing to pay more than the cost of service.
Bukittingi	3,025	3,400	**Yes.** Although the average reported WTP is below the full cost of service, this average is skewed by a number of people who responded that they would not want a PDAM connection and thus reported a willingness to pay of zero. This is evident in the fact that even though average WTP is below the full cost of service, over 61% of non-customer households would be willing to pay more than this cost
Yogyakarta	2,097	3,791	**Yes.** Although average WTP is below the cost of service the economic benefits are greater than WTP because of the highly contaminated groundwater that people are not aware of (see discussion in table above). Also, 47% of middle- to high-income non-customers are willing to pay more than the full cost
Palembang	3,855	4,081	**Yes**. Water is a high priority for citizens. The city has limited and poor-

			quality ground water. Although non-customers' average WTP is lower than the full cost of service, 62% of non-customers are willing to pay more than this cost. System expansion to targeted areas is justified
Ciamis	2,643	4,633	**Probably.** Average WTP is lower than the full cost of service, but willingness to pay is likely biased downward because the improvement scenario is not credible, as discussed in the table above.
Malang	2,443	4,139	**No.** WTP for all categories of respondents is low. Only 18% of all non-customers, and 25% of mid-high income customers, in the sample are willing to pay more than the full cost of service. Citizens in Malang do not see water as a priority. Households are largely satisfied with their water supply given the availability of good groundwater.

While there is also under-investment in expanding coverage to new customers, the evidence presents more of a mixed picture. There is under-investment in expanding service to some areas of the cities, but not all. Additionally, we observe that existing customers are willing to pay more than non-connected households. This seems to indicate that as people experience the benefits of piped water they come to value it more.[21] Experience in other areas also indicates that more people tend to be willing to connect once the water supply scheme is in place.

5.3 Conclusions on Under-investment

The evidence we present from the sample of 42 local governments and PDAMs, including the in-depth case studies of six cities, shows that there is considerable, systematic under-investment in water in Indonesia. The in-depth case studies show that under-investment in improving service to existing customers may be more prevalent than under-investment in expanding service to unconnected customers.

[21] General observations are that unconnected households underestimate their likely future use because they have no first hand experience of the benefits of piped water, or the convenience of a 24 hour supply. The restricted consumption of water by non connected households is due as much to the difficulty in using vendor water as it is to the cost. The cost per m^3 of piped water is significantly less than an equivalent volume of vendor water so that in time newly connected households tend to increase their consumption well above what they consumed from vendors. Where households have a pumped bore, piped water is more expensive than bore water but is usually of better quality and more reliable during the dry season. Newly connected households increase their consumption of piped water over time, as the benefits of quality and reliability become more apparent.

The juxtaposition of these two approaches, and comparing the targets set by local governments to the targets set by national governments, suggests that what really matters when measuring under-investment is the local picture.

6 Reasons for Under-investment

To understand the drivers of under-investment, and specifically the role that government plays, we test several explanations using both the dataset of indicators available at the national level, and the in-depth case studies of local governance and other issues. First, we test whether the lack of financial resources or technical and managerial capacity can sufficiently explain under-investment. Then we look at the role of governance.

This section begins with a regression analysis to examine what factors are significant in predicting under-investment. Then in each of the subsequent sections we test the three hypotheses on under-investment using the regression results, other evidence from the national data set, and evidence from the case studies. The final section concludes.

6.1 Regression Analysis on the Investment Deficit

To understand what measurable factors are associated with under-investment, we have constructed a basic multivariate regression model to test the relationship between the investment deficit and variables measuring local financial capacity, local governance, technical capacity, service quality, and other control variables. The "investment deficit" is defined as the gap between actual investment in 2007 and what is required to meet the NAP targets, allowing for depreciation. The model assumes the following reduced form relationship:

$$InvestmentDeficit_i = \beta_0 + \beta_1(LGarrears_i) + \beta_2(PDAMarrears_i) + \beta_3(BorrowingCapacity_i) + \beta_4(EGIgovernance_i) + \beta_5(AverageTariff_i) + \beta_6(\%waterloss_i) + \beta_7(ServiceContinuity_i) + \beta_8(Population_i) + \beta_9(Kota_i) + \beta_{10}(profit/connection_i) + \varepsilon_i$$

In the equation above, the investment deficit in city *i* is explained by the financial capacity of the local government and water utility, the quality of local governance, the condition and management of the water supply, the quality of water services being provided, and other control factors *X*. The error term ε is assumed to be random, normally distributed noise.

The variables in our dataset that capture the independent characteristics of the above model are presented, along with summary statistics, in Table 6.1.

Table 6.1: Definitions and Summary Statistics of Key Variables in National Dataset

Variable	Definition	What is the variable measuring?	Unit	Mean	Std. Dev.	Min	Max
Investment deficit	Actual 2007 investment net of annual investment required to meet NAP and depreciation	Dependent variable	Billion Rupiah*	257	1,102	-36	6,353
LGarrears	Total Local Government arrears in 2007	Financial capacity	Billion Rupiah	8,268	24,192	0	101,600
PDAM arrears	Total PDAM arrears in 2007	Financial capacity	Billion Rupiah	6,196	10,810	0	48,729
LG borrowing capacity	Total used and unused borrowing capacity in 2007, assuming DSCR of 2.5	Financial capacity	Billion Rupiah	6,959	14,433	562	80,636
Profit/connection	Net profit per service connection	Management / Governance	RP	-0.0066	0.0336	-0.1922	0.0007
Average tariff	Average tariff	Management / Governance	Rp/m3	2055	807	3	3759
Percentage water loss	Percentage of unaccounted-for-water	Management	%	38.42	16.51	20.67	112.00
Service continuity	Hours/day of facilities operation	Management	Hours	21.03	5.93	0.00	24.00
Population	2000 census population	Control factor	People	867,172	973,662	99,046	5,136,068
Kota	Dummy variable 1=Kota, 0=Kabupaten	Control factor	1/0	0.52	0.51	0.00	1.00
Governance score	Asia Foundation's Economic Governance Indicator	Governance	1-100 (Index)	63.87	4.36	52.00	71.30

* The average exchange rate in 2007 was Rp9,139:US$1. In 2009 it was Rp10,467:US$1

Table 6.2 presents the estimation results. The model explains a statistically significant amount of the variation in the investment deficit ($p<0.001$) with an average error in the predicted values of 172 billion Rupiah (RMSE=172). We tested multiple specifications of the same base model using different measures of the variables of interest without finding substantive differences in the results.

Table 6.2: Multivariate Regression on Investment Deficit (billion Rupiah), n=33

	Coefficient	Standard Error	t-stat	p-value
LG arrears	0.0015	0.0015	0.96	0.349
PDAM arrears	0.0015	0.0054	0.28	0.779
LG borrowing capacity	-0.0034	0.0032	-1.05	0.307
EGI Governance	-4.3573	11.9583	-0.36	0.719
Average Tariff	0.0210	0.0428	0.49	0.628
Percentage Water Loss	-0.5518	1.8963	-0.29	0.774
Service Continuity	-1.5458	5.5739	-0.28	0.784
Population	0.0001	0.0001	2.21	0.038
Kota	-94.2866	91.1747	-1.03	0.312
Profit per Connection	-32151.5000	965.7019	-33.29	0.000
Intercept	*282.6871*	*862.4541*	*0.33*	*0.746*

With the exception of the profit per connection, all of the slope coefficients models are statistically insignificant or weakly statistically significant. However, given the small number observations in our dataset it is not surprising that the estimates are imprecise. With this qualification, we can make some tentative observations on the direction and substantive significance of some variables despite the statistical insignificance. Given the difficulty of collecting this type of data in developing countries, any conclusions we can generate are valuable, and given the size of the dataset, weakly statistically significant variables that are substantively significant may still reveal important information.

While the slope coefficients on both measures of arrears are small and statistically insignificant ($p=0.35$ and $p=0.78$), they have the expected sign. As arrears increase, there is a

weak increase in the investment deficit, on average. For borrowing capacity—the key other measure of financial capacity—the relationship is also in the expected direction, although it is still statistically insignificant (p=0.31). Local governments with higher total borrowing capacity have smaller investment deficits, on average.

A similar conclusion can be made for the governance variable. To measure governance, we have used the overall measure of local governance ability reported by the Asia Foundation, which ranks local governments based on a variety of survey criteria.[22] While this is not statistically significant (p=0.72), the relationship is again in the direction we would expect—an increase in the local governance score is associated with a decrease the investment deficit. The weak evidence of a relationship between good governance and investment does not necessarily rule out the importance of governance. The Asia Foundation's index of governance is an imperfect measure and it does not focus on or directly include information on the water sector.

The slope coefficients on the variables meant to capture the technical and managerial capacity and service quality of the system are also statistically insignificant, including average tariff (p=0.62), percent of water loss (p=0.77), and service continuity (p=0.78).

Cities with higher populations, unsurprisingly, have higher investment deficits (p=0.04). Each additional person is associated with an increase in the investment deficit of about 100,000 Rupiah. Controlling for population, the model also predicts that kabupatens have investment deficits that are about 94 billion Rupiah higher than the kotas, on average. However, the latter of these relationships is not statistically significant (p=0.31).

The coefficient on **profit per connection** is the only estimate that is strongly statistically significant. In this case, increasing the profit per connection by 1 Rupiah is

[22] Local Economic Governance in Indonesia: A Survey of Businesses in 243 Regencies/Cities in Indonesia. Asia Foundation. 2007

associated with about a 32,000 billion Rupiah reduction in the investment deficit. This seems to be a logical financial explanation, in which PDAMs with more funds available after covering their expenses invest more. Another way to interpret the effect of profits on under-investment is that it indicates specific, enlightened governance that is not being captured in the Asia Foundation's broad measure of governance. Local governments set the tariff high enough to achieve cost recovery, make the system self-sustaining, and have money left over to invest in expanding or improving service. It is also likely that this a higher profit per connection indicates that the PDAM has good management capacity and is being run more effectively. We think that this variable is likely capturing good governance and management in the PDAM.

Therefore the final, and most significant, result of the model shows that cost recovery and good management is very important and perhaps the major factor determining whether local investments are being made in water supply. In other words, where investing in infrastructure is less of a fiscal cost and requires a lower or no subsidy, and where PDAMs are being managed so they are profitable, investment happens more.

We reference the above findings and analysis in the following subsections to address each of our primary hypotheses on the explanations for under-investment.

6.2 Hypothesis 1: Financial Constraints

We have hypothesized that one reason for under-investment in Indonesia's water sector is the lack of financial capacity. We tested this hypothesis in three ways:

- Including measures of financial capacity in the regression analysis
- Estimating the amount of investment that would be required for the 42 cities in the national dataset to meet the NAP targets for January 2015, and comparing this to their financial capacity

- Calculating the capital cost for the investments that are economically-justified in the six cities studied in depth, and analyzing whether the local government and PDAM have the capacity to fund this investment.

Results of Regression Analysis

In the regression analysis, the coefficients on local government arrears, PDAM arrears, and local government borrowing capacity are all in the expected direction, but statistically insignificant. A greater investment deficit vis-à-vis the NAP targets is associated with higher arrears and lower total borrowing capacity.

Higher net profit per connection implies a lower investment deficit, and this relationship is statistically significant. This indicates that finance is important. However, given the other evidence that simply being able to spend from reserves or borrow to invest is not a determining factor in investment, it seems that net profit per connection needs to be seen at least as much as a sign of better management and governance. A profitable utility is one that sets tariffs at a reasonable level and controls its costs. The first is a governance decision (local governments set tariffs), and the second is a managerial one. In other words, net profit per connection tells us more about the governance model adopted in an area, than about simple financial capacity.

Investment Needed versus Financial Capacity in 42 Local Governments

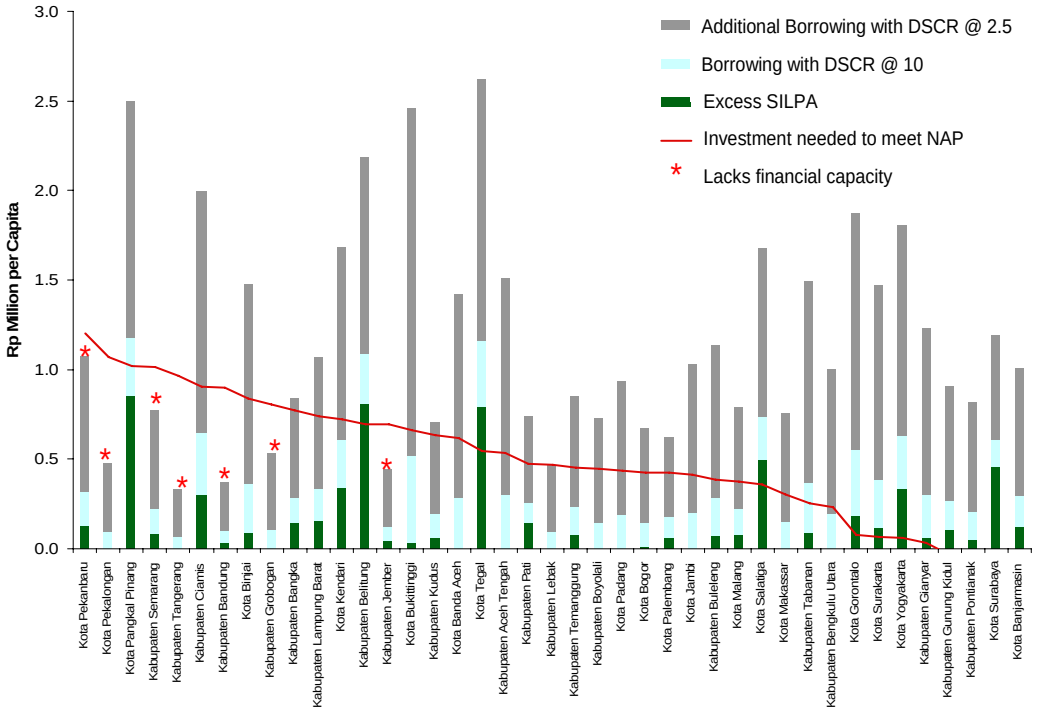
Local governments have a range of financial resources at their disposal. These include accumulated savings (*Sisa Lebih Perhitungan Anggaran*, SILPA) and unused borrowing capacity. The legal limit on local government borrowing is a debt service coverage ratio (DSCR) of 2.5[23] (Government Regulation 54/2005), in which debt service payments are 40% of revenue minus obligatory expenditure. A more conservative scenario would be a DSCR of

[23] A DSC factor of 2.5 is the maximum debt service ratio allowed by Gov. Reg 54/2005.

10. Taking into account the need for local governments to retain emergency cash reserves in the case of unexpected events,[24] as well as debt service on existing loans, nearly all of the 42 local governments have significant financial resources available.

Are these financial resources sufficient the meet the investment required to achieve the NAP 2015 coverage targets? Figure 6.1 examines this question. It shows that for all but 7 of the 42 local government areas—so, for 83% of the sample—the total investment required to meet the national target for water service coverage by 2015 can be met by current accumulated savings and unused borrowing capacity.

Figure 6.1: Financial Capacity to Meet NAP Coverage Targets



Source: Elaborated by Castalia based on 2007 Ministry of Finance local government audited reports

This suggests that the majority of local governments have sufficient funds available to pay for new water investments, and that access to financing is not a barrier to investment

[24] It is assumed that local governments retain cash reserves equivalent to 5 per cent of their operating budget (*Anggaran Pendapatan dan Belanja Daerah*, APDB).

in the sector. This analysis does *not* show that local governments have all the money they need to meet all their needs. What this does show is that if local governments made water a top priority, they could finance very significant increases in service. This suggests that a focus on local governments' prioritization and decision-making process—essentially, their governance—is the crucial element in increasing water sector investment.

The analysis above is based on the financial capacity of local governments, not their PDAMs. Some may object that this misses sector realities, in which PDAMs generally have very low financial capacity. However, Indonesia's democratically-decentralized constitution is quite clear: water services are a local government responsibility. If the water system is poor, local governments are responsible for ensuring the needed investment is made. There is evidence that local governments are investing in water services and helping their PDAMs borrow—this occurred in Palembang, and the government of Ciamis recently committed to investing in its PDAM.

Results from in-depth case studies

The data gathered from the six cities where in-depth case studies were done allows for an examination of whether a local government and its PDAM have the capacity to fund or finance a package of investments a package of investments specifically tailored to their needs and able to be implemented over the next 7 years, approximately. These calculations are based on 2007 data, the latest available. Table 6.3 presents the results.

Table 6.3: The Capacity of the Six Local Governments to Finance their Specific Investment Scenario

Local Government and Improvement Scenario	Capital Cost	PDAM Borrowing Capacity	Local Gov't Borrowing Capacity	PDAM Cash Available	Excess SILPA	Financial Capacity – Capital Cost
	Rp billions (US$ millions)					
Makassar—21,000 new connections, service improvement for 25% of existing customers	229.4 (22.4)	4.2 (0.4)	667.1 (54.1)	2.7 (0.3)	0.1 (0.0)	444.7 (43.4)
Bukittinggi—6,000 new connections, service improvement for 70% of customers	56.3 (6.8)	0.6 (0.4)	188.9 (18.4)	0.2 (0.0)	0 (0)	133.4 (13.0)
Yogyakarta—3,400 new connections, service improvement for 50% of customers	87.1 (8.5)	10.4 (1.0)	419.6 (41.0)	0.3 (0.0)	10.1 (1.0)	353.3 (34.5)
Palembang—35,000 new connections, service improvement for 25% of customers	368.3 (35.9)	48.9 (4.8)	741.8 (72.4)	5.1 (0.5)	5.9 (0.6)	433.4 (42.3)
Ciamis—25,000 new connections, service improvement for 25% of customers	132.1 (12.9)	1.2 (0.1)	676.8 (66.1)	0.2 (0.0)	11.6 (1.1)	557.7 (54.4)
Malang—Improvement for 60% of customers	199.9 (19.5)	17.0 (1.7)	341.1 (33.3)	3.1 (0.3)	3.2 (0.3)	164.5 (16.1)

Source: Castalia calculations based on PDAM and local government reports audited by BPKP

Financing is not a serious barrier to investment in any of the cities. Although the six PDAMs have only a small capacity to finance investments on their own, local governments have sufficient resources available to invest in the water improvements identified for their areas. On average, the financial capacity of PDAMs and local governments could fund 3.4 times the investments identified in each city.

Analysis also shows that local governments that choose to invest in water services could earn a return on at least some of their investment, given what citizens indicate they are willing to pay (see Table 5.1 and Table 5.2).

6.3 Hypothesis 2: Poor Technical and Managerial Capacity

We have hypothesized that one reason for under-investment in Indonesia's water sector is the lack of technical and managerial capacity. If a local government and its PDAM lack the capacity to plan and carry out investments, this would likely result in under-investment.

We tested this hypothesis in two ways:

- Including measures of technical and managerial capacity in the regression analysis
- Examining the technical and managerial capacity of PDAMs in each city as part of the in-depth case studies.

Results from regression analysis

Inasmuch as profit per connection is an indicator of managerial capacity, this was found to be a strong predictor of under-investment, with greater managerial capacity to turn a profit resulting in less under-investment. However, other measures of technical and managerial capacity—average tariffs, percent unaccounted-for-water, and continuity of facility operation—did not have significant explanatory power for under-investment.

Results from case studies

In the case studies of the six towns, we tested this hypothesis in our interviews with local government and PDAM officials. We found that capacity may be lacking in some places, but under-investment exists in places where there are no obvious weaknesses in technical and managerial capacity. Thus, we conclude that capacity is not a principal driver of under-investment.

There is no evidence to show lack of capacity in Palembang, Malang, or Ciamis. In Makassar, a failed public-private partnership venture for water and the failure to prepare an adequate environmental impact statement to get a grant for a sewer system may show some

lack of capacity. In Yogyakarta, a failed public-private partnership venture to develop water resources may indicate a lack of capacity, but may be due to other reasons. In Bukittinggi, the local government and the PDAM have not demonstrated an ability to manage their service obligations. However, the larger problem in this city seems to be that while water is a high priority for their citizens, it is not a high priority for the local government or PDAM. This shows that governance reasons are likely to be stronger drivers than a lack of capacity.

6.4 Hypothesis 3: Poor Governance

Our third hypothesis is that the quality of governance explains under-investment in Indonesia's water sector. If governance structures are strong and local governments are responsive to their citizens, investment decisions will be in line with citizens' priorities, and, all else equal, there will not be under-investment.

We tested this hypothesis in two ways:

- Including governance measures in the regression analysis
- Conducting in-depth case studies designed to measure the quality of governance in six cities.

Results of regression analysis

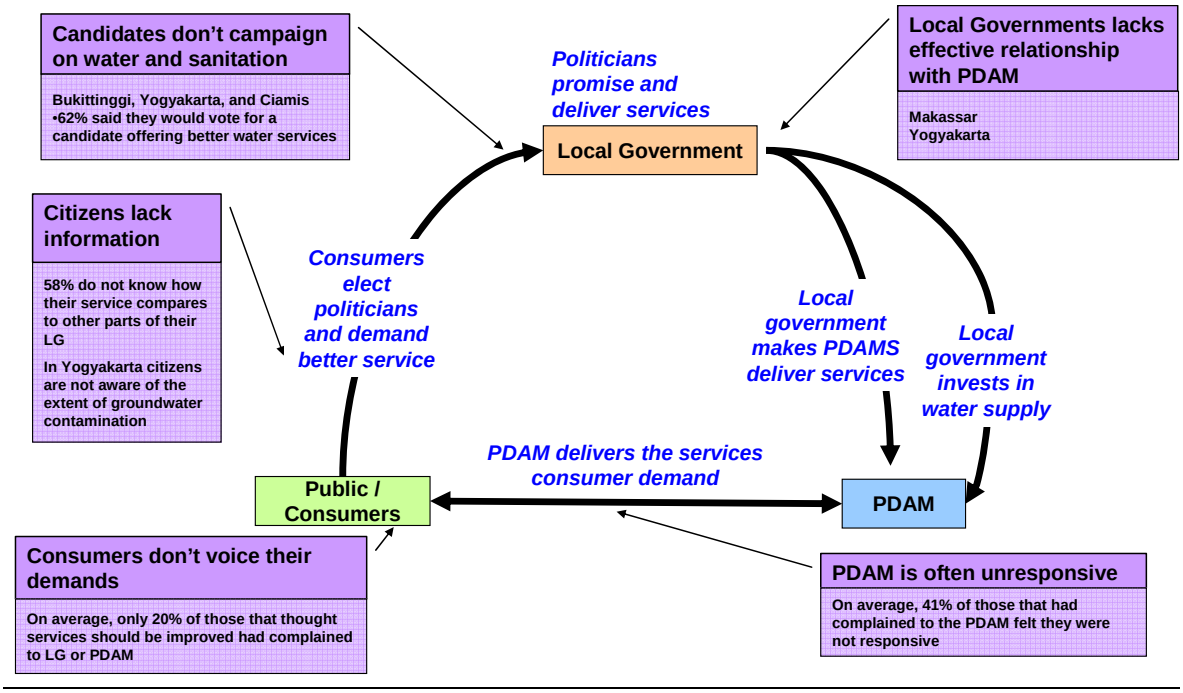
The Asia Foundation's economic governance indicator was not found to be statistically significant, though it is in the expected direction. This variable is likely not picking up factors that are specific to the water sector.

The statistical significance and direction of the coefficient on profit per connection shows that good governance may have a positive effect on investment decisions. Good governance is related to profit per connection because local governments set tariffs. Cost-recovery tariffs show an enlightened approach to governance in the water sector.

Results of case studies

In the case studies, we tested the strength of the various components of the framework for good governance (see Figure 2.1) in each of the six cities. We found that the governance and accountability cycle is weak generally, and does not work in the poorly performing cities. Figure 6.2 shows where this cycle of good governance fails.

Figure 6.2: What Goes Wrong in Local Governance—Results from Six Local Governments



Citizens demand better water services…

Investigations in the six cities reveal that citizens generally rank improved water services among their top four priorities. In most of the towns, citizens without service in at least some areas were willing to pay the full cost of a good quality piped water service. Also in four of the six towns, existing PDAM customers wanted and were willing to pay for an upgrade to 24 hour, 7 day a week, potable water service. On average, 79% of people surveyed thought that water and sanitation services in their area should be improved. In Makassar, Bukittinggi, and Palembang, this proportion is 94%-96%.

… but they lack information to hold their governments accountable…

On average, 58% of household survey respondents did not know how their water service compared to service in other parts of their city, and 56% did not know how it compared to service in other cities and districts. For those that did know, 84% got this information from their own observation of having lived somewhere else, or from a family or friend. Only 15% got this information from an institutionalized channel such as television (11%), newspaper (3%), or radio (1%).

In Yogyakarta, consumers do not demand better water and sanitation services because, on the whole, they are unaware of the dangerous concentrations of e-coli in the groundwater.

… and they do not voice their demands.

Of the people who thought water and services should be improved, only 20% had asked the PDAM or local government to act to improve services.

Because citizens in Yogyakarta are unaware of the problems with groundwater quality, they do not voice their demands for the local government to improve water or sanitation services. As a result, investment in these areas falls below what a better-educated and -informed citizenry would want.

Political candidates do not run on platforms of improving water services.

Although on average 62% of household heads would vote for a candidate that promises to improve water services, water has not been a significant election issue in the areas with the greatest disconnect between citizens' demand for better services and the quality of service they receive. Water was an election issue in Palembang, where the mayor campaigned on a platform to improve public services, delivered results, and was re-elected, partially due to his success in improving water services.

Local governments lacks effective relationships with their PDAMs

The case studies showed several examples of relationships between local governments and their PDAMs not working well. For instance, in Makassar, the local government does not have a good working relationship with the PDAM. Despite the needs, the local government has invested in other publicly owned companies but not in the PDAM, and t the local government does not seem to trust the PDAM. In Yogyakarta, there seems to be a lack of trust and communication between the PDAM and the local government (for example, the mayor uses data from the PDAM that is incorrect). Additionally, the PDAMs in Makassar, Bukittinggi, and Yogyakarta lacked clear and realistic targets.

PDAMs are unresponsive to customers and are not well-run…

The overriding reason why 80% of people who thought service should be improved had not voiced their demand was that people did not think the local government or PDAM would respond to their request. Indeed, of those that asked, only 40% thought that the PDAM or local government had responded to their request.

In Makassar, the PDAM is not well run and not transparent, and cases of corruption in the water sector are under investigation. The PDAM's revenues subsidize the local football team. In Bukittinggi, we were told of internal conflicts within the PDAM leadership.

… and local governments are unresponsive to citizens.

In Bukittinggi, demand for improved water services is high, but the local government is spending very little on water through its PDAM. The government is not very concerned about the water sector. In Ciamis, the former mayor and former deputy mayor were found guilty of fraud involving Rp5.2 billion and Rp7 billion, respectively, during 2001-2004. There were also allegations of corruption, but no evidence of guilty verdicts, in other cities.

However, there is also evidence that good governance does improve performance

In three of the cities in the sample, governance is working despite the lack of good governance systems. This has happened in a rather "crude" (not systematic) way: generally, water becomes an election issue, the mayor appoints a PDAM director he or she trusts, they work together to improve things, and the mayor gets re-elected.

In Malang and Palembang, services and investment have improved markedly over the last five years or so. In both cases, the improvements started when a new mayor was elected and made water sector improvements a priority. In Palembang, the mayor appointed a new PDAM Director. In Malang, the existing PDAM Director had demonstrated that he was capable, and remained in his position. The mayor and PDAM Director agreed on a business plan to rapidly improve services. The local government supported the PDAM financially, and the PDAM in turn delivered the agreed improvements. Malang now has the distinction of being the only PDAM in the country to supply potable water. In Palembang, the increase in new connections has been 2.5 times higher since governance improved. In both cities, the mayor was duly reelected, in part on his record of improving water services. Ciamis now seems to be poised at the start of the same cycle, having elected a new mayor (2004) who appointed a new PDAM Director (2006), agreed with the PDAM on an investment plan to add 50,000 new connections, and helped the PDAM secure a loan. After years of unprofitability, the PDAM recorded a profit in 2007.

6.5 Conclusions on Drivers of Under-investment

We have found that financial and technical and managerial capacity cannot fully explain the observed under-investment in Indonesia's water sector. While PDAMs are often short of cash and not credit-worthy, most local governments have surplus funds sitting in

their bank accounts, and significant borrowing capacity. In fact, as many as 83% of local governments may have the financial capacity to meet the 2015 urban coverage target of 69% by 2015, but are not making the investments that are needed to reach this target. Additionally, measures of financial capacity were not found to be significant in the regression analysis.

Among the six cities for which we were able to obtain sufficient detail to judge the technical capacity of the PDAM, we found no strong evidence that a principal reason for under-investment was a lack of capacity to plan and execute investments. The PDAM managers our team interviewed did not show an obvious lack of capacity, even when there was under-investment. The regression results, however, show that profit per connection is an important factor in reducing under-investment. This could reflect good managerial capacity, or a governance effect through cost-recovery tariffs and incentives for good performance.

The evidence shows that good governance is the key factor for improved service and investments in line with citizens' priorities. Improved water sector performance in Palembang, Malang, and Ciamis can be traced back to good governance. In spite of accountability structures being weak, "enlightened" mayors working with responsible PDAM directors were able to improve service, and, in Palembang and Ciamis, were rewarded through re-election. Improved governance led to better PDAM management and performance (evidenced by higher growth in connections in Palembang, and financial turn-around in Ciamis). In contrast, governance in the cities with poorly-performing PDAMs was very weak.

Specific governance issues have a significant impact on the extent of under-investment in water supply. The issues that are most relevant across the six cities are:

- While consumers demand better water services, their demands do not reach the local government because of insufficient channels to make their demands known, and insufficient information about PDAM's targets and achievements with which to justify their demands
- Local governments do not trust PDAMs to spend funds efficiently, have poor communication with PDAMs, and do not know to make them accountable
- Local governments prioritize other investments. In some cases, these other investments are attuned to constituents' priorities; in some cases they are not. In some cases, spending decisions have been influenced by the desire for personal gain.

Additionally, the regression results show that where tariffs are set at levels that allow costs to be recovered, and this is combined with good cost control, so that the PDAM is profitable, the investment deficit is smaller. The governance variable was not found to be significant, but may be capturing factors that are not relevant to the water sector.

This evidence suggests that governance has been under-estimated as a driving factor in water sector performance. It also suggests that the relationship between good governance, investment, and profit per connection should be explored further.

7 Conclusions and Policy Implications

The results of this study clearly show that cities and towns in Indonesia are not investing enough in water services. This is not primarily because they lack the financial capacity to do so. It is largely due to poor governance at the local level. Therefore, there is much value to be gained by focusing on water sector problems at a local level, and concentrating on governance to help improve performance. Finance and technical capacity

are important, but might not fully resolve problems. These results are likely to be applicable in other decentralized, developing countries.

What are the implications for citizens, local governments, central governments and donors? They should work to strengthen the cycle of accountability in the water sector (see Figure 2.1). Tools for strengthening it include:

- **National benchmarking of water utilities, and broad dissemination of results.** This would allow citizens to compare water service, costs and governance in their area with those elsewhere in their country. Armed with this information, citizens would be empowered to demand better water services and greater efficiencies from their local elected leaders
- **Performance contracts or compacts between local governments and water utilities.** This compact would define the accountability relationship between the water utility and the local government. It would establish coverage targets and service quality standards the utility would have to meet, while also committing the local government to provide the tariffs, subsidies or capital contributions needed to make economically-justified investments
- **Consultative planning process.** The targets and standards in the compact should reflect citizens' demands. The utility should develop a realistic business plan that can form the basis of the performance compact, in consultation with the local government and citizens
- **Performance-oriented management package for water utilities.** Accountability relationships are no use unless the service provider has both the ability and incentive to perform well. A performance-oriented management package would involve a detailed specification of the qualifications a utility

manger must have, a clear job description, and a remuneration structure that rewards the manager personally if the utility performs well against its performance compact.

There is a role for national governments to develop, disseminate, and socialize these tools. Local governments are at the center of governance improvements and should adapt and implement them. Furthermore, without citizen participation, the tools will not work. The donor community, NGOs, academia, and specialized community organizations can help national and local governments develop and implement these tools. They can help strengthen citizens' groups and the participatory processes involved in good governance.

And, while we found that finance and capacity were not major barriers to investment, these are still important for the water sector to function well. Governments, businesses, and civil society should continue to support efforts in these areas. These can be tied to governance improvements—for instance, if a local government commits to, and takes the initial steps towards, improving governance by using the tools listed above, then it could gain access to certain management and technical capacity-building programs and concessional financing from donors.

Appendix A: References

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Appendix B: Dataset

This paper has relied on two unique and valuable datasets. We describe them in the following sections.

B.1 Data on 42 Local Governments and PDAMs

The first data set is data that is available at a national level on water utilities (PDAMs) and local governments (PEMDAs). This data set includes technical and financial data drawn from 2007 audited reports of each PDAM and local government. The regional offices of the national audit agency, BPKP (*Badan Pengawasan Keuangan dan Pembangunam*), performed the audits and published the reports. All reports were published in 2009. This data set also includes Census data from 1990 and 2000, from which we projected population in 2007 through 2015, using the average annual population growth rate from 1990-2000. This data was available on a sample of 20 cities (*kota*) and 22 districts (*kabupaten*), for a total sample size of 42. This dataset is a compilation of the best data that exists on technical and financial indicators in the water sector at the local level in Indonesia.

To have an objective, standardized set of indicators on the quality of governance across as many local governments as possible, we combined the technical and financial data above with governance scores from the Asia Foundation and the Indonesian "Regional Autonomy Watch." The data used comes from their Local Economic Governance in Indonesia 2007 Index, undertaken with support from the U.S. Agency for International Development. Their work was published in the paper *Local Economic Governance in Indonesia 2007*. The index scores local governments on a number of governance criteria. Governance indicators were available for 33 of the 42 cities in our dataset.

The sample of 20 cities and 22 districts is fairly representative of Indonesia's geography and population distribution among regions (Sumatra, Java and Bali, Kalimantan, and eastern Indonesia). The sample represents 9% of the 465 local governments in Indonesia and 16% of Indonesia's population of 240 million.

Table B.1: Geographic Distribution of Indonesia's Population and of the Sample of 42 Local Governments

Area	Population (million)	Percentage of Population	Percentage of sample of 42
Sumatra	46	21.0%	26.2%
Java & Bali	131	60.2%	59.5%
Kalimantan	12	5.5%	7.1%
Sulawesi & Eastern Indonesia	28	13.2%	7.1%
Total	218	100%	100%

B.2 Case Studies of Six Cities

Our second dataset draws from primary field research in six cities and districts. These areas were chosen as part of the WASAP I project mentioned in the acknowledgements to this

paper. The areas are: the cities of Bukittinggi, Malang, Makassar, Palembang, Yogyakarta, and the district of Ciamis.

The WASAP I Steering Committee chose these six local governments to represent a range of situations, and examples of good governance as well as poor governance. In the selection process, the study team sorted the local governments and PDAMs by available surplus funds (SILPA), by performance on debt servicing, and by performance on delivery of water services. The team used additional secondary criteria such as geographic location, and city versus district governments. In making the final selection, the Steering Committee put more emphasis on local governments that had achieved significant improvements in water services during the last five years. The final selection therefore includes more local governments that are better performing than not. It also includes more city (kota) governments than district (kabupaten) governments because the focus was on urban water supply and sanitation.

The case studies conducted the following activities to collect "hard" (numbers and facts) and "soft" (perceptions and explanations) data:

- Household survey. We surveyed a representative sample of 220 households in each of the six cities. The sampling and survey methodology ensured that we would have statistically-significant results for low-income and middle- to high-income PDAM customers and non customers. The surveys were conducted by an Indonesian team. They gathered data on demographic and economic characteristics, the households' existing water consumption (including sources of water and expenditure on water) and sanitation facilities, households' satisfaction with their water and sanitation arrangements, willingness to pay for improved water and sanitation, ease of communication with and responsiveness of the local government and PDAM, and priorities. The willingness to pay portion used a contingent valuation methodology
- Focus group discussions. Focus groups were facilitated by a qualified Indonesian expert and gathered information on citizens' priorities, citizens' satisfaction with water services, the local government's and the PDAM's responsiveness to citizens' priorities, the ease of lodging a complaint with the local government and the PDAM related to water services, and other governance issues in the city such as any recent cases of corruption
- Meetings with local governments. In the six cities, we met with PDAM officials, the Mayor (in one city, only the Vice Mayor), and other local government officials in charge of relevant areas including finance, health, economic planning, and community relations. The purpose of the meetings was to understand the local government's and the PDAM's views of the water and sanitation situation in the city, and to test hypotheses on how governance affects water and sanitation services.

This allowed us to analyze whether the investments were economically justified, and to examine drivers of performance, including financial, capacity, and government aspects, in detail at the local level.