

Cost recovery in water supply in developing countries

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This article discusses trends in cost recovery policies, costs, consumers' ability and willingness to pay, water tariff structures, fee collection and financial management. Cost recovery, operational technology and appropriate institutions are the key requirements of sustainability. Commonly practised water vending and reselling, while a good indication of actual willingness to pay for water, is a very costly system. In practice free water supply benefits the rich. Progressive tariffs and innovative collection methods should be used instead.

Many developing countries have considered water supply a social service since their independence. This has meant adopting a policy of supplying water free or almost free of charge. External support in water supply has concentrated on constructing new schemes, an attractive option in many respects but one which has meant that the operative level of existing schemes has deteriorated. If already constructed schemes were kept operative, many developing countries would have no funds left for new investments.

To be able to introduce cost recovery, some basic conditions must be fulfilled. Firstly, prices must be affordable to consumers but they should also reflect the state of the national economy. Secondly, consumers must be willing to pay for water services. Thirdly, appropriate water charges and tariff structures must be developed. Fourthly, the charges must be collected and channelled into the intended uses (see Figure 1).

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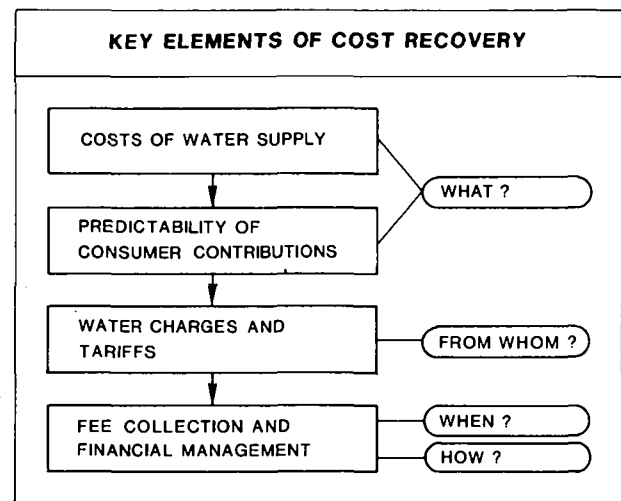


Figure 1. Approach to cost recovery with sequential key elements.

At the beginning of the International Drinking Water Supply and Sanitation Decade cost recovery issues were given little attention. In 1980 the United Nations prepared guidelines for water charges and regulations. They recommended the 'users pay cost of service' principle for household and industrial water. In 1984 a consultative conference on the experiences of the first years of the Water Decade was organized. Most of the participants agreed that in rural areas water supply tariffs should cover at

least operation and maintenance costs, whereas the World Bank argued strongly that costs should be covered fully to generate future resources.

During the first part of the decade some bilateral agencies such as the Federal Ministry for Economic Cooperation (BMZ) of FR Germany, the Swedish International Development Authority (SIDA) and the United States Agency for International Development (USAID) stated in their sector policy papers that at the least all running expenses should be covered. However, by 1988 the Nordic bilateral agencies had implemented this policy only to a minor extent, if at all. As regards non-governmental organizations (NGOs), missionary organizations have a long tradition of requiring initial contributions from consumers before starting any development projects.

The third international conference of external support agencies was held in Interlaken, Switzerland, in October 1987. About 30 external agencies attended, and six key concepts were identified, cost recovery being one of them. It was agreed that in urban areas full cost recovery is a long-term objective and in the short run operation and maintenance costs, including replacement of equipment, should be recovered, at least. In rural areas the beneficiaries should gradually assume responsibility for operation and maintenance and in the long run for the replacement of equipment (WHO and SDCA, 1987).

Since 1985 the WHO has organized a number of conferences on institutional development with the focus on cost recovery. Principles and models have been presented separately for agency-based and community-based systems (WHO, 1989). As pointed out by Laugeri (1987), the problem is no longer whether to charge but deciding to what extent costs should be covered by consumers. During the last few years many external support agencies and governments in developing countries have reconsidered their cost recovery policies and started seriously searching for means of implementing cost recovery in practice. In a way this can be regarded as one of the main achievements of the Water Decade.

What costs should be covered?

The WHO (1986) gathered per capita construction and operation data for several types of technologies in different regions of the world. The individual countries' per capita and per unit costs showed very large variations. The median construction cost of rural schemes was about \$40 per capita compared to figures of \$55 per capita in urban standposts and \$80 in urban house connections. Based on different

sources Okun (1987) concluded that a system with public standposts and pit privies costs \$5–10 per capita annually. The large variation in costs can be partly explained by different conditions and partly by different calculation methods. The actual costs may be underestimated since not all the components, eg personnel costs, are included. Cost data must therefore be regarded sceptically.

Selection of service standard determines costs. The selection depends on overall development targets. In a technical sense the design criteria and the level of technology are decisive. In rural areas water consumption is often far less than the commonly used design value of 30 l per capita per day in handpump and public standpost systems. The same is often true with a higher service standard. Since 50–80% of the costs of construction are attributable to the network, it should not be overdimensioned. On the other hand, due to leakage and other wastage the values have to be on the safe side.

The costs of the selected technology can be contained by (i) intersectoral action, (ii) decentralization, (iii) privatization and divestiture, (iv) metering and minimizing non-revenue water, (v) preventive maintenance, and (vi) community-managed operation and maintenance.

The concept of preventive maintenance can be difficult to introduce in developing countries due to the lack of a 'future orientation' among consumers. Through community management it is possible to save some costs due to the decrease in the need for professional staff and mobile transportation. Besides, community management can increase the sense of ownership and responsibility among the users, thus improving their willingness to maintain the system.

Affordability and willingness to pay

It has often been stated that the cost of water supply should not exceed 5% of family income. Yet there is no actual evidence for the feasibility of this 'rule of thumb'; moreover, the use of such a figure is questionable, as noted by Saunders and Warford (1976). The 'ability to pay' criterion can, at best, be only a broad guideline and represents an external assessment (WHO, 1989).

Detailed socioeconomic surveys are too laborious for practical water supply planning, but quick housing and housing material surveys could at least be made. The market value of a house in developing countries correlates roughly with the average annual income of an extended household. In developing countries such as Kenya and Tanzania agriculture and livestock raising increase the potential ability to pay for water. Affordability and payment of water

rates are closely related to income generation by women.

In economics a consumer's willingness to pay is defined as the maximum amount he or she would be willing to pay for a service rather than do without it. Recently it has been strongly argued that it is not affordability but consumers' willingness to pay for water that is crucial.

Vending and reselling

The widespread practice of water vending in today's developing world indicates a high level of affordability and willingness to pay for water. Although vending (transporting water and selling it to consumers door-to-door) is an old tradition all over the world, fairly little attention has been paid to its role in water supply.

Recently the Water and Sanitation for Health (WASH) project has carried out studies on water vending in a number of countries. These studies show that substantial amounts of money are spent on vended water. Vendors do not, however, earn large profits (Whittington, Briscoe and Mu, 1987; Whittington *et al.*, 1989). Reselling of water in this context means selling water from a private connection or source without any controls. Customers typically come and collect their water from resellers. The prices of resold water are high enough to cover the costs of the resellers but typically lower than those of vended water.

Other methods of predicting user payments

Consumers' willingness to pay for water can be predicted by: (i) asking consumers in advance about their own estimate of their future willingness; (ii) looking at the previous actual behaviour of consumers in similar or related fields; or (iii) monitoring consumers' actual behaviour in real situations. The first option can investigate general willingness or use specific preplanned questionnaires such as the contingent valuation (CV) method. The second option can include: improvement of housing facilities by inhabitants (part of the affordability criterion), traditional water vending and reselling, source selection criteria, or services in similar geographic areas, eg parallel surveying.

Contingent valuation method

This method asks households or consumers directly to state their willingness to pay for water, or their likely reactions to price changes. It has commonly been asserted that this kind of questionnaire approach in estimating an individual's willingness to

pay is useless (eg Saunders and Warford, 1976). According to Whittington, Briscoe and Mu (1987) a study in Haiti was the first systematic attempt reported to apply the CV method to estimating willingness to pay for a public service in developing countries. The method was still in 1989 being tested in Nigeria and Brazil. It has several advantages compared to other methods. It is inexpensive and quite fast, which is particularly important in developing countries.

Nevertheless, a number of studies support a fairly critical view of the reliability of the CV method. There has been and still is a fair amount of scepticism about whether consumers are able and willing to give reliable answers. In rural areas with only communal water points, decisions are made by the community rather than by individual households. However, the reliability of the method should be compared with that of other tools of water supply planning. For instance, design criteria for specific water consumption are often overestimated. By accumulating experience of the CV method and comparing the results with actual consumer behaviour, it may be possible to make limited indicative predictions.

Actual behaviour

There is some evidence that people are more willing to pay for a piped than a point-source water supply. The level of service and the willingness to pay have probably quite a lot to do with the cultural and social values of a given community or individual consumers. In many cases consumers' willingness has more to do with attitudes than their ability to pay. In the developing world, even in quite primitive conditions, people are willing to pay a lot for different types of rituals which they find important.

The author's view is that an individual's willingness to pay changes with time and is difficult to predict in changing situations. Overall willingness to pay increases with time along with practical experience gained. Decision making by an individual does not necessarily follow externally rational economic rules; consumers have their own criteria in source selection. Reviewed against their own background and values their decisions can, however, be regarded as rational.

There are a number of possible factors which can affect an individual's willingness to pay (see Figure 2). These can include policy, environment, technical, economic and financial, social and cultural, personal as well as administrative and organizational factors. The impact of each factor can vary a great deal and is subject to prevailing conditions. In practice, the consumer applies only one or two criteria to

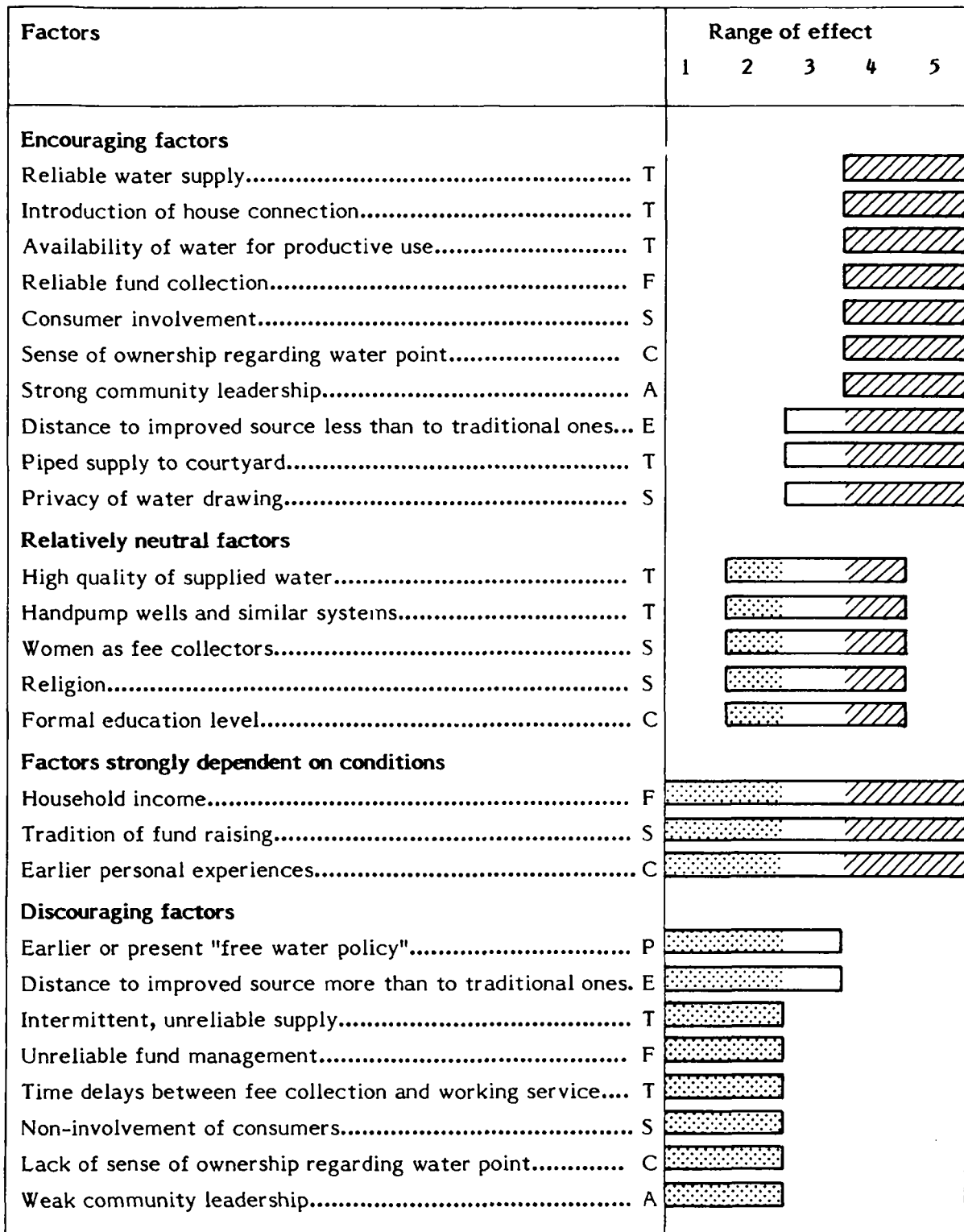


Figure 2. A list of factors and the possible range of their effects on consumers' willingness to pay for water in rural areas of developing countries.

Key: 1 very discouraging, 2 discouraging, 3 neutral, 4 encouraging, 5 very encouraging.

Type of factor: A = administrative, C = consumer-dependent, E = environmental, F = economic and financial, P = policy, S = social and cultural, T = technical.

Source: Katko (1989), based on open-ended interviews of 30 persons.

his or her decision, but these criteria are different in different cases (Rinne, 1989; Simon, 1958).

Consumers' willingness to join the system

Surprisingly, the willingness-to-pay criterion has often been considered to cover regular payments only. In the case of piped supply with individual connections, the decisive factor is the willingness to join the system. When people see that the system will be realized, their willingness to join increases. This typically happens during and after construction. Once people have joined the system by paying a connection fee, their willingness to pay for actual consumption is self-evident. Thus the willingness-to-pay criterion is more valid for covering recurrent costs on a regular basis whereas the willingness-to-join criterion involves investment costs.

Charging and fee collection in agency-managed systems

Water charges are meant to improve or guarantee allocative efficiency, equity, financial requirements, public health, environmental efficiency, acceptability and understanding, simplicity, employment, etc. These objectives are at least partly contradictory, therefore some compromises are evidently needed. Charges can be levied according to the capacity reserved for each customer or according to actual water use. The first option means charges based on property values whereas the second typically involves metering of actual water consumption. In the first case flat-rate charges are used. The second case can include a uniform consumption charge, a declining or increasing block tariff, a minimum charge or fixed charge and different combinations of these.

Flat rates

Since flat rates are not related to the amount of water used, they typically lead to wastage. However, flat rates are simple to administer and revenue collection is fairly easy.

Declining and increasing blocks

In the USA declining block rates have been most popular. This tariff structure was aimed at giving an incentive to industries which use large quantities of water. Since large water users have lower peak factors, decreasing block rates have been considered justified. The relative share of declining block rates has fallen, but the method is still overwhelmingly used in the USA. In Canada fixed charges and decreasing blocks are almost exclusively used. The

general trend is away from decreasing block pricing in the developed countries. Experiences from Japan and Italy show that progressive tariffs have reduced water consumption quite dramatically (OECD, 1987).

In 1983 the WHO (1986) made a study of the use of tariffs in developing countries. In the Americas over 80% of countries used progressive tariffs. In the Eastern Mediterranean and Southeast Asia the figure was about two thirds. In Africa more than half of the countries and in the Western Pacific region about 40% used progressive tariffs. In the late 1970s Chappey (1980) made a survey of water tariff systems, mainly in Francophone Africa. In eight of 23 countries increasing block charges, and in five countries declining block charges, were used. The two surveys indicate the increasing trend towards progressive tariffs in Africa. They also indicate that tariff structures in developing countries apply efficiency criteria relatively more than in developed countries.

Minimum block consumption

In the case of progressive tariffs the minimum consumption of the lowest block is of special interest. The author's view is that in developing countries the minimum charge should be based on consumption of about 3–5 m³ per household per month, which in the case of a ten-member household corresponds to a per capita consumption of 10–15 l per day. This is valid mainly for consumers relying on public standposts. However, examples from different developing countries (eg Chappey, 1980) show that the minimum consumption criterion is often much higher. It is probably based on design criteria instead of actual consumption. In practice no water tariff should consist of too many blocks, otherwise the calculations and administration will be too complicated and costly.

Level of water charges

The low level of water charges and the lack of continuous adjustment of tariff level are big constraints in developing countries. Any increase in water charges must typically be decided at cabinet or other high level. Water agencies should have adequate autonomy to adjust tariffs when necessary. Such an arrangement has been achieved by the Zairean water supply authority, for example.

In developing countries geographically uniform national tariffs are typically used. Saunders and Warford (1976) noted that the pressure towards these charges is caused by emotional appeals and by the consolidation of the water authorities into large

regional or national water boards. Thus we face institutional questions. However, geographically uniform tariffs do not take into account differences in local conditions and the production costs of water. If less efficient systems were cross-subsidized by the more efficient ones, total tariff levels would increase. Yet in the case of the minimum consumption category geographically uniform tariffs are justified.

Tariff structures should be such that the minimum consumption by the urban and rural poor is cross-subsidized by other consumer groups. Water should not be free to any group of consumers except in emergency cases. Even a small charge can be important to avoid wastage of water. For higher consumption progressive tariffs should be favoured.

Metering

Today's developed countries show interesting trends in water metering. The International Water Supply Association (IWSA) made a study of water prices in their member countries. A clear majority of water charges were based on metering of individual connections. Norway and the UK are exceptions where 95% and 99% of the charges are based on estimates instead of metering (Stadtfeld and Schlaweck, 1988).

Due to intermittent supply, metering is often difficult in developing countries. In water intakes and treatment plants master meters should be used. For the waterworks it is important to know, at least, the

biggest consumers (macro-metering). Metering of individual connections is a further step in development.

Fee collection and financial management

In agency-managed water supply systems banking facilities are normally available, and thus payments can be regular, mostly on a monthly or bimonthly basis. Instead of actual fee collection the problems are more often related to inefficient billing, meter reading and accounting management. In billing cubic metres and gallons can be mixed up. Moreover, there are a number of examples where highly paid officials do not pay their own water bills. This can be explained either by their powerful position or by the lack of a disciplinary management and disconnection policy.

Charging and fee collection in community-managed systems

In community-managed systems the biggest constraint upon cost recovery is often the non-existence of banking facilities and the non-applicability of 'conventional' fee-collection systems. The primary options for fee collection include community fund-raising, regular charges, spot cash payments and down payments. Figure 3 gives a summary of these options. The approach is a modification of the one presented by van Wijk-Sijbesma (1987).

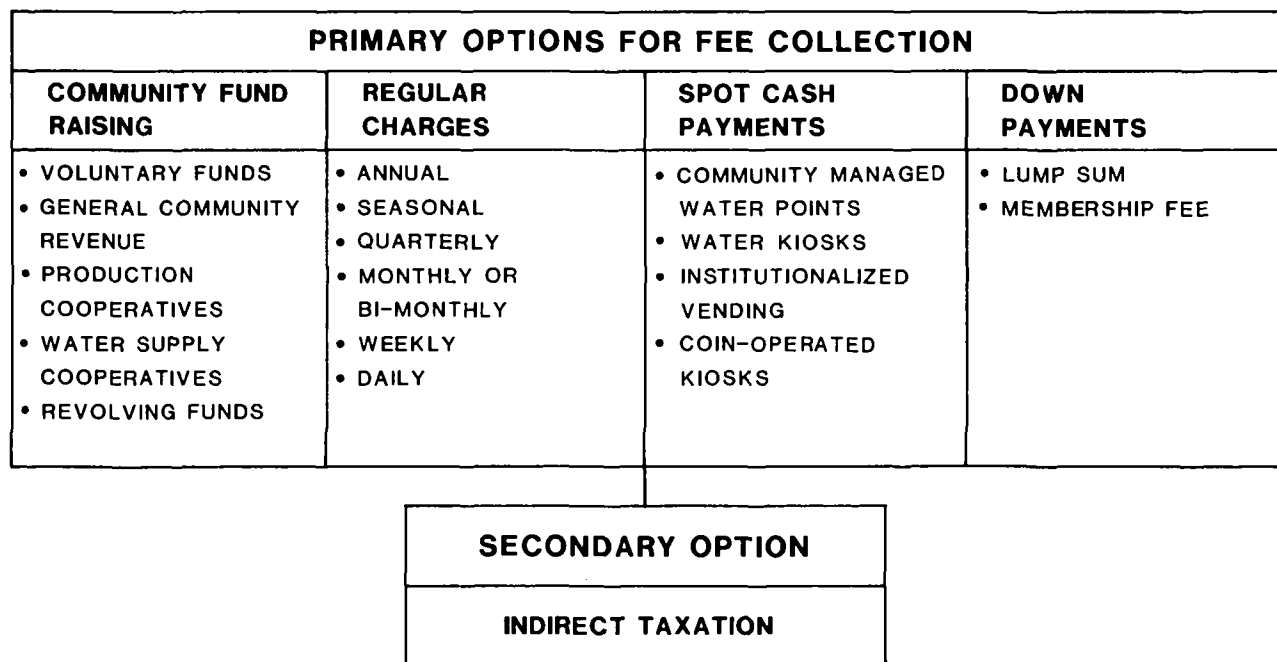


Figure 3. Primary options for financing community-managed water supply in developing countries include community fund-raising, regular charges, spot cash payments and down payments. Taxation is regarded only as a secondary option.

Community fund-raising

Community fund-raising can be realized through voluntary activities or the use of general community revenue, production cooperatives, water cooperatives or community revolving funds. Community contributions in the form of time, labour, skills and materials are important. However, this paper concentrates on the monetary contributions.

Voluntary funds can be raised by local leaders, community groups or a water committee. Consumer contributions are in principle voluntary, but success can vary a great deal. The methods used can include, for example, lotteries and entertainment. In some cases voluntary fund-raising has been used for political purposes and due to misuse has decreased consumers' willingness to contribute. Besides, these funds may create a problem of continuity.

In some countries communities are used to managing their own enterprises such as the communal field, village shop or flour mill. Because water is not necessarily considered a high priority, this revenue tends to be used for other purposes. The revenue may fluctuate and be quite uncertain.

Production cooperatives are typically based on the production of one or a few products such as tea and coffee. Their management and organizational experience could be utilized in water supply development at a later stage. The disadvantage of this approach can be that cooperatives function on the basis of shared economic interest, and therefore the service might not necessarily be extended to everyone in need of it.

In water supply cooperatives each member has one vote and contributes accordingly. The cooperative board takes care of practical management, possibly assisted by a part-time manager. Each member pays a membership (connection) fee, an annual fee and a metered or estimated consumption fee. It has been reported that water supply cooperatives in developing countries are common at least in Argentina, Bolivia and Chile, in the Philippines and in the Middle East.

A revolving fund is formally defined as a fund that is continually replenished as it is used by income generated by the activity that it finances. A revolving fund can be established at the national, regional or community level. It aims at financing individual community projects. The funds that are loaned out are recovered by the beneficiary community. The repayments are reloaned for financing other projects.

Regular charges

The convention has been that water is billed for and

paid for once a month. In community-managed systems meter reading and billing can take place less frequently. In the rural areas of developing countries the cash available to consumers, farmers and cattle owners often depends on the time of year. In such cases seasonal charges could be considered. However, once unpaid charges accumulate into a large sum there is the risk that consumers will come to regard the total as beyond their means. Instead of individual house connections consumers can have a common connection. A group of users is collectively responsible for paying the bill and decides how to divide the costs.

Spot cash payments

Spot cash payments are charged by systems based on vending, reselling, water kiosks or coin-operated standposts. In spite of its wide use in developing countries, the existence of vending is often underestimated. The existence and limitations of vending should be honestly admitted. Water kiosks can be run on a commercial or a community basis. For instance, in Burkina Faso the urban water company has introduced a strictly managed system where non-payment will be immediately punished.

In many countries public toilets and baths are managed by permanent caretakers who maintain the facilities and collect the spot fees paid by customers. Toilets are located near railway stations, bus stops, markets, hospitals and other busy places. In Thailand the Provincial Waterworks Authority had a pilot project on developing coin-operated standposts. Instead of coins some countries have introduced ticket systems. There are also a number of examples of vandalism against these selling units. These machines are viable if maintenance and control at a reasonable distance can be organized.

Down payments

Initial contributions by consumers or communities can be monetary or non-monetary. The first types are here called down payments. They can be lump sums, for instance, for maintenance or spare-part purchase. They can also be membership or connection fees such as those charged by cooperatives. However, down payments can cause problems. The government is not necessarily able to give support to all those who have paid lump sum contributions. Another drawback could be that down payments do not introduce the idea of permanent payments to consumers.

Taxation

A taxation system is simple to use if all households

receive the same level of service. Typically this is not the case. Although taxpayers and customers are often the same people, the effects of direct charges and taxation are very different. Because taxation is not based on the actual use of water services, it is considered only as a secondary option.

Discussion

We find that cost recovery is one of the key requirements in developing reliable water supply services. Cost recovery is also highly dependent on operational technology and appropriate institutions in the sector. Together these three elements form the basis of a sustainable water supply.

Water supply systems will be sustainable only if sufficient resources are recovered to keep them operational. In the long run it is absolutely necessary to generate resources for repair, rehabilitation, replacement and investment. Covering only operation and maintenance costs is not adequate. If, and when, sustainable development becomes a generally accepted goal, full cost recovery should be achieved in water supply and sanitation. The need to implement sustainability and cost recovery leads to the fundamental question: what roles should each of the main parties in water supply development play? The parties are the central government, the local administration, the water agencies, the consumers and the private sector. Each party should take care of those activities it is best at.

In the home countries of the supporting agencies the role of the central water authority is quite limited. It concentrates on the most important policy issues, guidance, promotion and monitoring. The systems are run by more-or-less autonomous municipal, private, public or otherwise-owned water utilities. Tariff levels can be set either by the utilities themselves or by local municipal councils. The general principle is that tariffs are designed and set separately for each system. This means automatically that, for instance, geographically uniform charges are not used. Thus there is a lot that developing countries could learn from the experiences of the more developed ones. However, as the examples on progressive tariffs show, developed countries also have interesting lessons to learn from developing ones.

Some external support agencies regard water supply purely as a social service, stressing the important issues of equity, basic need and health, but forgetting the actual costs involved. Other agencies regard water supply as a social-infrastructure service where both social and infrastructural issues are stressed.

The author's view is that, by proper formulation of water tariffs and charges, it is possible to supply the minimum basic amount of water for the rural and urban poor at a highly subsidized price. However, water service should be free only in exceptional circumstances. Any volume exceeding the minimum consumption level should be charged in accordance with a progressive tariff so that the total collected revenue will cover costs fully. Therefore the application of economic principles is not, as often erroneously believed, socially unjust.

Conclusions

The following conclusions on cost recovery in water supply in developing countries can be drawn:

- Cost recovery, operational technology and appropriate institutions are the key requirements for any sustainable development in water supply and sanitation.
- The policy of supplying free or almost free water has often produced very inequitable results. Governments have been able to arrange water supplies only to some consumers. This service benefits mainly the better-off consumers instead of the urban and rural poor. A better and more equitable method would be to collect water fees from middle-level and large consumers via progressive tariffs and cross-subsidize the poor consumers.
- The best evidence of consumers' actual willingness to pay for an operative service is the commonly practised vending and reselling of water. This door-to-door service is a challenge to water suppliers.
- Innovative fee collection is needed. In addition to monthly billing many alternatives exist, from spot cash payments to seasonal ones. In rural areas consumers can make largely non-cash contributions. In rural areas community-managed institutions should be developed.

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