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CONNECTION FINANCING FOR WATER SUPPLY AND SEWERAGE IN DEVELOPING COUNTRIES

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TABLE OF CONTENTS

Chapter

Page

Chapter 1

INTRODUCTION

1.1 Scope of Work

Water supply and sewerage facilities impose substantial cost burdens on their users. Some of these costs are assessed when a user connects to the water main or sewer and are referred to as "connection charges." When these connection charges are high and must be paid as a lump sum by users who are poor, the alternative occurrences may be either non-connections or so-called "midnight" (illegal) connections.

Obviously, problems are associated with both outcomes. If townspeople fail to connect, then they forego the benefits of using the system. Not only do the individual households suffer, but the external benefits to the entire community which acrue from eliminating or minimizing contagious water-related diseases and promoting good health are lost. Furthermore, failure to connect results in lost revenue which may make it difficult or impossible for the community to pay for the system and which will result in higher prices for those who do connect, thereby curtailing their use of the water. On the other hand, if users connect illegally, the overall prices are higher yet, and the cost must be borne by those who are legally connected.

This paper examines several mechanisms by which the burden of water and sewer connection charges in developing countries, especially for the poor, can be mitigated. The objectives of the paper are as follows:

(i) To briefly describe connection cost recovery mechanisms in use in the U.S. and in less developed countries (LDCs)

(ii) To assess these mechanisms at an operational rather than theoretical level

(iii) To make recommendations for evaluating alternative mechanisms through further research.

1.2 Connection Charges

Perhaps not widely recognized, the term "connection charge" is imprecise and has several interpretations, both in economically advanced countries and LDCs. At the simplest level, connection charges include only the costs actually incurred for the physical connection to a water or sewer system. In the case of a water connection, the charge usually covers the cost of tapping the street main; installing the corporation stop, meter, and box; and making the connection. A typical cost for this might be $50 to $100. The work covered by such a charge is centered at the point of connection between the public system in the street and the private lateral at the edge of the owner's property. A sewer connection charge is similar, including the wye and stub that connects the private house lateral to the public sewer; a typical cost might be a few hundred dollars.

In LDCs, another concept of connection charges is that they sometimes include not only the connection where public and private facilities intersect, but the private facilities as well, covering such items as the house lateral, yard faucet, sinks, water storage containers in the house, bathing facilities, toilets, bathrooms, and soakaways or septic tanks. In this context, the "connection" presupposes that the user does not already own the facilities that make it possible to use the public system. The connection charges in these cases might range from a few hundred to one thousand dollars or more.

Another interpretation, which is perhaps more common in economically advanced than in developing countries, is that connection charges cover not only the cost of connection but also a portion of the water supply, transmission, treatment, and distribution systems and the wastewater collection and treatment systems. Such charges are sometimes called "availability charges," "density charges," "front footage fees," acreage fees," etc. They are costs that the household must pay to cover not only the physical connection, but also to recover a portion of the major capital works as well. It is not uncommon for such charges to be several thousand dollars. There are at least two philosophies about what they cover: one is that they pay for present construction, and the other is that they pay for future construction. When such charges are used to pay for present construction, the typical scenario is that of an entirely new system that serves the whole community de novo; towns in developing countries that have not had a public water or sewerage system before fall into this category, as well as new subdivisions and new towns in the U.S. On the other hand, connection charges that pay for future construction typically apply to existing systems, where the facilities for serving most of the community are already in place and where new construction is primarily for the purpose of making extensions.

It is not the purpose of this paper to distinguish between these different meanings of "connection charges." Rather, the purpose herein is to examine alternative methods available to households and other users for paying the connection charge, whatever it might include.

Chapter 2

CONNECTION CHARGE PAYMENT MECHANISMS

2.1 Characteristics of Connections and Connection Charges

Water and sewer connections and connection charges have several distinguishing characteristics which are useful as a method of categorization for this paper. With regard to when payment of the connection charge is made, it can be either a lump sum or time payment. With regard to who makes the payment, it can be either the user or others via a subsidy. Finally, with regard to who makes the connection itself, it can be either the utility or others.

These characteristics represent extremes of continua. For example, for the "when payment is made" category, lump sum payments are one extreme while time payments are the other. In addition, only a portion of the connection charge might be paid up front as a lump sum with the remainder paid over time. For the "who pays" category, the user paying all connection charges is one extreme, while full subsidies by others (usually the government) is another. Commonly, the user pays a portion himself and obtains a subsidy for the rest. Finally, for the "who makes connection" category, the utility making all connections including house and yard plumbing represents one extreme, while the user (or his contractor) making all connections including house and yard plumbing is the other.

The remainder of this paper examines several combinations of these three characteristics. Each combination is described along with examples of its use with advantages and disadvantages discussed.

2.2 Alternative 1--Lump Sum Payment by User; Connection by Utility

2.2.1 Description

This scheme involves a lump sum payment by the user at the time of connection. The utility makes the connection. This is the traditional U.S. and LDC method by which existing houses are connected to new systems. The connection charges may be only the costs associated with the actual connection, or they may also include availability/density/frontage/acreage charges.

2.2.2 Advantages

The obvious advantage of this method is to the utility. It immediately recovers its connection costs. It does not need to borrow, and the accounting systems are simple. Because the utility makes the connection, the quality of work is under its control. Leakage or infiltration/inflow from poor connections is minimized. Lump sum payment by the user for connection is an explicit action. The user clearly sees his cost to connect and can make his decision of whether to connect or continue with whatever substitute (e.g., standposts, vendors) is available. The lump sum payments from wealthy users may be used to cross-subsidize other facilities, such as public standposts for the poor.

2.2.3 Disadvantages

The main disadvantage of this method is that the poor may not be able to make the lump sum payment and, consequently, do not connect to the utility. Thus, they are deprived of the system's benefits. If they connect illegally, a host of problems may result. Indeed, the disadvantages with this method are the motivation for this paper.

2.3 Alternative 2--Lump Sum Payment by User; Connection Not by Utility

2.3.1 Description

This method is identical to Alternative 1 except that the user and/or his plumber make the physical connection. Although this method once was common, in most cases it has been replaced by Alternative 1.

2.3.2 Advantages

As in Alternative 1, the utility need not borrow to cover connection costs nor keep accounts for billing and receipts. Additionally, the utility need not concern itself with the equipment, materials, and labor required to make the connections. From the user's viewpoint, the fact that the utility does not make the connection may result in lower connection costs, especially if competition among plumbers is keen. Additionally, the user himself may do some of the work to further lower costs.

2.3.3 Disadvantages

The major financial disadvantage is again that the user may not be able to afford to connect even with the possibility of reduced costs. With this method, the utility loses some quality control, especially when the user participates in the connection. In addition to poor quality control, connections performed by private contractors will probably involve different materials, sizes, fittings, etc., which may give rise to future maintenance problems for the utility. The utility could mitigate poor quality control and dissimilar materials by requiring strict adherence to connection standards and by limiting connection work to reputable plumbers. Such supervision is practiced in Bolivia. Although connection by plumbers may result in lower costs when a competitive market exists, the lack of such a market could result in price gouging and in higher costs.

The two alternatives discussed above involve lump sum payments by the user. This payment scheme is simply not affordable to the poor both in the LDCs and in the U.S. Therefore, alternatives to the lump sum payment in the form of time payments have been introduced in the U.S. and the LDCs. Many variations of time payments are possible, depending on how the payment is made and to whom it is made; several of these are described in the remaining sections.

2.4 Alternative 3--(Subsidized) Time Payments by User Via Commodity Charge; Utility Makes Connection

2.4.1 Description

This method involves the utility making the connection and incurring the connection costs. These costs are then recovered from the user through the tariff structure as a commodity charge (charge per unit of water delivered) along with other capital, operational, and maintenance costs. This is probably the most common method in use in LDCs and seems to be favored by the World Bank. This method is not a common one in the U.S. water industry, although other utilities (e.g., Raleigh, North Carolina natural gas) use it. The New Orleans, Louisiana water utility makes connections "free of charge" and, presumably, recovers these costs through commodity charges. A likely candidate for this method is the case where an entirely new system is installed and many connections are made at the same time. The decision to connect is not based on the ability-to-pay requirement, since no charge is explicitly levied. Although uncommon, this kind of connection also could include private facilities such as sinks and toilets.

The commodity pricing structure can be quite complex. At the simplest level, with metered consumption, total annual costs are divided by predicted water sales to arrive at the water price. The user's bill then reflects consumption times price. His payment covers capital (including the connection) plus operation and maintenance (O&M) costs; the bill does not break out the components separately. In practice however, block rate structures are usually used instead of a single price. In LDCs, the block rates typically increase, i.e., the cost to the consumer for each successive block increases, whereas in the U.S. the rates decrease.

2.4.2 Advantages

From the viewpoint of the poor, this method has the advantage of eliminating up-front connection costs or at least reducing them, thereby making connection possible. This method involves substantial cross-subsidies of connection costs: although the extent of subsidy will depend on the particular price structure, high volume users (commercial, industry) will generally subsidize the connection costs of low-volume (household) users, especially the poor. From the viewpoint of both the utility and the users, this method simplifies collection and payment of connection costs; a separate bill is not necessary. Since essentially everyone is able to connect, public health benefits are realized, and household costs are relatively lower than when only a portion of the community connects.

2.4.3 Disadvantages

The basic problem associated with recovering fixed costs through commodity charges is that revenues are variable. If water sales differ from those upon which prices are based, either a shortfall results (when sales are less than predicted), or the utility realizes a profit. On economic grounds, recovering connection costs through commodity charges results in water prices that are higher than the optimal price, which is based on marginal cost. In theory, the user is sensitive to the water price and bases his consumption accordingly.

When the price of the last unit consumed (the marginal price) is artificially high because connection (and other) costs have been included, nonoptimal usage results.

There is no economic justification for recovering connection costs through commodity charges. This method is purely for financial convenience. Since this method will unavoidably involve subsidies, there is, at least from the point of view of the subsidizers, a question of equity. For existing projects where connections are made over time, cross-subsidies occur primarily from high-volume currently-connected users to low-volume newly-connected users. Anytime a user must be subsidized in order to make his connection possible, a question of revenue shortfall arises. If the user must be subsidized, then his ability to make even the commodity charge payment is questionable. Where his user has an alternative such as public standposts, vendors, or private latrines, an argument exists for denying him access to the system via connection.

2.5 Alternative 4--Time Payment Entirely by User Via Installment Payments; Utility Makes Connection

2.5.1 Description

This alternative is identical to Alternative 3 except that the connection charge is recovered as a periodic payment that is separate from the commodity charge. This is a common method for payment of connection charges in the U.S., but less common in LDCs. The utility makes the connection and incurs the connection costs. The user is then extended credit for the connection charges so that these charges may be paid in installments over time. In the U.S., typical payback periods are less than ten years. The Durham, North Carolina water/sewer utility finances over five years at six percent interest, while the Hartford County, Connecticut utility finances over nine years. These loans may be dispensed from a so-called "revolving fund."

In a revolving fund, capital is acquired at the outset to establish the fund and disbursements are then made over time as required, for example, to finance connections. Payments are made back to the fund from the user, and further disbursements are made (hence the name "revolving" fund). Revolving funds are currently in use in Bolivia and Morocco to finance house connections for water and sewerage. (Interestingly, in those cases, funds are not dispensed to individual home owners, but rather directly to the private contractors performing the connection, thereby insuring that connection is made.)

When a utility provides connection charge financing, sufficient capital must be available to establish the loan fund. These up-front funds may be considerable, as in the cases of large new systems or extensions. In the U.S., capital is usually obtained by the water industry through the sale of revenue or general obligation bonds. Local bond issues in general are not applicable in LDCs because the bond market is quite different from that in the U.S. There is not as much private capital available from which to purchase bonds; additionally, the tax structures of many LDCs encourage private investment of capital, not in public infrastructure but in other markets that promise higher rates of return. Up-front monies to establish loan funds in LDCs are generally provided by the central government or by international lending institutions such as the World Bank.

A recent movement in the U.S. that may have application for financing connection charges in LDCs is the establishment of "infrastructure or public works banks." Because of the recent economic climate in the U.S., especially with regard to fluctuating interest rates, the raising of capital through local bond issues has become increasingly difficult. An alternative is a state-wide bond issue wherein the state sells bonds, thus acquiring a pool of money to establish a revolving fund. The fund dispenses loans to local governments which then repay these debt obligations over time. Such "infrastructure banks" are under consideration in New Jersey (New Jersey Infrastructure Bank) and New York (New York State Water Finance Authority). While capitalization of these public works banks in LDCs might not be viable through the sale of bonds, the concept of a regional, revolving fund may have application there, perhaps capitalized through World Bank loans or central government contributions. Brazil already has such a mechanism established in its "Housing Bank." The capitalization of a revolving fund for a local utility could be provided by loan from such a public bank.

2.5.2 Advantages

This method is applicable both for situations in which large numbers of connections are made at the same time, such as for a new system or for new connections made over time to an existing system. The only difference is the amount of up-front money required to establish the fund and the accounting procedure. The revenue recovered from this method is not sensitive to the sale of water in contrast to recovery via commodity charges. This method involves an explicit charge to the user that is separate from the commodity charge. Thus, the commodity charge can be set in accordance with marginal costs, if desired. Since each household pays for its own connection, the system is equitable.

2.5.3 Disadvantages

The principal drawback of this method is the increased complexity of the billing and collection procedure. Two bills (or an additional line item on the monthly bill) are now required. While this system is equitable, it eliminates cross-subsidies from rich to poor, and it is possible that even with financing, the payments by the poor may be excessive, thereby precluding connection.

2.6 Alternative 5--(Subsidized) Time Payments Via Ad Valorem Taxes; Utility Makes Connection

2.6.1 Description

This method is similar to the previous two alternatives except that the connection costs are recovered by property taxes (based on house value) or assessments (based on frontage or acreage); this system almost always involves cross-subsidies. Ad valorem taxes in the U.S. are usually collected annually by municipalities that have the power to levy taxes. Assessments are commonly made in the U.S. by utilities, most of which do not have taxing power. These assessments are usually paid off through installment payments. The

distinguishing feature of this scheme is that payment is due regardless of whether connection is actually made. Capital expenditures are commonly recovered by this mechanism in the U.S. The rationale behind a front footage or acreage assessment is that the property that has access to the facility is increased in value regardless of actual connection. A similar argument for property taxes holds that the general public is benefited by wholesale connection to water and sewerage facilities and therefore (due to external economies) has an obligation to pay the costs of connection.

2.6.2 Advantages

Connection costs recovery through assessments or ad valorem taxes are not sensitive to water sales; hence, recovery of costs is essentially guaranteed. A persuasive economic argument exists for this method due to external economies (public benefits). The poor user is cross-subsidized by wealthy users and by non-users since they pay whether connected or not.

2.6.3 Disadvantages

The utility must have the power to tax or assess. The total revenue from ad valorem taxes must be disaggregated and a portion given to the utility. This leads to accounting complexities and may be difficult to do in LDCs. Ad valorem revenues are a function of property values whereas connection costs are not; hence, as with all subsidies, there is a question of equity. Periodic updating of property values is costly and complicated, and runs the risk of fraud. When capital costs are recovered by assessments or property taxes, billing and collection systems become complicated. Few LDCs are sufficiently well-organized to levy property taxes.

2.7 Alternative 6--Time Payment Entirely by User Via Home Mortgage; Connection Not by Utility

2.7.1 Description

This method is primarily applicable to homes in newly constructed subdivisions and developments. The developer and builder are responsible for land development, including the installation of water and sewer mains and the construction of private water and sanitary facilities in the house. House connections are made by the developer/builder; connection costs are then passed along to the home owner implicitly in the housing price, which are typically financed through long-term mortgages (20 to 30 years). This financing method is commonplace for new housing both in the U.S. and the LDCs.

2.7.2 Advantages

All new home owners are connected. Connection is not the responsibility of the utility nor does it have to bill and collect connection charges. Long-term financing of connection costs as a part of the mortgage reduces the monthly payment from what it might be with short-term, utility financing.

2.7.3 Disadvantages

The obvious disadvantage is that the method is applicable only for new housing and for those who can afford such housing. Connections are not done by the utility and may be of poor quality using dissimilar materials; the utility loses substantial control. Although long-term financing reduces the monthly payment, the mortgage interest rates may be higher than those charged by the utility, thereby resulting in higher connection costs. This might be particularly true when variable rate mortgages (now popular in the U.S.) are used in high inflation LDCs.

2.8 Alternative 7--Time Payment Entirely by User Via Commercial Loans; Utility or Others Make Connection

2.8.1 Description

This method is common in both the U.S. and LDCs. The utility or private contractors make the connection and bill the user. No financing is available from the organization making the connection, so the user who is unable to afford lump sum payment must resort to local bank loans.

2.8.2 Advantages

The utility does not have to concern itself with financing and accounting problems. Furthermore, the utility, when it makes the connection, retains quality control.

2.8.3 Disadvantages

Many poor individuals may simply not qualify for local bank loans. When many connections are to be financed at the same time, local banks may encounter cash flow problems. Local commercial financing may be more expensive (higher interest rates) than utility-provided financing. Also, commercial financing may be available only in urban areas.

2.9 Other Alternatives

The alternative financial mechanisms discussed above are only a few of those possible. Several others which may merit consideration include:

1. The utility makes the connection and recovers a portion of the costs through lump sum payment and the remainder through in-house financing.

2. The utility makes the connection and then arranges with a local bank for commercial financing to be made available to poor users. The utility in this case controls the quality of the connection, but does not get involved in the connection charge financing. If it guarantees the loans, interest rates may be reduced.

3. Although some cross-subsidy mechanisms have been discussed, many additional avenues exist. For example, "permanent" houses (occupied by higher income families) might be charged more for connection than temporary dwellings.

Chapter 3

DISCUSSION

The above alternatives described different combinations of the several factors that play key roles in recovery of connection charges. These alternatives trade off two or more of these factors against each other. It is clear that there is no single scheme that is optimal for all situations. Rather, the optimal scheme for any specific case depends on its "characteristics," which, in general, constitute the set of objectives and constraints to be considered in selecting the appropriate method for cost recovery. This section briefly describes such factors for consideration.

3.1 Risk of Recovery

The different alternatives provide different levels of assurance with respect to recovery of cost. At one extreme, lump sum payments at the time of connection virtually assure recovery, at least of the connection cost. At the other extreme, recovery through commodity charges is risky. Almost without exception, new water utilities tend to be overly optimistic about the amount of water that will be sold. This gives rise to prices that initially are set too low. Revising prices upward after the first year of sales is extremely difficult. Hence, the utility frequently lags behind in generating revenue to cover costs. Between these two extremes are ad valorem charges and assessments. They seem to provide relatively high assurance that costs will be covered, whether water is sold or not. However, to be successful they requie fairly sophisticated institutional back-up.

3.2 Level of Payment

Clearly, lump sum payment at the time of connection imposes the greatest financial burden on users. Financing by the utility or a commercial bank over a few years results in lower payments that are less burdensome. At the low end of the spectrum is financing through mortgage payments and commodity charges, since the term for payback is so much longer than with the other alternatives. However, the total amount the user must pay is in inverse relation to the level of the charge, with lump sum payments lowest and commodity/mortgage payments highest. In general, poor people are usually not much concerned with the total amount they pay but rather with keeping the level of payments as low as possible, which argues in favor of commodity/mortgage charges.

3.3 Subsidy/Equity

The subsidy/equity tradeoff is a universally serious issue in poor countries. Lump sum payments and utility-financed connection costs are equitable since users pay for the benefits they receive; mortgage payments may similarly require each user to pay for his/her own connection, although the possibility of cross-subsidies also exists. Commodity charges and ad valorem taxes, on the other hand, involve cross-subsidies from rich to poor (assuming that the rich consume more water and live in more expensive houses than the poor). Since

this issue is so important, it is possible to arrange nearly an infinite number of combinations of charges to meet the precise social and financial objectives of the community. For example, all users can be required to pay at least some minimum portion of their own connection costs, whether through lump sum payments or financed. The remaining portion can be recovered through commodity or ad valorem charges to meet the social obejctives of cross subsidization. The key question, of course, is to decide the portions to be recovered by each mechanism.

3.4 Accounting/Institutional

The final key factor which may constitute an overriding consideration for all the others is the institutional reality. While ad valorem taxes have relatively low risk and meet the social goal of cross-subsidy, they require a level of institutional development and sophistication that is frequently lacking in LDCs. Clearly, the popularity of commodity charges is based to a large extent on their institutional simplicity.

In the final analysis, each utility must decide for itself the optimal combination of these factors. This paper, therefore, does not provide the "right solution" to a tough problem, but rather attempts to inform decision makers of the key factors to be taken into consideration in selecting a mechanism for recovering connection costs.