JAKARTA, INDONESIA: THE ECONOMICS OF WATER AND WASTE

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ABSTRACT

Jakarta's main streets are landscaped, manicured, and modern. Off these streets, however, the environment is that of an overgrown village. Compared to other Asian cities, Jakarta's drinking water, sewerage treatment, solid waste disposal, and general environment are seriously deficient. This case study briefly outlines the deficiencies. Less than one-fourth the residents have piped water. Almost no one is attached to a sewer. One-third of the city's solid waste never reaches the landfill.

The source of the problems is historical -- for a long time, the problems of this rapidly growing city were not adequately addressed. And the problem has become worse in recent years by the policymakers' concern with providing first-class service to all, despite the fact that budgetary shortcomings prevent them from extending such service beyond the richest households. As a result, the poor often receive no public services and must resort to expensive private provision or do without. The principal lesson from and for Jakarta is that policymakers must give more attention to providing less-than-first-class but affordable services to the poor.

MESSAGE FROM USAID

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EPAT Case Studies are written for development professionals and policymakers in developing countries who are responsible for establishing and implementing policies on the sustainable use of natural resources and for civil servants, project officers, and researchers who are directly involved in the implementation of development activities. This Case Study of Jakarta, Indonesia describes how three urban environmental services - drinking water, wastewater, and solid waste - are handled and how their costs are managed. Several lessons learned are presented, and the use of different solutions are proposed that match different kinds of environmental services to different income groups. The range of alternatives summarized may be useful to policymakers in developing alternatives in providing basic urban environmental services.

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REFERENCE

JAKARTA, INDONESIA: THE ECONOMICS OF WATER AND WASTE

Introduction

Jakarta today is two cities, the beautiful and the ugly. Beyond its landscaped, manicured, and modern "protocol" avenues, the city looks like an overgrown village in the way it provides drinking water, sewage treatment, and solid-waste disposal facilities to its inhabitants. The city has grown from 1.8 million in 1950 to 8.3 million in 1990. But, during this period, little happened to the urban infrastructure behind the main streets. Compared to similar capital cities in Asia, Jakarta's housing, water, sewerage, waste disposal, and general environment are seriously deficient.

This case study focuses on the reasons Jakarta does not provide adequate environmental amenities for its citizens. The study also tries to draw lessons that may be applicable to other large cities in developing countries (Porter 1995).

Water

Background

There is no shortage of water in Jakarta. A dozen rivers and several canals wind northward through the city. Groundwater is accessible within a few meters of the surface throughout the city. But, much of this water has become too polluted for human consumption.

Even today less than one-fourth of Jakarta's population have water piped into their homes. More than half of Jakarta's households draw their water supply entirely or principally from shallow wells. The remaining one-fourth rely upon public wells, standpipes, or water vendors.

Jakarta's Water Distribution System

A state-controlled agency, Perusahan Air Minum Jaya (PAM Jaya) supplies piped water. It receives its water from canals, rivers, and deep wells. The water is heavily treated but remains so polluted that it seldom attains minimum World Health Organization drinking-water standards. PAM Jaya supplies the water through private residential and commercial connections and public standpipes.

Private entrepreneurs distribute the water from standpipes. Vendors then carry the water in jerrycans placed on long handcarts that can navigate the narrow alleys where most of the poor live. Since it is the poor who rely on water vendors, they must pay the vendors' high prices for water. Vendor water costs 10-25 times as much as water piped to houses. This reliance is not unique to Jakarta. Water vendors serve nearly one-third of

the urban population in developing countries.

Public hydrant operators receive water from PAM Jaya at heavily subsidized rates. But the prices paid by consumers were, in the late 1980's, often at least twice the officially-fixed prices. The principal reason for this was a lack of standpipes so that each operator had a high degree of local monopoly power.

To bring hydrant-water prices down, PAM Jaya nearly doubled the number of standpipes from 1988 to 1993. Standpipe water prices declined dramatically. This process led to three kinds of welfare gain to water consumers:

* It reduced the average distance between households and standpipes, resulting in reduced transport cost for the household (or its vendor).
* There was, in effect, a money transfer from the hydrant operator to the consumer due to lower standpipe prices.
* The reduced price of water encouraged consumers to increase their water consumption.

PAM Jaya sets high piped-water prices for commercial establishments so that it can give lower prices to home owners. This policy drives many commercial establishments to drill deep wells, thus contributing little to financing homeowners. In the end, since PAM Jaya does not recover its costs, it uses taxes or cuts public expenditures elsewhere to subsidize wealthy homeowners who receive piped water.

Getting Water Prices Right

* deep well water,
* public standpipe water,
* household connection water, and
* commercial/industrial connection water.

All prices, except for standpipes, rise with the quantity of water consumed. PAM Jaya has three goals in setting water prices:

1. Efficiency. Everyone should pay a price that covers what it costs society to produce one unit of water.
2. Equity. No matter what their income, all people have a right to clean water. This may mean that the poor pay less than the actual cost.
3. Covering Costs. When the government's general fund is under stress, it may not be able to subsidize the water supply. This may happen even though greater water use would greatly improve general health and well-being. Policymakers are increasingly asking water companies, in Jakarta as elsewhere, to cover costs.

Of course, these three goals usually conflict. For example, efficiency requires a single price for all users. Equity may suggest an upward-stepped schedule of prices. And, the efficient price, the cost of one additional output unit, may not generate sufficient revenue to cover full costs.

With these criteria in mind, let us examine PAM Jaya water pricing decisions for its three main categories of consumers:

Large Commercial and Industrial Users

As long as the cost of groundwater is low, commercial and industrial users will continue to overuse and deplete the deep aquifer, leading to severe long-term problems. Efficiency requires both reducing the price of piped water and raising the price of groundwater. The correct price structure requires the piped water price to be the cost of one additional unit of output and the deep-well groundwater price to be at a level that will keep its cost above the piped water price. These price adjustments will raise water costs for most industrial users. Some firms that use a lot of water may leave the Jakarta area for other parts of Indonesia. But this is not an undesirable result.

Public Standpipes

PAM Jaya could raise its price for standpipe water to, or above, its cost to produce a marginal unit of output. This would cause little impact on the poor if more standpipes accompany the price increases. The price the poor pay for water from standpipes more reflects vendor labor costs, largely proportional to distance, rather than the price of water itself. More standpipes will reduce the average distance the vendors need to carry water. And pipes move water more efficiently than handcarts.

Household Connections

PAM Jaya uses the lifeline structure of pricing for household connections. It charges low rates for the first few units of water and progressively higher rates for additional units. This is not efficient. But, it is one way to cover the costs of providing piped water to households. Nevertheless, this pricing system would produce more revenue if PAM Jaya could reduce the "size" of the lowest-priced segment in their schedule and raise the "price" of the highest-priced segment.

Wastewater

Background

Despite its size, Jakarta has almost no sewer system. Wastewater receives little treatment. It is discharged either directly into the canals and rivers or into septic tanks that are too densely sited or too poorly maintained to prevent groundwater contamination. The resulting pollution is worst in the poor areas where congestion increases the number of polluters and the number of sufferers.

Sewers are expensive. In a budget-constrained city, policymakers must seek alternatives to residential sewers for many decades to come. In most areas of the city, the near-term solution must involve improved septic tanks and public toilets.

Septic Tanks

A large and growing percentage of Jakarta's households have private toilets (54% in 1980, 72% in 1992). Most private toilets drain into septic tanks or leaching pits. But for one third of these, there is no treatment. They directly drain to open

watercourses. Many septic tank systems are defective. Some septic tanks leach. Others are not emptied regularly. For others, the sludge is pumped directly into ditches, canals, or rivers. Even those private septic tanks that are well maintained are often collectively ineffective. They are too numerous. They are too densely packed together. Their drainage fields are too small. And their leachate pollutes piped water, well water, and canals and rivers. Many public toilets are not well maintained and overflow into nearby pools or canals.

Alternatives to Sewers

In Jakarta, there are three basic problems with alternatives to sewers:

* Some people do not operate their septic tanks properly.
* Some people do not use septic tanks at all.
* Many people live in areas where the terrain or congestion necessitates off-site treatment of human waste.

The first problem is that households do not desludge their septic tanks every one or two years as required. When they do, they often don't treat the sludge properly before disposal. The city desludges about 25,000 household septic tanks annually, only a small fraction of the (unknown) total. Clearly, the city needs a plan for establishing large-scale and systematic septic-tank emptying operations.

The second problem is the absence of septic tanks or any human-waste disposal system in households for whom septic tanks are feasible. This is a serious problem because septic tanks, even leaching pits, are expensive. Construction cost is $80 to $350, which is very high for low-income families. Perhaps the best hope is to persuade people in such areas to use public toilets.

Providing public toilets is also the solution to the third problem. Many people live in terrain or congestion that requires off-site waste treatment. Public toilets and washing blocks are not a new idea in Jakarta. But, they have not been successful for a variety of reasons:

* They are expensive because of the need to acquire scarce and high-priced land for drainage.
* They have been poorly planned, sited, and constructed. The result is that the facilities are often not wanted and not used.
* They are not maintained.
 They are not desludged by the city.
* Being built in areas prone to flooding, the toilets themselves are often flooded.

As a result, these communal facilities have failed in three senses:

* Many end up as inefficient treatments of human waste.
* Many potentially efficient facilities are not used much.
* Others, potentially efficient if modestly used, serve so many people that they overflow their design capacity, perpetuating the very problem they were designed to solve.

The magnitude of the failure of public toilets indicates that there is no easy solution. Yet for many years there may be no other way to properly treat human waste at an affordable cost, especially in poor and crowded areas. Perhaps we can learn lessons from Jakarta's standpipes. Officials could turn carefully-designed public toilets over to private entrepreneurs who will maintain the facilities and create pricing structures that will result in both use and profit. Privatization is not costless. It involves subsidization, both in construction and in desludging. But, it may be the cheapest interim partial solution to Jakarta's problem of human-waste treatment in poor and densely populated areas.

SOLID WASTE

Background

Jakarta generates a surprisingly large amount of solid waste given its modest standard of living and extensive recycling. Its solid waste is wetter and denser than that of its richer counterparts in developed countries. This makes disposal both more urgent and more difficult. Much solid waste is collected from paying households by handcart and is transported to local depots. At the local depots, or dumpsites, thousands of scavengers pick over the waste. This unsubsidized activity produces recycling and reduces pressure on collection and landfilling processes. The solid-waste disposal process works less efficiently at the second stage. Only a portion of the solid waste moves from the local depots to the landfill. Since the city has difficulties collecting fees at this stage, it faces inevitable budget-constraints.

Initial Solid-Waste Collection

The collection process for solid waste in Jakarta is decentralized and different in different areas. For more than half the households, initial waste collection is organized by the lowest level of government, loosely structured communities of less than a few thousand people. The community itself decides on and pays for the kind of collection service it wishes. For less than one-tenth of the population, it means door-to-door curbside pick-up. For another one-tenth it means block collection. That is, the collection vehicle moves down the street on pre-arranged days. It stops every 200 meters or so and plays music to alert residents to bring their solid wastes to the vehicle. These services are expensive and require streets wide enough for large vehicles. So only well-to-do areas choose this method.

Collectors pick up the majority of residents' waste either by foot or handcart. Several thousand handcart operators ply the narrower streets of Jakarta, delivering the waste to temporary solid-waste storage spaces where it awaits city collection.

The cost of this first stage of solid-waste disposal is borne entirely at the local level. The sophistication and completeness of collection depends simply and essentially on what the

residents are willing to pay. The disadvantage of this system is that, in neighborhoods composed almost entirely of poor residents, handcart operators can collect very little waste-fee revenue and therefore give poor service. Not only is this inequitable, but it worsens the health problems that are most worrisome in these highly congested areas.

On the other hand, Jakarta's policy of making the first stage of solid-waste collection a neighborhood responsibility makes very good economic sense for two reasons. One, it is easiest to collect a fee for solid-waste removal when it is near the household that created the waste. After all, at that point, it is that household itself that benefits the most from its removal.

Only as the solid waste accumulates far from its creators does it require public solution at a higher government level. And two, most Jakarta neighborhoods contain residents from many different income levels. No one is better situated to find the proper level and structure of solid-waste fees than the local community leader.

The rest of the collection system is more familiar. Many households have their solid waste picked up by door-to-door service provided either by the neighborhood, the city, or a contractor for the city. Big commercial and industrial establishments are responsible for disposing of their own waste. Some use city service, but most employ private contractors.

Recycling

Jakarta has an extensive recycling system. No sooner has solid waste left the household than scavengers begin to pore through it. These are people with bags or carts who seek a living by collecting discarded items that can be recycled or reused. There are 10-40 thousand scavengers in Jakarta. The range of estimates is large because of the informal nature of the occupation. Also, until recently, officials considered scavengers to be urban undesirables. They were liable to compulsory job retraining or exile from the city. They collect not only items that are recycled in industrialized countries, such as paper, plastic, glass, and metals, but also discarded household durable goods, wood, bone, sawdust, boxes, and cigarette butts.

Currently there are a dozen factories in the Jakarta area recycling more than 200,000 tons of waste paper per year, another half dozen factories processing 500,000 tons of scrap iron per year, and various processors of plastics, glass, rubber, and textiles.

Transportation to the Landfill

It is the city's job to move solid waste from the small local transfer station to the landfill. This stage of disposal ends up being paid for by the city's general fund. In principle, this is covered by the solid-waste fees collected at the local level, but very little of that money reaches the municipal agency. This lack of funding means that about one-third of the "collected" solid waste never, or slowly and irregularly, leaves the local

transfer stations. The transfer trucks are too few, too old, and too poorly maintained.

Even for Jakarta's poorest people, a willingness to pay for a cleaner environment probably exceeds the city's actual expenditure. But Jakarta could spend its existing solid-waste budget more effectively. There are three ways to achieve greater waste-disposal productivity:

* keep the operations as labor-intensive as possible,
* emphasize solid-waste collection rather than street-sweeping or landfill-monitoring, and
* open new landfills closer to the city center.

On Covering Costs

There are two questions to answer here. The first is a question of principle. "Should" Jakarta attempt to cover the costs of providing drinking water, wastewater treatment, and solid-waste disposal? If the answer to that question is "yes," then a second question arises -- one of fact. "Can" we conceive a pricing structure that would permit Jakarta to cover these costs through collection of fees?

The "should" question is quickly answered. The theory of public provision of urban services tells us that the private market will supply an optimal quantity "if all four" of the following conditions are met:

1. The cost of producing the last unit of output is not below average cost (total cost divided by total output).
2. There is no element of a public good in its provision. (A public good is one that can be consumed by more than one person and people cannot be stopped from consuming it.)
3. Its provision generates no positive benefits to those who do not pay for it.
4. The service is not one that the government thinks all people should receive.

We know that each of the three environmental services considered here involves several, if not all, of these causes of "market failure."

Once any of these four conditions for market failure arise, policymakers cannot rely upon the market to provide a sufficient amount of the service. It then becomes necessary for government to step in and provide or subsidize the service. The question then becomes: is it better to cover costs through non-optimal prices above the cost of the last unit of output (through increases in general taxation) or through other kinds of social expenditure reductions? Theory offers us little help in this choice between second-best alternatives.

Suppose, however, that the scope for raising taxes is limited and that greater cost coverage is the appropriate path. The second question then arises: can we achieve greater cost coverage through user-fees for services? In this respect, there is a

great difference between providing drinking water and treating or disposing of human or solid wastes.

Drinking water is absolutely essential for survival. The only limit to what a person will pay for water is income and wealth. The question for drinking water, therefore, is not whether PAM Jaya can cover its costs -- it can. The details of the appropriate pricing structure have already been discussed in "Getting Water Prices Right."

On the other hand, waste treatment or disposal, both human and solid waste, is not essential, and substitutes (including no treatment or disposal) are available. Although these alternatives have a high cost to society, they have a low cost to individuals. This limits the price the government can charge.

In a budget-constrained world, governments must raise taxes to cover the costs of providing urban sanitation services, especially human-waste and solid-waste disposal services. We must remember that the basic reason why urban governments try to provide environmental services is that, by the nature of the services, at least one of the four above referenced conditions are not met.

Lessons

Historically the general backwardness of urban environmental services in Jakarta seems ironically to derive from its natural abundance of water, both for drinking and waste disposal. Only recently, as the rivers and groundwater have become polluted, has it become clearly necessary to undertake investments in these services.

By now, the investments needed to provide first-class services to all its residents are huge, far beyond politically feasible budgetary reallocations. The result has been an effort to provide first-best services to as many as possible within existing budgets. This has resulted in services being provided largely to those who can and will pay a price for them. The irony is that where piped water is not available because the poor cannot afford to pay for first-class service, they must be willing to pay a higher price for second-class water service.

This is the dilemma of urban environmental services not only in Jakarta but in many other cities of developing countries. Equity, health problems, and economies of scale all urge providing modern, first-class service to all. However, budget constraints and willingness to pay mean only the rich receive first-class service. The dilemma is worsened by a belief that the best and fastest route to providing first-class service to all is by providing first-class service to a few and gradually expanding the system over time. This single-minded emphasis on first-class service means that the poor too often receive less than second-class service.

The principal lesson of this study is that policymakers need to give more attention to less-than-first-class, but affordable,

services to the poor. In each of the three services we have examined, it is possible to improve the welfare of the poor, at low cost, by providing better service that falls short of desirable first-class service. In the interim, we could solve the dilemma by providing different kinds of environmental services to different income groups.

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