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

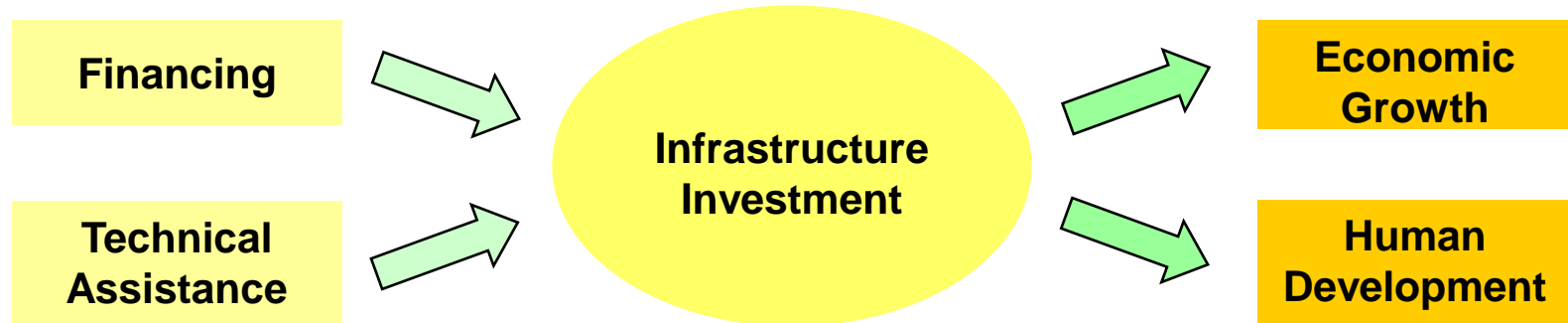
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January 15, 2010

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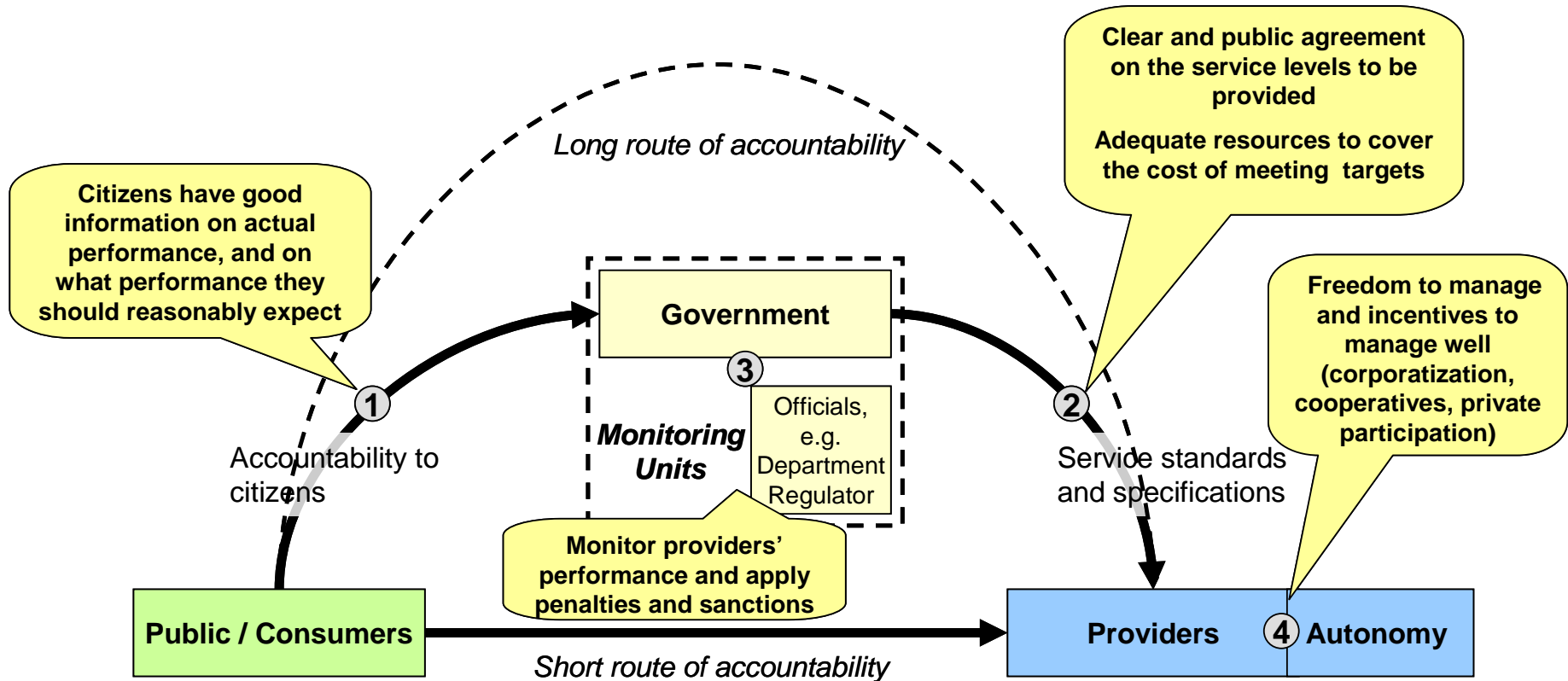
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Context and Research Questions



- **Is there under-investment in piped water supply in Indonesia?**
- **To what extent can under-investment be explained by measures of financial capacity, technical and managerial capacity, local governance, and other local factors?**
- **This paper draws on work done on the Indonesia Water Supply and Financing Initiative (Water and Sanitation Program/World Bank, Government of Indonesia, Royal Netherlands Embassy, 2008-2009)**

Context and Research Question: Governance Framework



From World Bank Sourcebook on "Deterring Corruption and Improving Governance in the Water Supply & Sanitation Sector" (Jonathan Halpern, Charles Kenny, Eric Dickson, David Ehrhardt and Chloe Oliver)

Data Sets

National Data Set

42 local government areas and water utilities (PDAMs)

- 2007 Local government and PDAM reports audited by government audit agency (BPKP, *Badan Pengawasan Keuangan dan Pembangunan*)
- 2007 Asia Foundation economic governance indicators (33 cities)

Representative of Indonesia's population distribution. 9% of the 465 local governments in Indonesia and 16% of Indonesia's population of 240 million

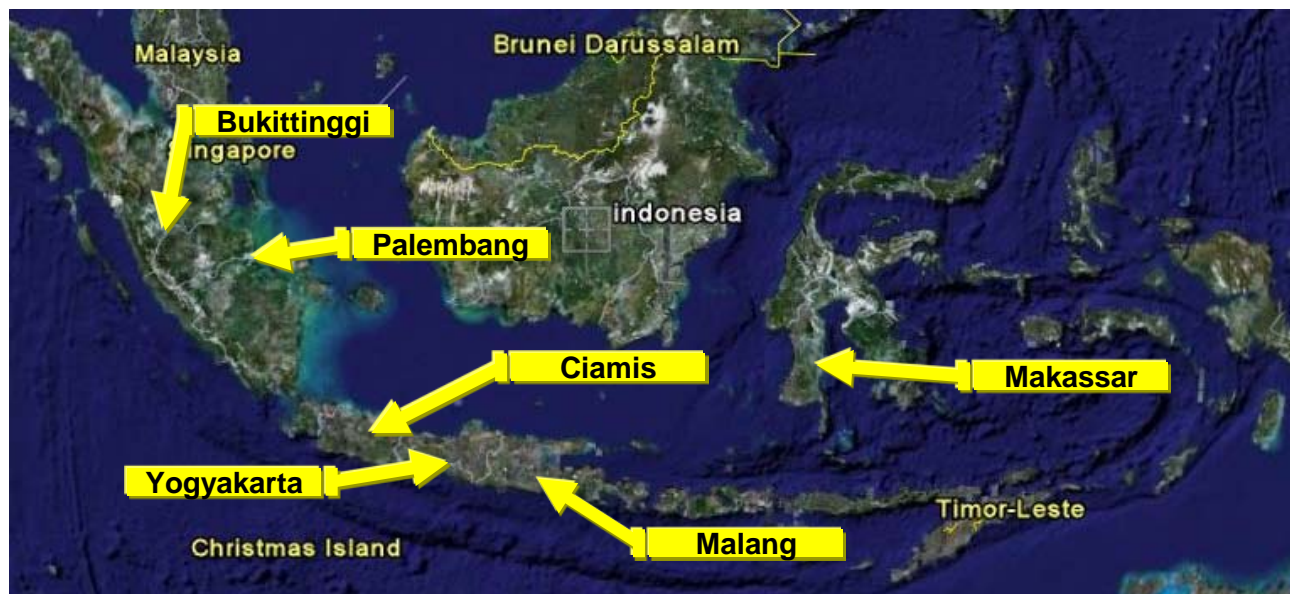
Case Studies

5 cities, 1 district

- Household surveys
- Focus group discussions
- Meetings with local government and PDAM officials
- City-specific investment estimates

Cities chosen through combination of statistical screening and Steering Committee knowledge

Data Sets: Case Study Cities



	Makassar	Bukittinggi	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)
Average PDAM tariff (Rp/m ³)	3,249	1,348	2,440	3,300	2,070	2,694

Literature Review

**First broad introduction
of institutions into
mainstream economics**

1960

**Growing focus on effect of institutions
and governance on development**

1990s

2000s

2010s

**Coase, “The Problem
of Social Cost”**

Douglass North 1993-94: New Institutional Economics

**Acemoglu, James, Robinson 2001: Effect of institutions on
economic growth**

**Kaufman & Kraay 2002: Strong causal relationship from quality of
governance to per-capita income in Latin America**

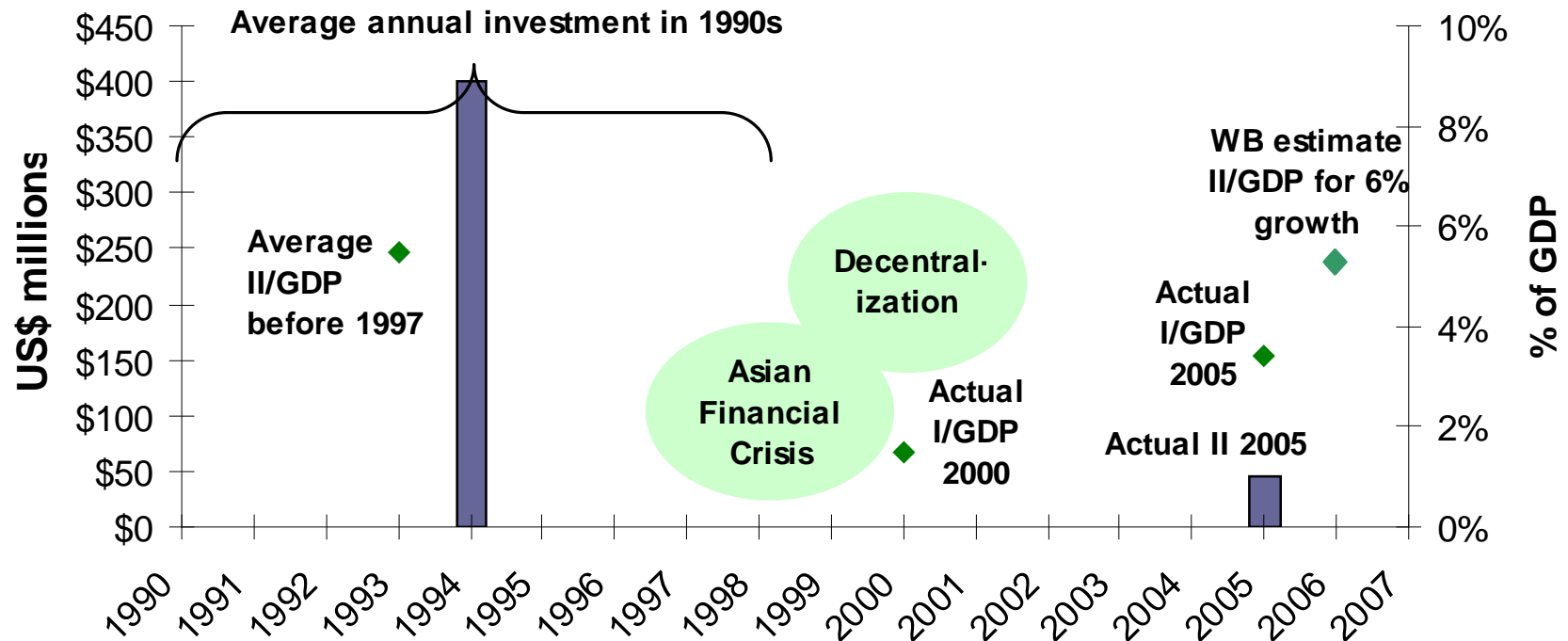
**Rodri, Subramanian and Trebbi 2002: Quality of institutions is more
important than geography and trade in determining cross-country
differences in income levels**

**Fauget 2004: Decentralization can increase public investment in
water and sanitation and other services**

**Schwartz 2006: Decentralized public management and consumer
orientation have potential to improve performance of water utilities
in developing countries**

**Whitford, Smith, and Mandawar 2009 working paper:
Democratization and quality regulation can improve access to clean
water and sanitation**

Background on Infrastructure Investment in Indonesia



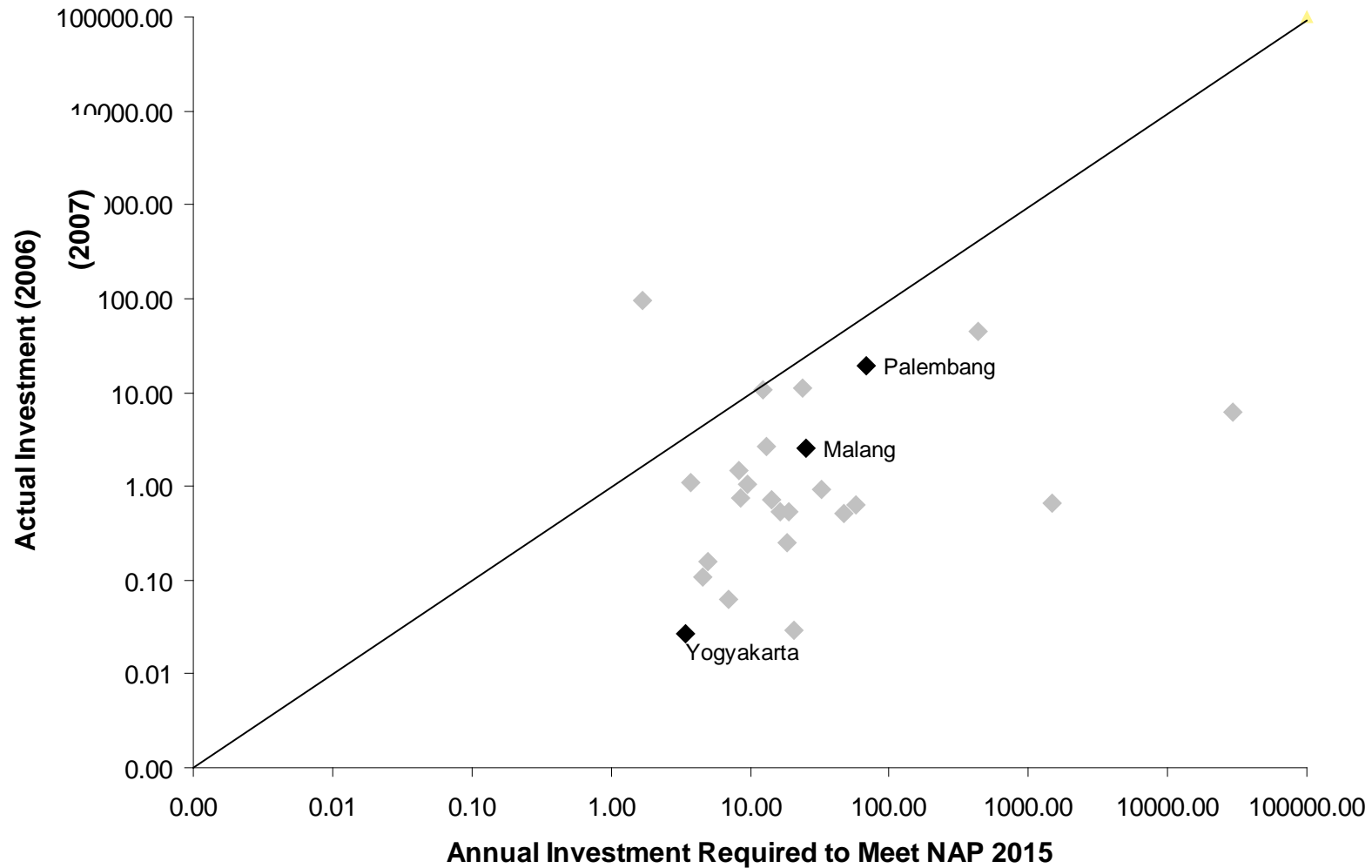
Piped water supply coverage in 2007: 32%

Is there under-investment? “Top-down” Approach

- **Is investment sufficient to meet national targets in Government of Indonesia’s National Action (NAP)?**
 - **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.**

- **Findings: In 71% of cases (30 out of 42 local government areas), investment is below that needed to reach the NAP targets**
 - **Five cities had already met the target for urban coverage, and four districts had met the target for rural coverage**
 - **Average investment required in cities that had not met target: US\$61 million**
 - **Only 9% of local governments that require investment (three local governments) were investing enough to meet their targets. 91% were not**
 - **Two local governments that were investing enough were “outliers” - Banda Aceh and Aceh Tengah**

Actual Investment vs. Investment Required



Is there under-investment? “Bottom-up” approach

- **Are economically-justified projects not proceeding?**
- **Compare city-specific investment plan (economic cost) to willingness to pay and other factors (economic benefits)**
- **Findings:**
 - **There is under-investment in improving services to existing customers. Further investment would be clearly justified in 5 cities, and likely justified in the 6th city**
 - **There is under-investment in expanding services to new customers, in 4 of the 6 cities. In one city, it would likely be justified. In the last city, evidence suggests it would not be justified**
- **Conclusions:**
 - **There is considerable, systematic under-investment in piped water in Indonesia**
 - **Under-investment in improving service to existing customers may be more prevalent than under-investment in expanding service to unconnected customers**

Is there under-investment in improving services to existing customers? Findings

City	Average WTP (Rp/m3)	Full Cost of Service (Rp/m3)	Is there under-investment?
Makassar	5,451	4,947	Yes. Average WTP > cost. 64% of all PDAM customers, and 81% of middle- and high-income customers WTP > cost
Bukittingi	3,622	3,400	Yes. Average WTP > cost. 70% of all PDAM customers WTP > cost. Most customers complain about unreliable service. Levels of satisfaction with the reliability, availability and pressure are the lowest of the 6 cities
Yogyakarta	3,728	3,791	Yes. Average WTP is slightly < cost of service. But people are not fully aware of risks related to the contaminated groundwater. Avoiding negative health consequences of using contaminated water increases benefits. Also, 48% of customers' WTP > cost
Palembang	4,451	4,081	Yes. Average WTP > cost, and 73% of all PDAM customers WTP > 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 < cost, but WTP likely biased downward: <ul style="list-style-type: none"> •Improvement scenario not credible – LG and PDAM stated commitment to improve but no improvements have materialized •Customers are used to paying low water bills. Consumption is low due to supply restrictions, monthly bills lowest in sample
Malang	4,598 *	4,139	Yes. Average WTP > cost. Customers generally satisfied, but if an improved service were available, 58% of customers would pay.

Is there under-investment in expanding services to new customers? Findings

City	Average WTP (Rp/m3)	Full Cost of Service (Rp/m3)	Is there under-investment?
Makassar	3,962	4,947	Yes. Average WTP < cost, but there are some justified investments in 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, WTP > cost
Bukittingi	3,025	3,400	Yes. Average WTP < cost, but average is skewed by “zero” responses. Over 61% of non-customer households’ WTP > cost
Yogyakarta	2,097	3,791	Yes. Average WTP < cost, but avoiding negative health consequences of using contaminated water increases benefits. Also, 47% of middle- to high-income non-customers’ WTP > 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 < cost, 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 < cost of service, but WTP is likely biased downward because the improvement scenario is not credible
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’ WTP > cost. Citizens in Malang do not see water as a priority. Households are largely satisfied with their water supply given the availability of good groundwater

Reasons for Under-investment

- **Hypothesis 1: Under-investment in Indonesia's water sector is due to local governments' and PDAMs' lack of financial capacity**
- **Hypothesis 2: Under-investment in Indonesia's water sector is due to lack of technical and managerial capacity in PDAMs and local governments**
- **Hypothesis 3: Under-investment in Indonesia's water sector is due to poor governance in the water sector at the local level**

Regression Analysis on Investment Deficit

➤ **Basic multivariate regression model**

$$\begin{aligned} \text{InvestmentDeficit}_i &= \beta_0 + \beta_1(\text{LGarrears}_i) + \beta_2(\text{PDAMarrears}_i) + \beta_3(\text{BorrowingCapacity}_i) \\ &+ \beta_4(\text{EGIGovernance}_i) + \beta_5(\text{AverageTariff}_i) + \beta_6(\% \text{ waterloss}_i) + \beta_7(\text{ServiceContinuity}_i) \\ &+ \beta_8(\text{Population}_i) + \beta_9(\text{Kota}_i) + \beta_{10}(\text{profit / connection}_i) + \varepsilon_i \end{aligned}$$

- **“Investment deficit” = gap between actual investment in 2007 and what is required to meet the NAP targets, allowing for depreciation**
- **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.**

Regression Analysis on Investment Deficit – Results

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

Hypothesis 1: Financial Constraints – Results of Regression

- **Coefficients on all variables directly related to financial capacity are 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, net profit per connection may be seen as a sign of better management and governance, and not purely financial capacity:**
 - **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**

Hypothesis 1: Financial Constraints – Results of National Sample

83% of sample (35 of 42 cities) have the financial capacity to borrow to invest and meet 2015 coverage targets. Some cities can make full investment from accumulated savings.

Additional Borrowing with DSCR @ 2.5

Borrowing with DSCR @ 10

Excess SILPA

Investment needed to meet NAP

* Lacks financial capacity



Hypothesis 1: Financial Constraints – Results of Case Studies

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)

On average, PDAMs and local governments could fund 3.4 times the investments identified

Conclusion: Financial capacity is important but cannot explain observed under-investment

Hypothesis 2: Poor Management and Technical Capacity – Results

- **Results of regression analysis:**
 - **Inasmuch as profit per connection is an indicator of managerial capacity, is a strong predictor of under-investment. Greater managerial capacity to turn a profit → less under-investment**
 - **Other measures of management and technical capacity were not significant**
- **Case studies:**
 - **Capacity may be lacking in some areas, but under-investment exists in places where there are no obvious weaknesses in technical and managerial capacity**
- **Conclusion: Capacity is not a principal driver of under-investment**

Hypothesis 3: Poor Governance

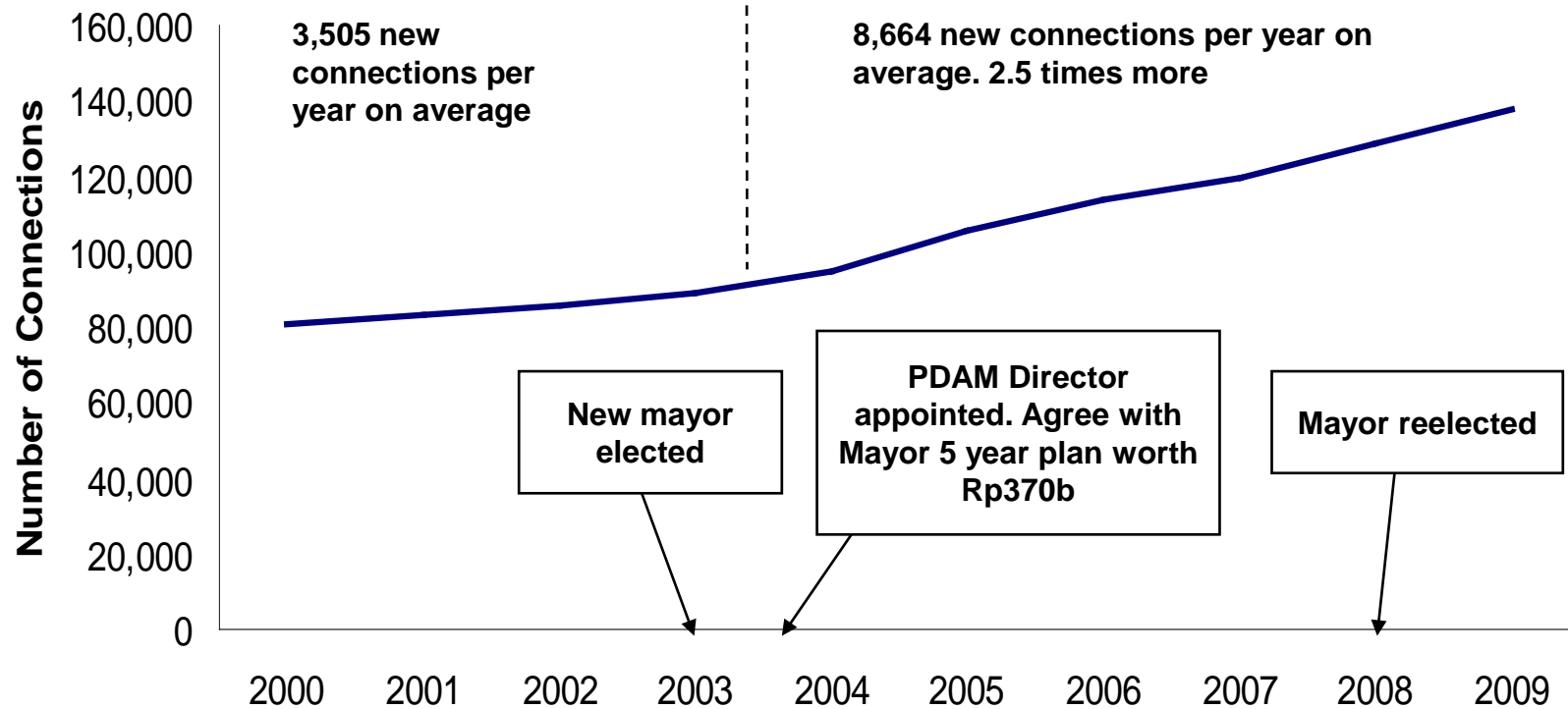
➤ **Results of regression analysis:**

- **The governance variable was not found to be significant, but may be capturing factors that are not relevant to the water sector**
- **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.**
 - **Decision to set tariffs at reasonable level is a governance one**
 - **Good cost control is evidence of good management, and there is evidence that good governance has improved PDAM management**

Hypothesis 3: Poor Governance – Results of Case Studies – Examples of Poor Governance

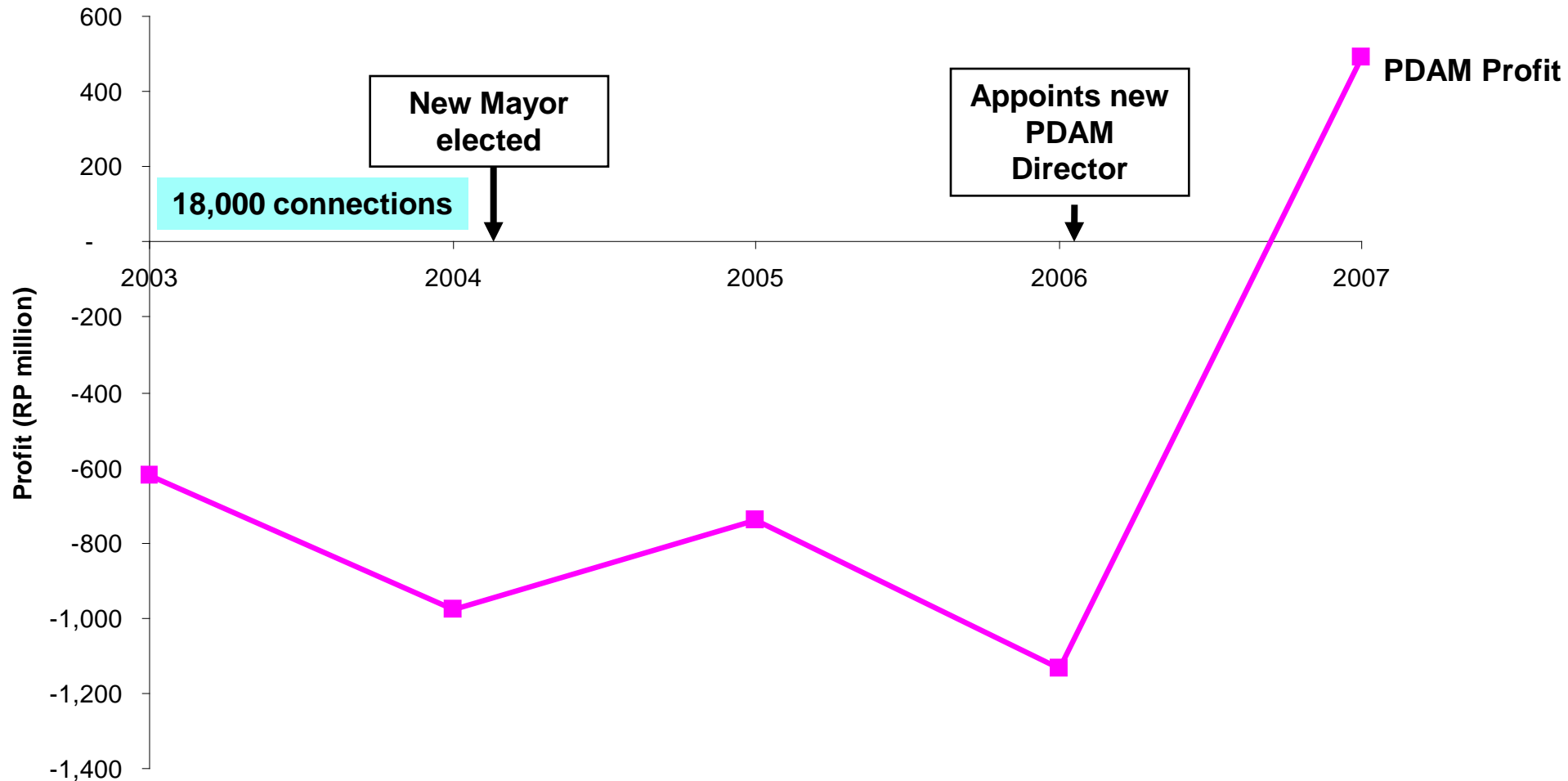
City	Investment	Think service should be improved	% who would vote for improvement in water services	Water an issue in last election?	Governance aspects
Bukittinggi	No recent investments	95%	70%	No	LG prioritizes other sectors. Citizens want better services, but do not demand that the local government provide them.
Makassar	PDAM invested much less than depreciation in 2006	96%	20%	A former PDAM director campaigned. He was tainted with corruption allegations but was never indicted. He was not elected.	LG does not have a good working relationship with the PDAM. LG has invested in other publically owned companies but not in the PDAM. The PDAM is not well run and not transparent. There are allegations of corruption and use of PDAM for personal benefits.
Yogyakarta	Little investment in water	60%	60%	No	Yogyakarta is generally well governed. However in the water sector, the LG does not communicate on groundwater contamination issues. There also seems to be a lack of trust and communication between the PDAM and the LG.

Hypothesis 3: Poor Governance – Results of Case Studies – Good Governance Improved Services in Palembang

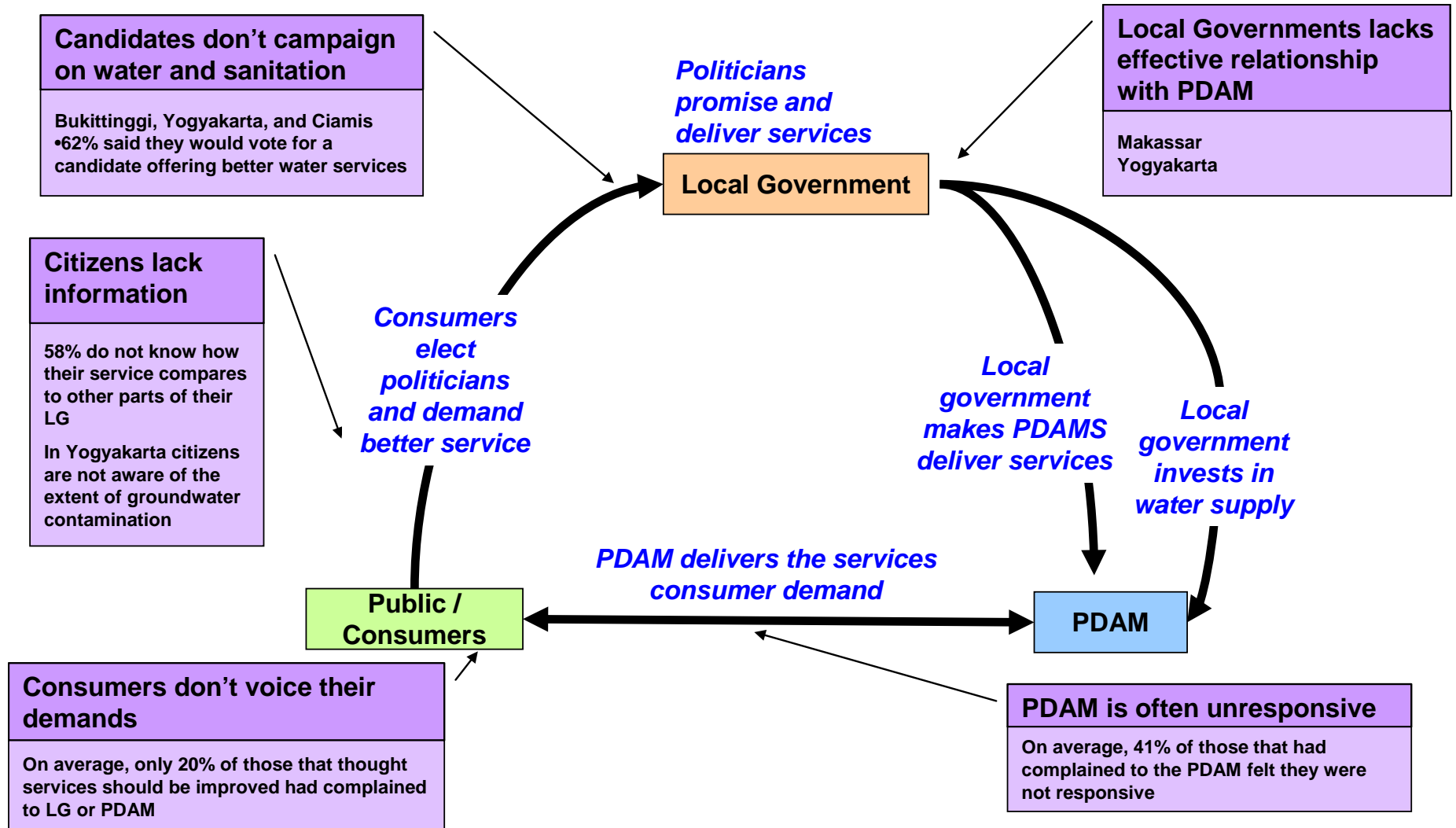


Hypothesis 3: Poor Governance – Results of Case Studies – Good Governance Improved Services in Ciamis

Finance in place to go to 50,000 connections



Hypothesis 3: Poor Governance – Results of Case Studies – What goes wrong?



Conclusions on Drivers of Under-investment

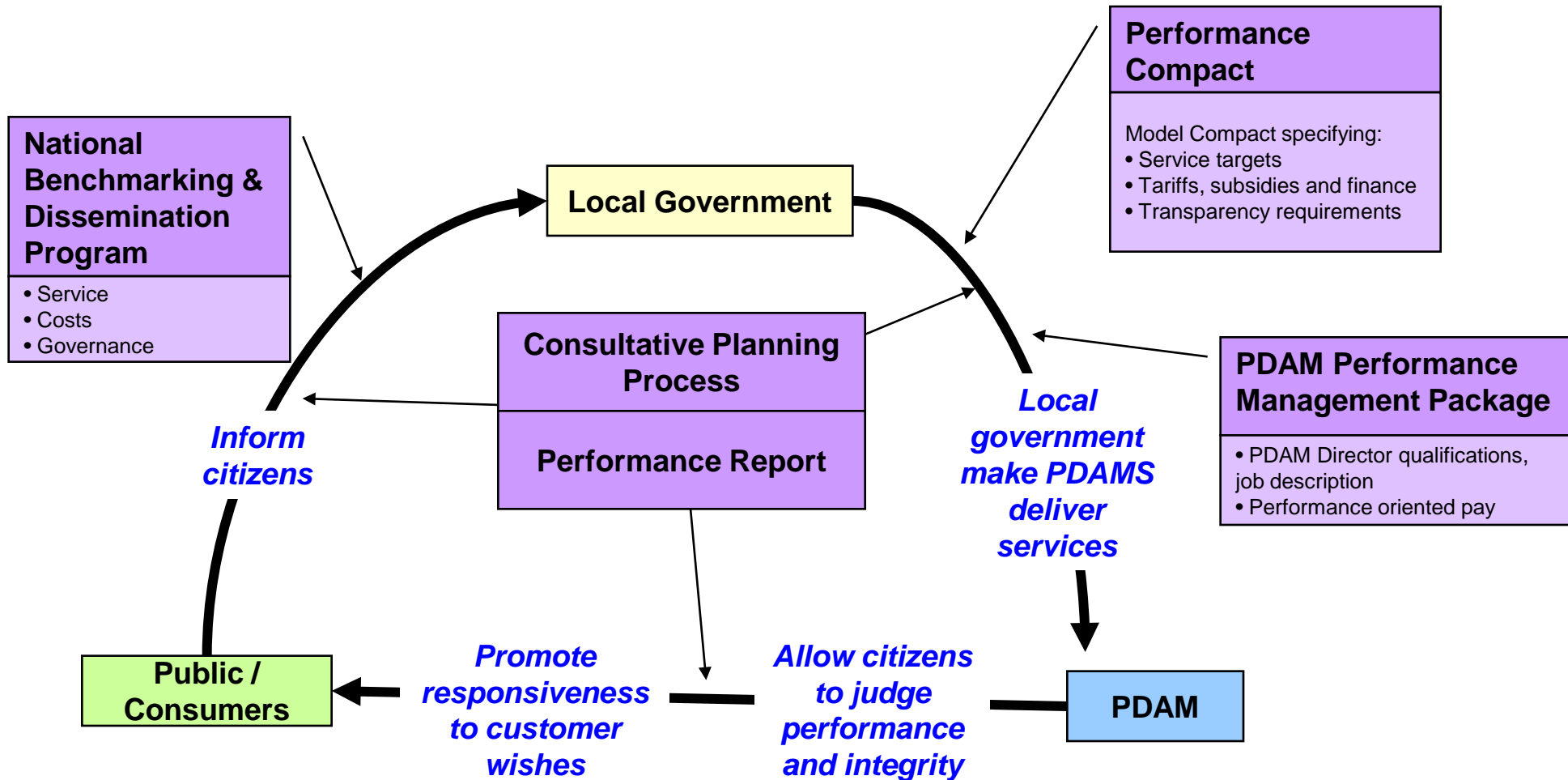
- **Financial:** While PDAMs are often short of cash and not credit-worthy, most local governments have surplus funds sitting in their bank accounts, and significant borrowing capacity
- **Technical and Managerial Capacity**
 - We found no strong evidence that a lack of capacity to plan and execute investments was a principal reason for under-investment
 - 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
- **Governance:** Good governance is the key factor for improved service and investments in line with citizens' priorities. The governance issues that are most relevant across the six cities are:
 - Consumers demand better water services, but 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
 - 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
- **Governance has been under-estimated as a driving factor in water sector performance**

Conclusions and Policy Implications

- **Cities and towns in Indonesia are not investing enough in water services**
- **This is largely due to poor governance at the local level. Finance and technical/managerial capacity are important, but are not the primary drivers**
- **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**

- **How to strengthen local governance for water services?**

Policy Implications – Tools for Improving Local Water Sector Governance



Areas for Further Research

- **How to measure various aspects of local governance structures, including sector-specific such as water, and create larger data sets that can be used to test the governance framework**
- **Role of profit per connection**
- **Apply tools for improving governance, adapt to local contexts, and learn from experiences**