The Challenge of Demand Assessment in Pro-Poor Infrastructure Projects

By Dale Whittington[1]

Introduction

The topic of "demand assessment" is part of a broader discussion currently underway in the development community about why and how donors and governments should consult with households and other stakeholders that are affected by projects and policy interventions. These potential beneficiaries, particularly poor households, have knowledge of and hold attitudes about the direct and indirect consequences of infrastructure projects. This information is of great relevance to planners who are responsible for making investment and management decisions about what services to provide households. Information on the extent to which project beneficiaries demand and are willing to pay for project outputs is necessary to design better projects during the early stages of the project cycle, and to manage and evaluate the performance of projects *ex-post* (Whittington and Davis, 1993).

My objective in this paper is to provide a brief commentary on the basic approaches to demand assessment and how this information can be used.[2] I use the term "demand" in the economic sense to mean how much an individual's desire or preference for a good or service changes as a function the price of the service, the income of the person, and the prices of close substitutes and complements. Thus, "demand assessment" entails the development of an understanding of this relationship between the quantity of the good or service purchased and the determinants of this behavior. Because prices, income, and preferences themselves may change over time, demand assessment is not simply a one-shot affair, but rather a continual process of studying, listening, and consulting with the users of infrastructure services. The use of demand

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[2] Readers interested in a more in-depth discussion of the issues raised here will find numerous references to the academic literature.

assessment techniques in infrastructure planning is not an end in itself, but a means of improving investment planning and project performance.

Approaches to Demand Assessment

Economists have long been concerned with demand assessment; indeed one of the main activities of traditional project appraisal (e.g., cost-benefit analysis) is the measurement of households' preferences in terms of their "willingness to pay" for project outputs. Demand assessment involves four main tasks: (1) selecting households to study, (2) data collection, (3) data analysis and report preparation, and (4) checks for validity. There are different research tools available for each of these four tasks (Table 1). The selection of households to listen to or consult with can be based on rigorous random sampling procedures, or more informal or purposive sampling.[3] Data collection can involve a review or use of secondary data sources, or primary data collection in the project (study) site. Primary data can be collected through participant observation, structured or open-ended interviews, focus groups, or participatory community meetings. Data analysis can range from qualitative interpretation of participant observations, to simple tabular presentations of raw data from structured interviews, to sophisticated econometric estimation of household demand relationships. The accuracy and reliability of the results can be crosschecked by the use of multiple methods or repeated investigations.

In designing a demand assessment, a project planner must decide (a) how to allocate resources between these four generic tasks, and (b) which research tool(s) to use. A related decision is whether to allocate more resources to a single, one-off study, or spread these resources out over a larger number of periodic demand assessments. Actual information on household demand relationships can be obtained in two principal ways. First, one can observe what people

[3] By "purposive sampling" I mean the nonrandom selection of households that are judged by decision makers to be of particular interest – perhaps because they are deemed to be representative, or, alternatively, particularly influential in shaping the opinions of others.

actually do (or ask them what they do), and then attempt to infer people's willingness to pay by using an economic theory of individual choice based on utility-maximizing behavior.[4] Within this broad approach to demand assessment, there are a number of *revealed preference techniques*.[5] For example, when using a hedonic property value model, economists assume households reveal something about their preferences for infrastructures services in the decisions they make about which house to buy. This is because when someone purchases a house, it comes "bundled" with different infrastructure services (e.g., a private water connection), and the availability of these services can affect the price that the housing unit commands in the market. In travel cost models households are assumed to reveal their demand for improved services by the distances they currently walk to access services such as public water taps or public telephones.[6]

Second, the project planner can simply talk to people directly about their preferences for improved infrastructure services. Over the last 15 years there has been a surge of activity in the development of systematic techniques for interviewing households in developing countries to directly determine their willingness to pay for the outcomes of environmental and health-related projects, policies, and regulations (Carson et al. 1995). These methods are called *stated preferences techniques* because assessments of demand are based on what people state that they would do if faced with a hypothetical choice, not on inferences drawn from their observed (or reported) behavior.

Economists often have a disciplinary predilection against obtaining information about preferences by talking directly to people. However, almost thirty years ago Nobel laureate Amartya Sen (1973) cautioned economists …

"We have been too prone, on the one hand, to overstate the difficulties of introspection and communication and, on the other, to underestimate the problems of studying preferences revealed by observed behavior."

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[4] This approach is consistent with the advice U.S. President Richard Nixon once gave to his staff on understanding political opponents: "Don't listen to what they say; watch what they do."

[5] These are termed "revealed preference" techniques because the person is assumed to reveal his preferences in the choices he makes.

[6] See Freeman (1993) for a thorough discussion of such revealed preference techniques.

Many economists and other social scientists are now using *stated preference techniques* such as the contingent valuation method (CVM) and choice modeling (CM), to assess demand for hypothetical goods and services in developing countries. Indeed, stated preference methods are the technique of choice in both developing and industrialized countries, in large part because they are so versatile. In particular, these methods can be used to investigate people's preferences for goods and services that they do not now have. This is especially important in the study of poor households' demand for infrastructure services because many poor households do not have services now and it is not possible to infer much about their willingness to pay from observed behavior (Komives, Whittington, and Wu, 2001).

In developing countries most of the applications of stated preference methods to date to estimate the demand for infrastructure services have been contingent valuation (CV) surveys conducted in the water and sanitation sector (Choe, 1996; Davis et al, 1996, 1998, 2001; Lauria et al. 1999; Whittington et al., 1990, 1992, 1993, 1998, 2000, 2002). A few researchers have used the CVM to examine households' willingness to pay for solid waste collection (e.g., DeShazo and Altaf, 1996). Very few demand assessments using stated preference techniques appear to have been done in the power or telecommunications sectors.

Crafting a good CV questionnaire amounts to writing a brief story about the problem or situation that is the focus of the survey, and then posing an interesting choice (or decision) for the respondent. A useful way to think about the CVM is that the researcher must describe a hypothetical "deal" to the respondent, and then the respondent can either accept or reject this deal. The CV researcher must be able to put herself in the place of a respondent and understand how a respondent would consider the different facets of the hypothetical deal that he is being asked to evaluate. Putting together a sound deal structure is difficult in most fields; valuation of infrastructure services is no different.

If the researcher is to learn something from the respondent's acceptance or rejection of this deal, the respondent must be (1) sufficiently intrigued by the story to listen closely to the aspects of the deal being described, and (2) able to understand the characteristics of the deal *as the CV researcher intends*. This requires that a balance must be struck between not insulting the respondent's intelligence and not overestimating what a respondent knows about a subject. Because exactly the same CV scenario must be delivered to each respondent in a survey, finding the right balance in a CV scenario between intelligibility and sufficient detail is often difficult.[7] It requires that the CV researcher utilize focus groups and carefully administered pretests to learn how different groups in a population are responding to the CV scenario, i.e., whether they are engaged by the story, understand the deal structure proposed, and provide answers that are influenced by the price of the hypothetical good or service.

One of the advantages of using stated preference techniques for demand assessment in infrastructure planning is that it is relatively easy to look at differences in demand between poor and nonpoor households. If one can determine who is poor and who is not, then it is possible to examine directly how poor households answered questions about their preferences for improved infrastructure services.

How "good" is the information collected from demand assessments?

I believe that it is possible to conduct high quality, policy-relevant demand assessments using stated preference techniques. However, over the past several years I have become increasingly discouraged about the quality of many of the contingent valuation studies that are being conducted in developing countries (Whittington, 2002). There are three main reasons why so many of the contingent valuation studies conducted in developing countries are so bad.

[7] In some general population surveys, it is in fact not possible to ask some groups of respondents exactly the same CV questions as other groups. For example, when estimating the demand for improved infrastructure services, the CV researcher will typically need a different CV scenario for owners and renters. In effect, the research involves two related distinct CV surveys (one for renters and one for owners). But for each group, all respondents must receive the same CV scenario.

The first is that the contingent valuation surveys themselves are often poorly administered and executed. Many of the economists directing CV studies are not themselves well trained in household survey methods, and they thus tend to underestimate their importance. In my opinion many of the puzzling, inconsistent results that one often finds in CV results are due to poorly trained enumerators and the resulting enumerator bias. Even the best CV scenario may make little sense to a respondent if a well-trained enumerator does not deliver it smoothly and sensitively.

Second, contingent valuation scenarios are often very poorly crafted. Critics of the CVM often argue that there is no economic content to respondents' answers to questions posed in CV surveys because respondents do not face real economic choices or an actual budget constraint (Diamond et al., 1993; Diamond and Hausman, 1994). The problem with many CV scenarios is not, however, that respondents have trouble thinking in economic terms about hypothetical choices. Rather it is that the CV researchers themselves cannot construct hypothetical choices that make economic sense to respondents.

Third, few CV studies conducted in developing countries are designed to test whether some of the key assumptions that the researcher made were the right ones, and whether the results are robust with respect to simple variations in research design and survey method (Task 4 in Table 1). The scholarly literature on the contingent valuation method stresses the importance of carrying out a variety of split-sample experiments in order to better understand how respondents may be reacting to the CV scenario and the elicitation procedure (e.g., Carson et al, 1997, 1998, 2001; Lauria et al. 1999; Whittington et al. 1992, 1998). The absence of such "split-sample" tests does not necessarily mean that the findings are inaccurate or unreliable, but it does make it difficult to place much confidence in their results.

Using CV surveys to assess demand for infrastructure services can also present project planners with some special challenges in interpreting responses to the valuation questions. For example, in 1995 we conducted a CV survey in Semarang, Indonesia that was designed to

determine whether a household would vote in favor of having water and sewer lines installed in its neighborhood if everyone in the community had to pay a specified assessment fee (whether or not they connected), and then, *if* water and sewer lines were installed, whether the household would choose to connect to them if a given monthly tariff were charged (Whittington *et al*., 2000). After the first couple of days of pretesting a CV questionnaire, we discovered that everyone was saying "yes" to everything, regardless of the assessment fee or monthly tariff offered to them.

We stopped the pretesting and held a meeting with our team of enumerators to find out why everyone was answering "yes" to all our valuation questions. During the course of a lengthy discussion, it became clear that respondents were in fact answering "yes, but ...," and then giving many different qualifications to their answer. The interviewers informed us that in Indonesia these were all polite ways of saying "no." We then developed a coded list of all the many ways a respondent might say "yes, but ..." to our valuation questions and mean "no" (Whittington, 1998).

Table 2 presents this list of different ways to say "no" and the number of times respondents gave each "yes, but" answer to the valuation question (regarding whether the respondent's household would want to connect to the new water and sewer lines if a specified monthly tariff would be charged). For example, of the 164 answers that we recorded as "no," 52 respondents (32%) answered "Yes, but I cannot afford it." Another 18% said, "I agree, but the costs are too high." These "yes, but" responses (50% of the total number of "no's") seem to be clearly negative and correctly classified as "no." However, another 30% of the respondents said, "I need to know others' opinion about the program before I decide." Our enumerators assured us that this was again simply a polite way of saying "no," but to us the respondent's answer seemed reasonable. The assignment of such responses to the "no" category seems more uncertain than the previous two types of answers. Other answers listed in Table 2 also seem somewhat ambiguous and uncertain, highlighting the difficulty of this kind of cross-cultural communication and the difficulties it poses for translation.

Solutions to these kinds of problems will require that CV researchers spend more time and money on their work. Yet the push from mission-oriented agencies is for faster, less expensive "streamlined" CV studies with a practical, operational focus. Infrastructure project planners need to weigh carefully the risks of obtaining poor quality demand assessments before cutting corners on stated preferences studies.

There are, however, some things that can be done to reduce the costs of demand assessments using stated preference techniques that infrastructure planners may judge to be reasonable compromises between cost and quality. First, in many situations in developing countries, accurate sample frames do not exist. In such cases, rigorous random sampling can require the creation of sample frames, and this may prove quite expensive. A much cheaper approach would be to purposively sample some target groups or neighborhoods that decision makers judge to be of interest. One cannot extrapolate the findings of such a survey to the general population with great statistical confidence, but decision makers may feel they can live with this uncertainty. For example, when on a tight budget, I have occasionally interviewed individuals in a "convenience" sample obtained by approaching people in markets and plazas scattered throughout a metropolitan area (Whittington et al., 2002).[8]

Second, it is easy to become overly ambitious in stated preference studies and to try to learn too many things about individuals' preferences for infrastructure services (e.g., how demand would be affected by changes in tariffs, connections fees, quality of service, financing options, availability of bundled services). Terms of references for demand assessments routinely ask the consultant to provide information on every conceivable issue of interest. The main problem here is actually not that overly ambitious terms of reference increase the required sample size (increasing sample size *per se* typically does not add that much to the total cost of the demand assessment), but that the time required for questionnaire development, enumerator training, data

[8] If census data are available, one can then compare the socioeconomic characteristics of the respondents in the convenience sample with the census profile.

analysis, and report writing increases significantly. If reducing the costs of a demand assessment is important, then the terms of reference must focus only on the key issues of concern.

Third, in some situations decision makers may not need a great deal of econometric analysis of the data from the stated preference survey. Raw data on the percentages of the sample that would be willing to pay for an infrastructure service may be most of what decision makers want to know. There is much that can be learned from careful econometric analyses of stated preference data sets, but this usually requires the time of more skilled analysts.

In light of these challenges to using stated preference techniques to estimate demand, many infrastructure planners may understandably seek comfort in more established revealed preference techniques. However, as Sen warned, studying preferences by observing behavior has its own set of problems and challenges. For example, over the past two decades there have been a number of studies in developing countries in Asia and elsewhere that have used hedonic property value models to measure households' willingness to pay for various infrastructure services (e.g., Jimenez, 1992; Follain and Jimenez, 1985; North and Griffin, 1993; Daniere, 1994; and Crane, Daniere, and Harwood, 1997). Many of these studies have found very high values for (some) households' willingness to pay for infrastructure services (Table 3). For example, Crane et al. report a mean willingness to pay in Bangkok for an electricity connection of US$72.38 per month and for a piped water connection of US$19.22 per month. Daniere reports a mean willingness to pay for a toilet in Manila of US$28.74 per month and for piped water of US$30.72 per month.

These hedonic estimates of households' willingness to pay for infrastructure seem high and are, in fact, not easy to interpret. For example, many of these estimates are much higher than estimates of households' WTP for improved water and sewer services based on CV surveys. Moreover, note that the WTP estimates (and market premiums) for an infrastructure connection are over and above the tariff that the household must pay, i.e., the household must pay the market premium for the privilege of having a connection and still has to pay its monthly bill. There are

several reasons why market premiums and estimates of household WTP for infrastructure services could be higher than one might expect.

First, if the urban population is increasing and investments in, for example, water supply and sewerage infrastructure investment lag behind population growth, there will likely be insufficient supply of connections to meet a growing demand. Existing houses with water and sewer connections will command a scarcity rent (i.e., a premium on the market). It is important to realize that this premium (estimated with the first-stage hedonic model) is a market-clearing price. Not everyone is willing to pay this scarcity rent. Some of the people who do pay this market premium might have been willing to pay more, but many households who did not pay it may have been willing to pay much less. If demand for services is heterogeneous (which the CV studies suggest is in fact the case), then high market premiums may reflect the fact that a very few households are willing to pay a great deal for an infrastructure service that is supply-constrained. It is difficult to know what proportion of the population without service would be willing to pay for a connection.

Second, the market premiums and WTP estimates may actually reflect scarcity created by rent-seeking behavior of the water supplier. If the water utility restricts the number of new water and sewer connections in order to receive informal, off-the-books payments for extending service or to enforce spatial monopolies (Lovei and Whittington, 1993), then it drives up the scarcity rent associated with a connection. This enables the utility's agents to extract larger illegal payments. The size of the illegal payment that they can charge should be less than the capitalized value of the monthly market premium for existing homes; otherwise a household would purchase a connection legally by moving to a house with a connection, rather than paying the illegal connection fee.[9] Of course, the transaction costs of moving may be high, and some households may prefer to pay an even higher illegal payment for a new connection in order not to move.

[9] If the rent-seeking agents controlling the supply of new connections also own properties with existing water connections, they can receive a "double dividend" by restricting the number of new connections. Not

Third, the market premiums captured by these hedonic property value models may in part reflect the fact that water and sanitation services are heavily subsidized. Households are in effect bidding for existing houses with a connection to receive a subsidized service that is worth much more than the nominal monthly bill.

Fourth, the hedonic property value models may themselves have been misspecified, i.e., the infrastructure variables may be picking up other aspects of the quality of the housing unit that were not captured in the other measured attributes of the house. The most likely candidates for omitted variables would seem to be neighborhood effects. Typically the older, more established parts of an urban area have water and sewer connections. These neighborhoods are also more likely to have better schools, roads, parks, libraries, and a variety of other urban amenities. The hedonic property value models may not be able to sort out all these neighborhood effects that contribute to the value of a house. Estimates of WTP are also sensitive to the analyst's choice of functional form for the hedonic price equation (Cropper et al, 1988).

The authors of these papers on hedonic property value models have not yet been able to shed much light on the reasons for the high willingness-to-pay estimates they have obtained. It is particularly difficult to be confident that one has learned much from such models about the willingness-to-pay of poor households for improved infrastructure services. After a careful review of the hedonic property value literature, one may conclude that stated preference techniques are not so bad after all!

<u>How is the information from demand assessments to be used in infrastructure project planning process?</u>

The classification scheme in Table 4 is stylized, but it highlights an important distinction between the need to learn about households' preferences and the use of information from demand

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only will scarcity enable them to receive higher illegal payments for new connections, but they will also receive a windfall profit due to the increased value of their properties.

assessments in the investment planning process. In Case A infrastructure investment decisions are made in a supply-driven planning process without collecting information about households' demand for the services. Top-down decisions are made without feedback from project beneficiaries. The project planner in effect gambles that he knows how households' will behave when offered new services. This approach is the source of many planning disasters.

The planning process can be improved by a move from Case A to Case B. Here the planning process is still hierarchical. The planner collects information on households' demand and then uses it to decide what infrastructure services to provide. In this planning framework the final decisions on choice of technology and level of service are still centralized with the provider of services. Chances of investment planning errors are reduced, but mistakes can easily arise from the planners' misinterpretation of the demand information. Proponents of increased participation often argue that Case B is not much better than Case A because the objective should be to give people a voice in the planning process, the freedom to choose (Cases C and D).

A key feature of a bottom-up planning process is that decision making rests at the lowest practicable level. In Case C there is no need for demand assessment. People simply express their preferences for the types of infrastructure services they want in a bottom-up, democratic planning process. When advocates of participatory planning approaches question the need for "expert" methods of demand assessment, they often have this planning process in the back of their minds.

At first glance Case D implies the most puzzling planning process. Why should the planner collect information on household demand for improved services in a bottom-up planning process? In Case D project planners collect demand information, perhaps in a participatory fashion, to inform a local community decision process. The information from demand assessments is used to structure the set of service options from which households can realistically choose. The provision of networked infrastructure services poses technological and economic challenges that preclude the possibility of offering every household a full set of service options. As just one example, it is not financially feasible to install sewers in a neighborhood and then let

each household decide whether or not to connect to the sewer line. A sewer authority cannot invest this much capital without prior assurance that households in a neighborhood will pay for the service. Households must make a collective commitment to pay for the service before the investment is made.[10]

In summary demand assessment is essential in two quite different types of infrastructure planning processes: (1) a hierarchical, "supply-driven" process in which households have few choices (Case B); and (2) in an iterative, "demand-driven" process in which planners use information on household preferences to structure the "menu of service options" for households. Similarly the usefulness of demand assessment techniques can be questioned from two quite different perspectives. Proponents of Case A argue that demand assessment is a waste of money because they already know what type of services people want and are willing to pay for. Proponents of Case C argue that demand assessment is a waste of money because it is a component or a tool of a misguided, "extractive" investment planning process.

Proponents of demand assessment come from two camps: advocates of Cases B and D. In their support for the use of demand information in the investment planning process, both these groups need to acknowledge that demand assessment remains difficult, and the estimates obtained are often subject to considerable uncertainty.

Concluding Remarks

To summarize, there are three main messages in this paper about the challenge of demand assessment, especially in pro-poor infrastructure projects. First, there is a suite of techniques

[10] These four cases also imply quite different levels of knowledge on the part of infrastructure planners about local political realities and the willingness and ability of planners to be active participants in local political struggles. In Case A the planner needs to know little about the political structure of the communities affected by the infrastructure projects. In Case B the planner needs to assess how local political realities may affect the quality of the demand information collected from households. In Case D the planner needs to know a great deal about the local political environment because he will be engaged with the community in a discussion of service options. Case C is similar to Case A in that the planner does not need to understand the local political situation. His role is more technocratic and advisory: to provide the local community with sound engineering or other technical advice.

available for assessing demand, and, if done well, they can provide valuable information for infrastructure planning. In particular, demand information can reduce the risks of building facilities that people do not want and for which they are not willing to pay for. Regular, periodic demand assessments can provide utility managers with the information needed to respond to changing customer circumstances, and regulators with useful information to assess the performance of service providers.

Second, good information on household demand is often not easy to obtain. High-quality demand assessments are not cheap. In the best of worlds they require sound sampling procedures, good survey administration, and careful econometric analysis. Researchers have to be open-mined and able to see phenomena that do not fit their preconceptions of how households behave. Some poor households may be willing to pay a large amount for a piped water connection because they need it for an income-generating activity in the household. Some rich households may be quite content with an existing shallow well and rainwater collection system, and be willing to pay very little for a piped water connection. Trying to assess demand for infrastructure services with simple rules of thumb or from experiences in other locations is often problematic.

Third, demand for improved infrastructure services is surprisingly heterogeneous. People do not all want the same thing. In a given population some people may be willing to pay a great deal for telephone service, others nothing at all. For infrastructure planning purposes it is information about the distribution of demand across a population that is essential, not simply an understanding of the average or typical individual.

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Table 1: Demand Assessment: Task and Research Tools

Tasks in a Demand Assessment	**Research Tools**
1. Selection of households	Rigorous random sampling
	Purposive sampling
	Informal, convenience sampling
2. Data collection	Secondary data
	Participant observation
	Structured interviews (individual or group)
	Semi-structured, open-ended interviews
	Focus groups
	Participatory community meetings
3. Data Analysis and Report Preparation	Simple Descriptive Statistics
	Econometric model of household demand relationships
4. Checks for validity	Use of multiple methods to cross-check results
	Test-retest experiments
	Multivariate analysis to check for internal validity

Table 2: Description, Frequency of Different "No" Responses (Semarang, Indonesia)

Description of response	Number of times recorded	Percent of Responses
I cannot afford it	52	32
I need to know others' opinion about the program	49	30
I agree but the costs are too high	30	18
Yes, if the costs are reduced	11	7
I have many expenses, children, etc.	8	5
I agree, but the current situation is satisfactory	6	4
I agree, but I do not want to pay in advance	4	2
Yes, if the payment period is extended	2	1
Yes, if participation is mandatory	1	<1
I can pay, but I want to avoid rumors about my wealth	1	<1
Total number of verbatim responses	164	100%

Source: Whittington, Dale. (1998). "Administering Contingent Valuation Surveys in Developing Countries." *World Development* 26 (1), 21-30.

Table 3 – Market Premiums and Estimates of Willingness to Pay from Property Value Studies (US$ per month in the year the survey was conducted)

Author	Study location and survey year	Market premium (US$ per month)	Mean WTP (US$ per month)	As % of mean monthly rent	As % of mean monthly hh income
Piped water					
Megboolugbe	Jos, Nigeria (1981)	$5.23		1%	
North et al	Rural Philippines (1978)		$2.25 / $0.94[1]		1.7% / 0.6%[1]
Crane et al	Bangkok[2] (1993)		$19.22	11%	
Crane et al	Jakarta[2] (1993)		$1.57	2%	
Daniere	Manila[3] (1983)		$30.72		34%
Toilet					
Arimah	Ibadan, Nigeria (1987-1988)	$2.97[5]		44%	
Crane et al	Jakarta[2] (1993)		$1.64	2%	
Daniere	Manila[3] (1983)		$28.74		45%
Daniere	Cairo[4] (1981)		$37.72		34%
Follain et al	Bogota (1978)		$12.27		1.8%
Follain et al	Cali (1978)		$4.66		1%
Follain et al	Davao, Philippines (1979)		$0.93		0.4%
Follain et al	Seoul (1979)		$57.42		7.2%
Follain et al	Busan (1979)		$40.72		6%
Electricity					
Arimah	Ibadan, Nigeria (1987-1988)	$0.80		12%	
Crane et al	Bangkok[2] (1993)		$72.38	43%	

Notes:
1) Results for in-house tap and private well/yard tap.
2) Low income areas of the city only
3) Results for lower middle income homeowners with households of 6 members or less
4) Results for high income homeowners with households of 5 members or less
5) Private toilet

Source: Komives, Kristin (2002) *Infrastructure, Property Values, and Housing Choice*, Draft Dissertation, Department of City and Regional Planning, University of North Carolina - Chapel Hill.

Table 4: Use of the Information from Demand Assessments in the Investment Planning Process

	Project planner **does not** collect information on households' preferences	Project planner **does** collect information on households' preferences
Top-down, supply-driven investment planning process	Case A	Case B
Bottom-up, demand-driven investment planning process	Case C	Case D