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Designing a “Neighborhood Deal” for Urban Sewers: A Case Study of Semarang, Indonesia

Dale Whittington, Jennifer Davis, Harry Miarsono, and Richard Pollard

Policy analysts, planners, and government officials in developing countries have become increasingly aware of the need for a new policy and planning framework for addressing urban water and sanitation problems. In response, considerable thought has been given over the last few years to the development of “demand-driven” planning approaches that redefine the roles and responsibilities of government, community organizations, households, donors, and the private sector in the planning and implementation of water and sanitation projects (World Bank 1993; Watson 1995; Sara, Gross, and van den Berg 1996; Wright 1997; Whittington, Davis, and McClelland 1998; Brook-Cowen 1996, 1997). In this paper we describe a demand-driven planning approach for urban sewerage in which neighborhood organizations and households are involved in an active partnership with government and technical staff. We argue that planners must reorient their thinking from the city-level master planning toward the neighborhood; rather than attempting to find an optimal solution to a city’s sanitation problem, they should focus on structuring what we term the *neighborhood deal*.

This reorientation requires that government officials and planners study household and neighborhood demand for improved water and sanitation services in order to design a “deal” that municipal and higher-level governments can afford, that is technically feasible, that is attractive to households, and that has public health and environmental benefits. In this demand-driven planning framework, pricing sanitation services involves finding a set of prices (e.g., assessment fees, monthly tariffs, and connection charges) to be offered to households in the neighborhood. A sewer network using this new approach will evolve over time in response to the incentives that government has incorporated in the neighborhood deal. If the incentives are well designed, then both the government and city residents should be satisfied with the dynamic evolution of the sewer network. If not, then the deal may be modified as experience is gained.

There are two principal advantages of thinking about sewer planning as a deal between neighborhood households and government. First, sewers will be built where people actually want them, resulting in high connection rates and thus in substantial public health benefits. Second, with relatively high connection rates among neighborhoods participating in the deal, increased revenues will be available for the government to finance its part of the deal. A faster expansion of the sewer network will occur than if some neighborhoods received a disproportionate share of available subsidies. On the other hand, disadvantages of this deal-making approach to sanitation planning include the complexity of network design for interceptor and trunk sewers, fairness concerns (that wealthy households may receive services first), and possibly slower progress in improving surface water quality.

This partnership between neighborhoods and government will not, however, be easy to achieve. It will require that planners and engineers relinquish some of the

ABSTRACT

The exclusion of neighborhood organizations and households from active participation in the planning process lies at the heart of the current sanitation planning crisis in many cities in developing countries. This paper describes a demand-driven planning approach for urban sewerage, in which neighborhood organizations and households are involved in an active partnership with government planners and other technical staff. We argue that planners must reorient their thinking from city-level master planning toward the neighborhood. This change in focus requires that government officials and planners study household and neighborhood demand for improved water and sanitation services in order to design a deal that municipal and higher-level governments can afford, that is technically feasible, that is attractive to households, and that has public health and environmental benefits. A case study of the sanitation situation in Semarang, Indonesia, illustrates how an innovative set of participatory tools can be used to assess household and neighborhood demand.

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responsibilities and privileges they typically assume for shaping and designing urban sanitation policy. They will also have to consider households as their clients, not merely passive beneficiaries of a sewer project. Considerable time and effort will have to be spent working with local communities and neighborhoods before construction can begin. Moreover, the agencies responsible for water and sewer planning will need new staff with different skills than the individuals they currently employ, or they will have to hire private consulting firms to provide such services.

This paper presents a case study of the sanitation situation in Semarang, Indonesia, that illustrates how an innovative set of tools can be used to estimate household demand for improved water and sanitation services. Through this study, we develop our concept of a partnership between neighborhoods and city government in more detail. In the next section of this paper, we provide some background on the sanitation-planning problem in developing countries. In the third section, we discuss our proposed new approach to sewer planning practice and the components of the "neighborhood deal." In the fourth section, we present the Semarang case study. The fifth section summarizes our findings and conclusions.

■ BACKGROUND

In most large cities in developing countries, only a small minority of households are connected to a sewer system. A tiny fraction of the waste water from those households connected to sewers is actually treated effectively at primary or secondary waste-water treatment plants. The reality, then, is that cities in developing countries are awash in human sewage. Groundwater is contaminated from pit latrines and septic tanks; drainage ditches and canals are full of human waste; and surface water bodies such as lakes, streams, rivers, and nearby bays are heavily polluted.

Many observers assume that, because conventional technological solutions to these problems are well understood (e.g., water-sealed toilets, sewerage systems, and waste-water treatment plants), what is needed is simply more money. Even when sufficient funds are available, however, there is great uncertainty in finding effective solutions to urban sanitation problems in developing countries. There are several reasons why improving sanitation service poses such a complicated policy and planning problem.

First, the costs of conventional waterborne sewerage solutions (e.g., on-site facilities such as water-sealed toilets, sewerage networks, and waste-water treatment) are expensive—on the order of US\$25 to US\$35 per household per month (Lauria, Whittington, and Choe 1998). This is more than the total monthly income of many poor households in urban areas of some developing countries. Because the capital investments required for sewers and waste-water treatment facilities are so large, implementation of construction plans takes a long time and involves cities in capital financing

arrangements with higher-level government authorities and private capital markets. Such long-term planning is problematic in low-income countries because poor households typically have high rates of time preference and short planning horizons (Poulos and Whittington forthcoming).

Second, sanitation improvements result in public health benefits that have a public goods character; the benefits received by one individual do not diminish the benefits available to another. Standard public goods theory indicates that collective action is often required for the efficient provision of such goods in order to avoid free riding. But household sanitation improvements such as the installation of water-sealed toilets are not pure public goods; they also yield important private benefits, including convenience, time savings, and aesthetics (Whittington et al. 1993a, 1993b).

A third challenge to effective sanitation planning is the lack of public awareness of the health benefits of sanitation services. Despite the fact that public health benefits ensue from collective solutions to urban sanitation problems, the public may not fully understand or perceive the magnitude of these benefits (Esrey 1996; Esrey et al. 1989; Esrey, Habicht, and Casella 1992; Young and Briscoe 1987). In this sense, sanitation improvements resemble "merit goods," and social marketing and political leadership may be required to implement a socially optimal investment program. This line of argument, however, has often led public health specialists, planners, and engineers to rely solely on their expert opinion and to ignore the presumably uninformed wishes of households (MacRae and Whittington 1988).

Fourth, planners attempting to increase user fees in order to finance sanitation improvements often face a dilemma. Poor households are unable and unwilling to pay for sewer connections or waste-water treatment, while many richer households have already invested in individual solutions to their immediate problems (e.g., water-sealed toilets and septic tanks). Thus, it is likely that neither group will be inclined to participate in a collective agreement to improve public health conditions (Choe, Whittington, and Lauria 1996). Quite reasonably, poor households are generally unwilling to address community-wide problems (such as sewage collection, solid waste removal, and flood drainage) until they have met their immediate household needs and have obtained the private benefits associated with improved household sanitation (e.g., water-sealed toilets). There is less justification for the public sector to subsidize private housing improvements such as the construction of water-sealed toilets.

Fifth, sewer network design, construction, and operation are subject to a variety of economies of scale. Design engineers thus prefer to lay sewer pipe throughout a city and hope that households and businesses will connect. This approach requires that care must be taken to estimate demand for connections, something that is rarely done. If connec-

tion rates are low, public health and environmental objectives may not be fully achieved. Also, revenues will be lower than expected. The network design task itself will thus become much more complicated in terms of sizing and location of interceptor and trunk sewers (Lauria, Swarna, and Randall 1992). A conventional sewer system may not function properly because of insufficient flows.

Sixth, large amounts of money are at stake in the way water and sewer projects are currently constructed and financed. A new policy framework for sewer planning will likely threaten established financial relationships and will meet strenuous opposition from some stakeholders in the current system (Lovei and Whittington 1993; Crane 1994; Tarr 1988).

Despite these challenges, environmental engineers and sanitation planners working in cities in developing countries do initiate some sewer projects, and they have used a variety of ad hoc rules-of-thumb to decide where new sewer lines should be installed, when construction should begin, and who should have access to these new services. In making such decisions, one of four different master planning strategies is generally employed:¹

1. Serving the downtown area first;
2. Serving upper-income and/or new developments first;
3. Serving the poor first; or
4. Addressing citywide environmental problems first.

Although these four master planning strategies for deciding where to begin laying sewer pipe in a city may have quite different spatial implications for project design, they have two things in common. First, all assume that the construction of sewer systems should begin now (i.e., the possibility that delaying construction might be preferable to starting immediately is seldom explicitly considered). Second, as currently practiced, these approaches rarely involve households and neighborhoods as active participants in the planning process. The only way households can register their disapproval is to not connect to sewer lines; neighborhood organizations often have no role at all.

■ A NEW SANITATION PLANNING APPROACH: THE "NEIGHBORHOOD DEAL"

It is our contention that this exclusion of neighborhood organizations and households from active participation in the planning process lies at the heart of the current sanitation planning crisis in many cities in developing countries. To appreciate why this is so, it is necessary to consider (1) what information planners and municipal governments need before committing to lay sewer pipe in a neighborhood and (2) what information households need before deciding whether they want a connection to a sewer line. Sound sewer planning requires that planners know both the number of households that will connect if sewer lines are installed, as well as the costs of sewerage a particular neighborhood (in-

cluding the implications for the entire sewerage network).

If it can be assumed that all households in a particular neighborhood will freely connect or can be forced to connect to new sewer lines, then this part of the planning problem is simple. However, if this cannot be safely assumed, as is typically the case, then the agency or authority responsible for the sewerage system needs assurance that, if sewer pipe is laid in a neighborhood, households will pay some predetermined amount for this infrastructure improvement. Simply put, a fiscally responsible authority cannot bear the financial risk of installing such expensive infrastructure without some form of payment guarantee. From the agency's financial perspective, the owner of each house in the neighborhood should be required to pay some share of the sewer network installation costs—whether or not that household obtains a connection—because the value of his property increases simply by having the option to connect in the future.

In practice, there are two principal means by which an agency could receive such assurance. First, individual households could sign a legally binding agreement with the agency which obligated them to pay a specified amount for the installation of the sewer lines. Under this approach, however, transaction costs for the agency are very high. Although 100 percent of households would not necessarily need to agree to participate, a minority of households could hold out, refusing to sign the contract with the agency, and delay the project for others. Moreover, once the sewer lines were installed, the agency would have the difficult task of enforcing numerous contracts with individual households.

Second, the agency could require a financial commitment or upfront payment from the neighborhood as a collective unit before installing the sewer lines. A neighborhood organization would arrange to collect a fee from households for the installation of the sewer pipes in the neighborhood. Either the neighborhood or the agency could determine the amount of the average household assessment. A neighborhood could agree to pay the assessment as an increase or surcharge on local property taxes or as local community improvement taxes.

It is not necessary to assume that the neighborhood organization has the power to assess households or to coerce an individual household into participating in the neighborhood deal. What is generally required is that households in the neighborhood reach some kind of collective agreement and raise the total amount of funds required by the sewer-planning agency. In many cities, neighborhood or community organizations may be weak or nonexistent. In such cases, the neighborhood deal approach to sewer planning could encourage their formation.² The key point is that the neighborhood as a collective unit would be required to decide whether or not to have sewer lines installed, and would be responsible for financial transactions with the agency. If a neighborhood decided to proceed with the installation, then most households would have to pay—even those against the plan.³

This approach has the important advantages of (1) substantially reducing transaction costs to the agency and (2) leaving the responsibility for a collective decision at the lowest possible administrative and political level, thus increasing the probability that the decision is responsive to local needs and desires. It might appear that transaction costs would merely be shifted from the planning agency to the neighborhood. In fact, we believe there are at least two reasons to believe that total transaction costs would be reduced. First, the neighborhood deal approach serves an important screening function. In many situations, neighborhood organizations should be able to easily determine whether the majority of households are interested in the neighborhood deal that the municipal planning agency is able to offer. If they are not interested, such a quick, decisive assessment of household demand can be quite valuable, and may be much harder for the planning agency to achieve. Second, if the majority of households in a neighborhood are interested, the neighborhood organization is more likely than the planning agency to be able to sort out any difficulties households may have in reaching a consensus.

Regardless of which of these two approaches is used to arrange for household financing of the neighborhood sewer network installation, there is still a household decision about whether or not to connect to the new sewer line. Clearly the collective, neighborhood-level decision regarding the installation of sewer lines and the household-level decision regarding a private sewer connection are interdependent. If members of a household do not want to connect to the sewer line, they may not want to pay for sewer-line installation for the neighborhood. Then again, if they own the dwelling, they may. By having sewer lines installed in the neighborhood, homeowners receive two benefits, even if they do not know whether they will connect. First, they purchase the option to connect at some time in the future. This option will increase the property value whether or not a connection is installed. Second, other households will likely connect, thus improving environmental quality in the neighborhood.

It is, however, certainly true that a household would need to know the costs of connecting to and using the sewerage system before it made a decision about whether or not it wanted its neighborhood to have sewer lines installed. In fact, there are many costs a household must consider when deciding whether or not its neighborhood should have sewer lines installed and whether it should connect to a sewer line if this were possible. First, it must consider the amount of, and financial arrangements available for, the assessment fee for the sewer line installation. Second, a connection fee must typically be paid to the water and sanitation authority by each household wanting to connect. Third, additional plumbing costs are associated with actually connecting the water-sealed toilet (and perhaps household "gray water" discharges) to the sewer pipe. The

latter costs are likely to vary significantly from household to household. Fourth, if a household does not already have a water-sealed toilet, it must incur the costs of installing one. Fifth, households with a sewer connection must typically pay a monthly tariff. For those with a metered private water connection, this tariff may be a surcharge on a monthly water bill. For those without service, the monthly charge may simply be a fixed fee.

The different costs and prices that the household faces, along with the financial arrangements for paying them, can be influenced by policies of the municipal government and the water and sanitation authority. We refer to the bundle of all such policies as the *neighborhood deal* because it is useful to consider how the whole package of government policies appears to the neighborhood and to the household. There are thus many alternative "deal structures" that the agency responsible for sewerage could offer neighborhoods and households. Each must, however, specify the relationship between the collective decision necessary at the neighborhood level and the individual connection decision to be made by households.

In this context, it is easy to understand why investment strategies that exclude neighborhoods and households from the sanitation planning process have had such a high rate of failure. First, such approaches preclude neighborhood organizations and households from providing the sanitation-planning agency with essential feedback about household demand for infrastructure improvements before sewer lines are installed and investment mistakes are made. Second, current investment strategies do not ask neighborhood organizations to bear the transactions costs associated with achieving collective agreements among households, and it has generally proven too difficult and expensive for government to shoulder this responsibility. Third, existing investment strategies utilize relatively simplistic "deal structures" without any empirical information about what households and neighborhoods actually prefer. In other words, government deals are frequently offered without any consultation or negotiations with neighborhoods or households. It is hardly surprising, then, that such deals are commonly rejected.⁴

■ OPERATIONALIZING THE NEIGHBORHOOD DEAL APPROACH: SEMARANG, INDONESIA

We explored the potential for introducing this new sanitation planning approach in Semarang, Indonesia, the provincial capital of Central Java. Semarang is a coastal city with a population of more than 1.3 million people, located approximately 540 kilometers east of Jakarta. The objective of the case study was to assist the Indonesian government and the World Bank in thinking strategically about new sewer and waste-water treatment investments in Semarang. As a first step, we needed to gain an understanding of current water supply and sanitation practices in selected neighborhoods of Semarang and to assess residents' demand for improved water supply and sanitation services.

Field Work

Over two-and-one-half weeks in July and August 1995, we conducted both a household survey and a series of participatory community meetings in Semarang.⁵ Three districts of the city (*kelurahans*) were selected purposively, with the intent of representing the range of residents' existing water supply and sanitation services and socioeconomic characteristics.⁶ The *kelurahan* Bugangan is a low-lying area near the coast; many residents of Bugangan rent their homes and do not currently have a private water connection. The *kelurahan* Sekayu is located in a relatively affluent downtown district with a mix of high-density, low- and middle-income housing and some business and office areas. Dadapsari is a middle- to low-income *kelurahan* in the eastern part of Semarang. A total of 42 neighborhood associations (RTs)—14 in each *kelurahan*—were selected for our study. In each *kelurahan*, nine RTs were randomly assigned for inclusion in the household survey, and five for participatory community meetings.⁷

The household questionnaire was designed to collect information about respondents' existing water supply and sanitation situation; environmental priorities and perceptions; willingness to pay for improved water supply and sanitation; and socioeconomic characteristics.⁸ Each of the 15 participatory community meetings was convened by an RT chairman and facilitated by a two-person team of community organizers. As with the household survey, these meetings were designed to learn how individuals in these neighborhoods perceive their existing water and sanitation situation and how they feel about possible improvements. The meetings lasted one to two hours, and attendance varied from 10 to 31 people.⁹

Socioeconomic Profile of Sample

Of the 319 respondents interviewed in the household survey, 125 (39 percent) are female and 194 (61 percent) male.¹⁰ The average number of persons per household is 5.7, and 15 percent of the sample households are headed by females. Five percent of respondents have earned a college degree, 41 percent have graduated from high school, and 12 percent have not completed primary school. Three quarters of the respondents are Moslem, while another 21 percent are Christian and 4 percent are Buddhist.

Three quarters of the survey respondents and 55 percent of community meeting participants own their homes; almost 90 percent of those interviewed live in single-family dwellings. All survey respondents received electric service; the average household monthly electric bill was 15,500 *rupiah* (Rp.) (US\$7.20). When asked to estimate the current market value of their homes, survey respondents provided values ranging from 1 million to 100 million Rp., with a mean of roughly 26.5 million Rp. (US\$12,320). The average market rental prices for homes in the study area was 32,245 Rp. (US\$15.35) per month.¹¹

Survey respondents reported household monthly incomes ranging between 3,000 and 2 million Rp. with a mean of 305,420 Rp. (US\$142). More than 80 percent of households interviewed own a television, and 22 percent have a telephone. Motorcycles are a popular mode of transportation in Semarang; almost one half of the respondents own a motorcycle (10 percent own an automobile).

Water Supply and Sanitation Conditions

A piped water system operated by the public water supply utility, PDAM (*Perusahaan Daerah Air Minum*), delivers water to roughly 25 percent of Semarang households. Among the 319 persons interviewed in the household survey, 88 (28 percent) reported having a working private metered water connection in their homes. Average reported monthly water bills range from 5,000 to 55,000 Rp., with an overall mean of 14,140 Rp. (US\$6.60). Only one respondent reported selling water to neighbors. Almost all respondents with connections use the water for drinking and cooking; every household reported boiling water prior to drinking it or cooking with it. In general, respondents rated the quality of water from their public utility connections highly.¹²

Approximately half of survey respondents' households have a private well; another 20 percent of respondents reported collecting water at least occasionally from a public well in their neighborhood. Half of these pay an average charge of 150 Rp. (US\$.07) per 50-liter *pikul*, and the other half pay an average monthly fee of 9,500 Rp. (US\$4.40) for unlimited access to the public well. Well water is used primarily for bathing and washing.

Reliance on vended water varies dramatically among the three *kelurahans*. Eighty-one percent of respondents in the Bugangan district reported purchasing vended water at least occasionally, whereas only 12 percent of the Sekayu respondents use vended water. Among all respondents, 11 percent reported obtaining "all or almost all" of the water their households use from vendors. These households purchase, on average, between four and five jerricans daily. With an average price for a jerrican (20 liters) of water of 295 rupiah (US\$0.14), these households are thus spending roughly US\$18.60 for vended water each month. Vended water is primarily used for drinking or cooking.

The majority of the city's households are served by private water-sealed toilets; approximately three-quarters (73 percent) of survey respondents reported having a toilet for the exclusive use of their household members. The waste from the vast majority of household toilets is deposited into septic tanks without septic fields.¹³ Public latrines are the primary form of sanitation service for almost all other respondents.¹⁴ Semarang currently has no sanitary sewerage system, and waste water flows into open combined sewers and storm drains to the Java Sea without treatment.

The Neighborhood Deal

In describing a feasible neighborhood deal to survey respondents and community meeting participants, we used photographs, drawings, and detailed information about the process by which an improved water and sanitation system might be installed and operated in Semarang. Enumerators provided this information to survey respondents in private, one-on-one interviews, while community meeting facilitators presented and discussed the “deal” with groups of participants in an open format.

Only 3 percent of survey respondents were familiar with the concept of a sewer system prior to their interview. Many respondents devoted significant time to studying the visual aids and asking questions about the system, which was described as having two components. A network of underground pipes would deliver potable water to households and would remove human wastes and waste water; a treatment plant would be constructed to treat waste water before it was discharged into the ocean. Respondents were told that such a system would provide reliable and high-quality water supply; improvements in neighborhood sanitary conditions; and a reduction in some types of water pollution and well-water contamination.¹⁵

Once respondents understood how such a system would function in Semarang, enumerators described the process by which it might be installed and financed. It was explained to respondents that the installation of an improved water supply and sanitation system would entail a two-stage process. First, RTs that wished to participate in the program would be required to raise the funds necessary to pay an assessment fee. Government would also contribute moneys, and these funds would be used to lay the neighborhood water and sewer lines from the major (trunk) pipes to each participating RT. Respondents were told that consensus must be reached within a RT for participation in the project, as every household in the district would be assessed a share of the

installation fee, whether or not it decided to connect to the water and sewer system.

In crafting a credible neighborhood deal for improvements in Semarang’s water supply and sanitation, we drew on the tradition of “self-help” programs extant in many areas of Javanese society.¹⁶ Each RT participating in the program would have to decide whether to use an engineering contractor (“full service”) or an engineering consultant (“self help”). Under the full-service plan, the contractor would design and carry out the installation of interceptor sewers. With the self-help option, residents of the RT would share the responsibilities of digging trenches, laying pipe, and other low-skill tasks, under the supervision of an engineering consultant. Respondents were told to assume that the assessment fee associated with the full-service would be twice that of the self-help plan. Residents of a RT would thus have to weigh the relative advantages of expertise, cost savings, and expediency in deciding whether the full-service or self-help approach were more desirable.

Once arrangements for an RT’s participation in the program were finalized, individual households would face a choice of their own: Private connections would be provided only to those households desiring and able to pay for one. Households with existing water connections would have the option of adding a sewer connection. Those without water service could have both a water and sewer connection installed (a water connection without an accompanying sewer connection was not offered as an option).

The different costs and prices of the project were carefully explained to survey respondents and community meeting participants (see Table 1). A fixed assessment fee—the cost per household of having neighborhood water and sewer lines installed—would be charged to each household. Under the full-service plan, this fee varied randomly between 50,000 (US\$24), 150,000 (US\$71), 300,000 (US\$143), and 500,000 Rp. (US\$238) for different questionnaire versions; that is, each respondent received only one of these

TYPE OF FEE	AMOUNT	HOMEOWNERS with water connection	HOMEOWNERS without connection	RENTERS with water connection	RENTERS without connection
Assessment fee*	50,000, 150,000, 300,000, or 500,000 Rp. for full service; 25,000, 75,000, 150,000 or 250,000 Rp. for self help	Pays	Pays	Does not pay	Does not pay
Connection fee	300,000 Rp. for water; 200,000 Rp. for sewer	Pays 200,000	Pays 500,000	Pays 200,000	Pays 500,000
Monthly fee	25% or 50% surcharge for HHs with existing connection; 15,000 or 25,000 Rp. average monthly charge for new connections	Pays	Pays	Pays	Pays
Water-sealed toilet	250,000 Rp.	Pays if needed	Pays if needed	Pays if needed	Pays if needed

* Could also be paid in 12 equal monthly installments with a 20% service charge. Note: US\$1 = 2,100 Rp.

Table 1. The proposed deals: Prices and costs for a household of improved water supply and sanitation service.

four assessment fees.¹⁷ The respondent was told that this fee could be halved if his or her community elected to use the self-help approach to installing the neighborhood lines. The fee could either be paid in full at the start of the project, or could be financed over a two-year period.

In addition, residents without indoor plumbing who wanted to take advantage of a household sewer connection would have to purchase and install a water-sealed toilet. These costs were estimated at 250,000 Rp. (US\$119) per toilet. For those choosing to connect their household to the water and sewer system, a fixed connection fee would also be assessed. Those needing both water and sewer connections would pay a fee of 500,000 Rp. (US\$238), and those with existing water connections would only pay 200,000 Rp. (US\$95) fee for a sewer connection.

A monthly service fee, comprised of a flat rate for sewerage and a use-based water fee, would also be billed to every connected household.¹⁸ For households with existing water connections, the fee for the improved system was described as a surcharge on their current water bill of either 25 percent or 50 percent in different questionnaire versions. For those without a household connection, average monthly water bills were estimated at either 15,000 (US\$7) or 25,000 Rp. (US\$12). As with the assessment fee, the surcharges and average bills were randomly assigned to different survey respondents.¹⁹

Respondents were given several opportunities to ask for clarification of the project description and the financing requirements for the system. Once the scenario described was well understood by the respondent, the enumerator asked him or her the following question:

Suppose that your RT had the option of participating in the improved water supply and sanitation project I have just described. Would you prefer that your RT not participate in this project; that your RT participate and hire an engineering contractor to carry out the work; or that your RT participate and carry out the work yourselves with the supervision of an engineer?²⁰

Next, respondents were asked to consider what their household would do if an improved water supply and sanitation system were installed in their RT. The costs of connecting were reviewed with the respondent, who was then asked the following question:

Now I want you to suppose that households in your RT did decide to participate in this program, and that the water and sewer pipes were installed along the street. I want you to

consider whether your household would connect to the pipes or not. Please consider this question carefully. If you would not be able to afford the connection, or if you feel you would have other, more important things to spend your money on, you should tell us that you would not connect to the system.

A unique aspect of the household survey was the classification of responses to questions about respondents' willingness-to-pay for improved water supply and sanitation. During questionnaire development, enumerators felt that some respondents would find it difficult to reject openly the improved water supply and sanitation program described in the questionnaire. Within the Javanese culture, they explained, it is common to provide an ambivalent rather than a negative response, with both the speaker and listener tacitly understanding the true intention of the comment. It was thus important for enumerators to distinguish this type of rejection from true uncertainty on the respondent's part. Working with the team of enumerators, we generated a list of ways in which residents of Semarang tell one another "no," and enumerators were asked to indicate on each questionnaire the precise manner in which a respondent provided his or her answer.

Household Survey Results

The results of the first question, regarding whether or not the respondent wished for his or her neighborhood to par-

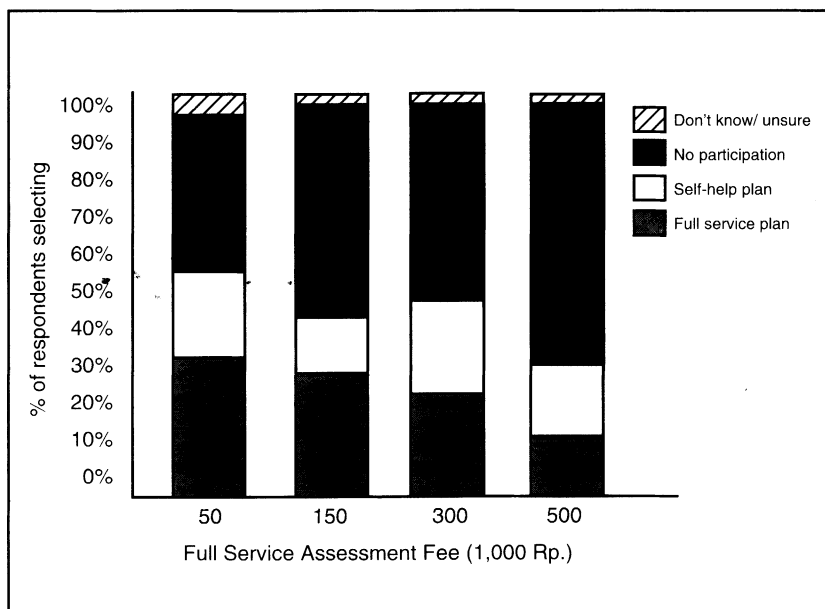


Figure 1. Proportion of respondents preferring no participation, full service, or self-help plan in their RT.

ticipate in the program for an assessment fee of a specified amount, are presented in Figure 1. The proportion of households that wish for their neighborhood to participate is relatively low at each of the specified assessment fees. Even with a very low per household assessment fee of 50,000 Rp. (US\$24) for the full-service plan, only 53 percent of respondents favored their RT's participation in one of the two service programs (i.e., full service or self help). These were relatively evenly split between the full-service plan (58 percent) and the self-help plan (42 percent). As the assessment fee increases, the proportion of respondents favoring their RT's participation in the program generally decreases (which increases our confidence that respondents were listening to the questions asked and attempted to give honest answers).²¹ At the highest assessment fee of 500,000 Rp., only 10 percent of the respondents wanted the full-service plan, and only about 15 percent wanted the self-help plan.

Figure 2 shows that households that already have a private water connection were more likely to want their RT to participate than households without a private water connection. This was true at each of the four assessment fees. For example, at the lowest assessment fee of 50,000 Rp.(US\$24), over half of the respondents with private water connection wanted their RT to participate, whereas fewer than 20 percent of households without water connections supported the program. Figure 2 also shows that the effect of increasing the assessment fee is both more consistent and more pronounced for households with private connections than for households without private connections.

The data presented in Figure 2 are difficult to interpret given the small size of our sample. If it is true that, other things equal, households with private water connections have a higher demand for the neighborhood deal than do households without private water connections, this will have important implications for project design. It would suggest that a strategy of trying to get unconnected households to take both water and sewer services might result in many households taking neither, and that an attempt to bundle water and sewer services may be ill advised. However, this result could simply be due to an income effect, i.e., households that have private connections are richer than households without private connections, and their greater wealth may be the reason why they exhibit stronger demand for the neighborhood deal. This result could also be caused by a price effect; households with private water connections would incur lower connection costs as compared to those of households without private water connections.

Table 2 presents the results of the second valuation questions concerning whether or not the respondent's household would connect to the new water and sewer system if it were available in the neighborhood. About one-third of the respondents in the total sample expressed a desire to connect. This varied from 30 percent in Bugangan to 40 percent in Dadapsari. The variation in the monthly tariff did not have

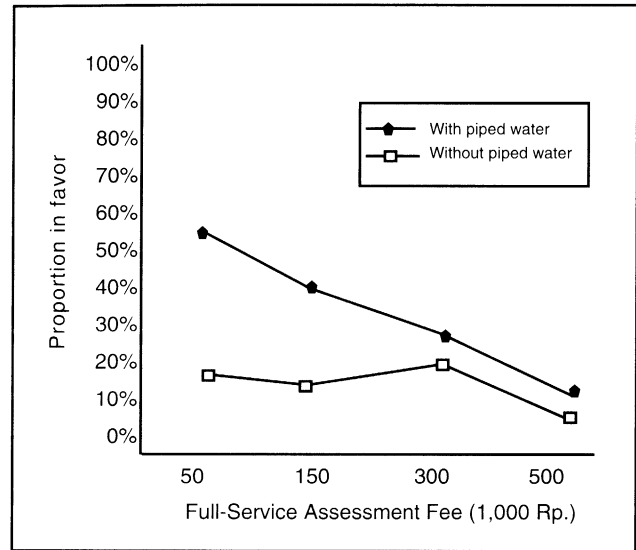


Figure 2. Proportion of homeowners preferring their RT's participation in improved water and sanitation program.

DISTRICT	LOW TARIFF	HIGH TARIFF	TOTAL SAMPLE
Dadapsari	39% (25/64)	42% (24/57)	40% (49/121)
Bugangan	20% (9/45)	40% (17/42)	30% (26/87)
Sekayu	32% (18/56)	26% (13/49)	30% (31/105)
Total sample	32% (52/165)	36% (54/148)	34% (106/313)

Table 2. Proportion of respondents willing to connect by monthly tariff and kelurahan (district).

a statistically significant effect on respondents' demand for connections. It is important to keep in mind, however, that this is just one of many costs and prices that households must consider in making this decision, and we have no reason to believe that it is the most important one. As with the first, collective decision regarding neighborhood participation, households with existing private water connections are much more likely to say that they want to connect to a sewer line than households without a private water connection are to indicate that they want water and sewer connections. For example, 75 percent of the homeowners in Sekayu with private water connections wanted to connect to sewer lines; only 15 percent of the homeowners without private connections wanted to connect to the water and

Would you want your RT to use the full-service plan, to use the self-help plan, or to not participate in the program to install water and sewer lines?				
Would your household connect to the new water/sewer system?	Full service plan	Self-help plan	No participation	Don't know/Not sure
Yes, would connect	17% (n=54)	12% (n=37)	5% (n=15)	0% (n=0)
No, would not connect	6% (n=19)	9% (n=28)	50% (n=158)	0% (n=1)
Don't know	0% (n=0)	0% (n=1)	0% (n=2)	1% (n=4)

Table 3. Proportion of respondents preferring no participation, full service or self help by proportion who would connect to new system.

DESCRIPTION	# OF TIMES RECORDED	% OF "NO" RESPONSES
I cannot afford it	52	32%
I need to know others' opinion about program	49	30%
I agree, but costs are too high	30	18%
Yes, if costs are reduced	11	7%
I have many children, expenses, etc., to worry about	8	5%
I agree, but current situation is satisfactory	6	4%
I agree, but without advance payment	4	2%
Yes, if payment period is extended	2	1%
Yes, if participation is required by the government	1	<1%
I can participate, but I want to avoid rumors (about my wealth)	1	<1%
Total	164	100%

Table 4. Frequency and description of "no" responses.

sewer lines. In Dadapsari, 50 percent of the homeowners with private water connections wanted to connect to sewer lines; only 30 percent of the homeowners without private connections wanted to connect to the water and sewer lines.

Table 3 presents a cross-tabulation of the results of the two valuation questions. As indicated, 29 percent of the total sample said that they wanted their neighborhood to participate in one of the two service plans and that their household would connect (17 percent preferred the full-service plan and 12 percent the self-help plan). Fully half of the sample respondents said that they would vote against their neighborhood's participation and, if their RT did participate, that their household would not connect. Interestingly, about one-third of the respondents who voted for their

neighborhood's participation in one of the two service plans said that their household would, in fact, not connect to the new water and sewer lines.

These household survey results would seem to suggest that demand for improved water and sewer services is low, and that there is little household interest in sewer connections in Semarang. We believe, however, that such a conclusion is premature, and that the policy message from these preliminary survey results is more complex. The problem arises from the uncertainty involved in interpreting the "no" responses. For those answers that we recorded as "no," Table 4 presents information regarding the frequency with which respondents gave a particular answer to the household connection decision question. As shown, there were 164 responses categorized as "no." Of these, 32 percent said that the reason for their "no" response was that they "could not afford it." Another 18 percent said they were in favor of the program, but "the costs are too high." These responses, which represent one half of the "no" answers, seem to be clearly negative and correctly classified.

Another 30 percent of respondents, however, said they needed to know what their neighbors' opinions about the project were before they could make a decision about their position. Our enumerators told us that this was a polite way of saying "no," but it seems to us, however, that assigning such responses to the "no" category is

less certain than the responses related to budget constraints. Similarly, other responses listed in Table 4 also seem somewhat ambiguous (e.g., "the current situation is satisfactory" and "I agree if participation is required"). For these reasons, we believe that the proportion of respondents classified as rejecting the improved water and sanitation service program is likely too high. That is, we believe that more households would probably favor the service programs than indicated by our household survey results.²²

Community Meeting Results

All participants in the community meetings faced identical prices in the hypothetical neighborhood deal: a full-service assessment fee of 150,000 Rp. (US\$71), and a self-help

DISTRICT	FULL SERVICE	SELF HELP	NO PARTICIPATION	DON'T KNOW/UNSURE
Bugangan	22%	0%	19%	59%
Dadapsari	41%	0%	39%	20%
Sekayu	9%	7%	60%	24%
Total sample	24%	2%	39%	35%

Table 5. Proportion of community meeting participants preferring full service, self help, or no participation.

assessment fee of 75,000 Rp. (US\$36), water and sewer line connection fees of 300,000 Rp. (US\$143) and 200,000 Rp. (US\$95), respectively; an average monthly tariff of 15,000 Rp. (US\$7) without existing water connections and a 25 percent water bill surcharge for those with a connection; and installation costs for households needing to purchase a water-sealed toilet.

After discussion and debate, the group was asked if they would prefer their RT to participate in a full-service arrangement or a self-help arrangement; if they preferred that their RT not participate in the program; or if they were unable to reach consensus on the matter. The results of this question are provided in Table 5. Of the 316 individuals attending the community meetings, 27 percent were in favor of their RT's participation in the program. Of these, the vast majority (92 percent) preferred a full-service arrangement. Thirty-nine percent were opposed to their RT's involvement with the program, as compared to over half of the household survey respondents. One-third of the community meeting participants provided a response of "don't know" or "not sure" to the facilitators, whereas only 2 percent of survey respondents exhibited such uncertainty.

In both the household survey and the community meetings, a greater proportion of Semarang residents oppose their RT's participation in an improved water supply and sanitation program than support it. The large percentage of "unsure" responses among community dialogue participants makes direct comparison of these findings difficult. Whereas many different types of responses were classified by enumerators as "no" answers in the household survey, community-meeting facilitators were asked simply to record the responses of participants without interpretation. It might then be expected that the majority of 109 "unsure" responses obtained during the community meetings would actually indicate opposition to the program. At the same time, the open discussion format of the meetings may have afforded participants the opportunity to consider a relatively greater range of issues about the program (e.g., the views of their neighbors) and enabled them to consider their decision more thoroughly. This added information may indeed have left many unsure about their preferences for improved water supply and sanitation service.

■ SUMMARY AND CONCLUSIONS

This study is an initial step in the process of learning more about household demand for improved water and sanitation services in Semarang, and how the concept of a neighborhood deal could be incorporated in a sewer planning process. The results of both the household interviews and the community meetings suggest that willingness to pay for a connection to a sewer system in these neighborhoods is low. Many respondents questioned whether the neighborhood deal proposed was a good idea even at very low prices. Among those households interested in having their neighborhood install new water and sewer lines, a diversity of opinion exists about whether to use an engineering contractor or a self-help approach. On the other hand, some households were enthusiastic about neighborhood sanitation improvements, and many survey respondents and community meeting participants were keenly interested in learning more about the sewerage and waste-water treatment technologies introduced.

Overall, household demand for improved sanitation sewers appears highly uncertain in Semarang; people are simply not yet of one mind regarding the need for new sewers in their neighborhood. Given this uncertainty in demand, approaching sewer planning as an effort to design the best neighborhood deal has considerable advantages. If the municipal government offers neighborhoods the best technically sound deal it can afford, then it would not be necessary to estimate demand neighborhood by neighborhood. Planners and engineers would need a rough picture of demand for improved services in order to anticipate what neighborhood deal they can offer and to decide where to build trunk sewers, but accurate predictions of connection rates in each neighborhood would not be required. Some neighborhoods would decide to install sewers now, others later, and some perhaps not at all. The sewer network in Semarang would thus begin with the neighborhood and move outward. If trunk sewers are built along the existing main canals, many neighborhoods will be able to connect to the larger sewer network without needing long interceptor sewers or waiting for other neighborhoods to install sewers.

More needs to be learned, however, about exactly what

kind of neighborhood deal households and neighborhoods would prefer. The research described in this paper assessed demand for essentially one "deal structure." This deal may well not be the one households would find most attractive. One issue of particular importance is whether it is desirable to offer different deals in different parts of the city. We proposed a single deal to all households; however, the costs of installing sewers will be higher in some neighborhoods than others. Costs for one neighborhood may also differ depending on what other neighborhoods decide to do. The possibility of varying the deals available to different neighborhoods raises a host of issues, such as fairness and practicality, that would need to be carefully examined.

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■ NOTES

- Sewers may be the only feasible sanitation alternative for some areas of a city (e.g., downtown, areas with a high groundwater table, or areas with impervious soils where septic tanks will not function). In this sense, technical feasibility can dictate where sewers will be needed; however, technical feasibility rarely offers guidance on the staging of sewer construction.
- Professionals in the water supply sector often credit new water projects with helping to establish new community organizations and increasing social capital (WASH Project 1990).
- Neighborhood organizations could agree to make special arrangements for the poor and other special cases.
- The neighborhood deal may also be rejected because households do not understand how the technology of sewer pipes and waste-water treatment works, nor the public health benefits likely to ensue. This may require that government initiate a proactive education and social marketing program to provide households such information.
- At the time of our study, the city's economy, like that of Indonesia, was growing rapidly (averaging 7 percent annually during the period 1984-1994). Per capita gross domestic product for 1993 was estimated at US\$560.
- Within Semarang, communities are organized on several different levels. Between 10 and 120 households comprise an "RT" (*Rukun Tetangga*, or neighborhood association) which is headed by an unpaid, elected chairman. Roughly 10 RTs are grouped into each RW (*Rukun Warga*, or community association). RWs, in turn, are grouped into *kelurahans*, headed by appointed *lurahs*; there are roughly 20 *kelurahans* in each *kecamatan*.
- The household interviews were conducted by 15 college-educated enumerators from Semarang (six women and nine men) over a six-day period. Half of the enumerators were students, and the rest were staff from government agencies.
- The survey was written and administered in Bahasa Indonesian, the most widely used language in Semarang. Each questionnaire was administered to a head of household (and occasionally to both heads of household). Interviews lasted between 30 and 70 minutes and were conducted in respondents' homes. A total of 319 questionnaires were completed. The contingent valuation method was used to elicit information on households' willingness to pay. See Whittington (1998) for a discussion of the use of the contingent valuation method in developing countries.
- For more information on these participatory group methods for assessing household demand and their accuracy, see Whittington and Davis (1994) and Davis and Whittington (1998).
- A significantly higher proportion (79 percent) of males participated in the community meetings (men frequently represent their households in community events in Semarang). The format of the community meetings was not conducive to the collection of many additional socioeconomic data.
- This average includes only those respondents living in non-subsidized housing. More than one-third of the respondents who rent their homes, however, live in subsidized rental units and pay less than 5,000 Rp. (US\$2.40) per month in rent.
- Only 8 percent felt it had a bad odor and 1 percent thought it appeared dark or dirty. Nineteen percent reported a strong chlorine taste in their water, while 78 percent considered it "normal" or "fine."
- Fifty-eight percent of respondents with a private toilet and septic tank reported having emptied the tank at least once; 15 percent have replaced their septic tank or installed an additional tank.
- Approximately half of public latrine users are required to pay a "contribution fee." A fixed monthly fee is the most common payment arrangement, with an average fee of 1,040 Rp. (US\$0.50). Another 40 percent of respondents who use public latrines regularly reported paying a charge per visit; the average price was 85 Rp. (US\$0.04).
- They were informed, however, that floodwater drainage would not improve significantly as a result of the proposed improvements in water supply and sanitation service, an issue important to low-lying neighborhoods near the coast.
- As one example, an influential grassroots organization dedicated to issues of women and children's health and education (called the PKK) has as one of its ten principles the idea of *gotong-royong*, or cooperation and empowerment through self-help programs.
- It was not possible to vary prices among participants in each community meeting. All received a full-service assessment fee of 150,000 (and a self-help fee of 75,000).
- As the amount of this fee would depend on the quantity of water a household consumed, the questionnaire was carefully worded to convey the idea that the prices cited represented estimates for average household consumption.
- All community meeting participants with existing water connections received a monthly tariff equal to a 25 percent surcharge on their water bill. Those without connections were told that the average combined monthly bill would be 15,000 Rp.
- Homeowners would be responsible for the assessment fee and, ostensibly, for the indoor plumbing costs (i.e., renters were told they would only pay the connection and monthly service fees).
- This is not, of course, strong evidence that respondents' answers to such hypothetical questions are accurate indications of how they would behave if faced with a real choice. Griffin et al. (1995), however, present a rigorous comparison of respondents' *ex-ante* stated intentions in contingent valuation surveys *versus* their *ex-post* actual behavior. The authors found that answers to well-designed, soundly executed contingent valuation surveys provided fairly accurate predictions of how people actually behaved.
- Another possible reason for the high proportion of "no" responses is strategic bias on the part of the respondents (e.g., that some may have said "no" in hopes of lowering the prices that the government might ultimately charge households and neighborhoods). However, the risk of strategic bias does not seem to us to be large in this study because it is not obvious how respondents should answer if they wished to behave strategically. For example, it seems equally plausible that a respondent trying to answer strategically would have answered "yes" to our CV questions in hopes of encouraging the government to provide the services, knowing that after the sewer lines were installed that it might not be able to raise prices or collect monthly water and sewer bills. In fact, these days most CV researchers are more concerned about "yea saying" than strategic "no" responses, and would probably find such a high percentage of respondents answering "no" to lend credibility to our survey.

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