

Financing River-Basin Organisations

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Abstract

The paper considers how reliable sources of funding can be found, for new river-basin management organisations, if these are established in the economic conditions of developing countries. These questions are considered against the general context of the gradual global movement towards the "users pay" concept, which is already familiar in the irrigation sub-sector in many countries. Aspects discussed include the types of costs that will have to be met, possible sources of funds and the difficulties or constraints associated with them, methods by which the liability for payments can be assessed, methods available for compliance on the income side and for control and accountability on the expenditure side, and the impacts that charging systems may be expected to cause.

1. Introduction: uses and demands for water

It has become quite widely accepted that countries should be aiming towards comprehensive management of water resources through organisations based on river basins or aquifers. (There may be other ways of managing the resources of a basin, but this paper addresses the specific situation where a country has decided that it wants to assign an organisation for this management purpose.) Such organisations will not develop effectively unless they can be provided with adequate financial resources.

In this respect, the experiences of the richer countries may not offer much useful guidance to the developing countries, especially the poorest ones. Their patterns of water use are radically different. Table 1 shows the breakdown at the broadest level, among the three biggest user sectors. In the rich countries, industrial users predominate. In the poorest countries, the industrial category is not yet very significant, whereas as much as 89 percent of all the water abstracted is used for agriculture.

Table 1: Sectoral consumption of water

Units: % of annual freshwater abstractions

Sector [†]	Agriculture	Domestic	Industry
Wealth category [‡]			
Low income	89	4	7
Lower middle income	74	8	18
Upper middle income	73	12	15
High income	40	15	45

These patterns of use illustrate two obvious factors that have great influence on the financing situation. Firstly, in a basin where the majority of users are small agriculturists, they are usually extremely numerous, forming a large majority of the people in the poorest countries. Secondly, the productivity of water used in agriculture is usually very much lower than that of water used in industry. So when we deal with industry we are usually dealing with a relatively smaller number of people who are engaged in relatively profitable activities, while, when we deal with agricultural users (in developing countries), we are probably dealing with large numbers of people whose financial resources are very meagre.

We can note also (although it is far beyond the scope of this paper) that the low productivity of irrigated agriculture has well-known links with the agricultural production policies of rich countries, with market access problems for poor countries, and other issues of global scale which no developing country can modify much by its own choice of policies.

Domestic water supply is different again. We cannot compare it with other types of use on the basis of productivity. Domestic use is essential for human health and indeed for survival. So we supply water for social objectives as well as for productive objectives, and these are not really comparable in a financial sense.

Even that distinction is not as clear as we might like. The four basic human needs for water—drinking, washing, cooking, and sanitation—are certainly essential, but domestic uses of water can include many non-essential uses. When we compare the consumption patterns of the rich and poor countries, this becomes very evident. As Table 2 shows, in the rich countries the amount of domestic water consumed per person is very much higher than in the poorest countries. Also, within each country there are similar variations of consumption, related to poverty or affluence.

Table 2: Abstractions per person

Units: m³/person/year abstracted from the natural systems

Sector ▶	Agriculture	Domestic	Industry
Wealth category ▼			
Low income	332	16.4	26.7
Lower middle income	339	36.3	81.7
Upper middle income	332	55.9	68.9
High income	386	146.5	442.2

In Table 2, we see that in the poorest countries the abstractions for personal use are minimal. We may estimate the basic needs at about 30 m³/person/y, so the figure of 16.4 indicates that many people are obliged to satisfy those needs in ways that do not reach the formal statistical system. These are people who have to bathe in open bodies of water, carry household water from local streams, and in other such ways that are omitted from the data.

Table 2 also shows that, around the world, the gross amounts of water extracted for agriculture are quite similar. Here again we see that (although irrigated agriculture

is often blamed for water scarcity) the uses in poor countries are lower than in rich ones. We can also relate these figures to basic human needs. At the minimal nutritional levels required for sustaining human health, in a society where the basic food is a cereal crop such as rice or wheat or maize, it takes in the order of 300 m³/person/y to grow that food if the water is applied very efficiently.

Of course that figure does not reflect directly the abstractions from the natural river systems, since much is supplied by rain, and also most of the irrigation water is not applied at highest efficiency; nevertheless, the need to satisfy a certain basic food requirement applies to us all, and it is good to note that this need is in the order of ten times bigger than our basic need for domestic water.

These widely differing patterns of water abstraction and use have various implications for the effectiveness of financial policies as charging tools. In the affluent countries, where personal domestic consumption is very much more than the amount required for satisfying the four basic needs, a charging policy may have significant impacts on consumption. A high charge may make people reduce frivolous or non-essential uses of water, or may just make them more conscious about water costs, and therefore induce them to change their behaviour, in ways such as becoming quicker to attend to leakages.

But in countries, or families, where domestic consumption consists simply of satisfying basic needs, a charging policy is not so likely to have those impacts. Supplying a basic need such as drinking is not something about which the "user" can exercise much choice. If the cost increases, the basic consumption will have to stay roughly the same. Any financial effect on that user will appear in some other direction, by not spending on some other item that must appear as less vital.

When we look at the productive applications of water, we can find many illustrations of the relatively low financial productivity of agricultural water. For example, Schiffler and others (1994) analysed the economics of water uses in Jordan, a country with one of the world's lowest levels of water resources per person. They reported that the average productivity of water in industry was 11.2 dinars / m³ (about 16.8 US dollars / m³ at the bank exchange rate then) whereas the average productivity of water in agriculture was 0.28 dinars / m³, or 2.5 percent of the industrial level.

Within the agricultural sector, there are further huge variations of productivity. The productivity of basic cereal crops in the developing countries is usually around the equivalent of a few US cents per cubic metre, while fruit and vegetable crops, especially those for export, may show productivity as much as 100 times greater than the cereals. In the Jordan case, Schiffler and others found that the productivity of grapes was 130 times more than that of wheat.

So here again we have the problem of basic needs. In the poorer countries, or poorer environments within any country, these low-productivity cereal crops—rice, wheat, maize especially—dominate the agricultural scene, and are not necessarily grown for the market. In the studies of five small irrigation systems reported by PMI-Burkina Faso (1997), it was found that the proportion of products marketed was 25.6 percent. In the system with least road access, this fell as low as 5.3 percent. The rest was household consumption.

To the users in those villages, the financial productivity of water must seem an utterly irrelevant concept. The idea makes sense (to the user of water) only in the context of marketable alternatives. Of course there is a governmental or "public interest" viewpoint that may suggest something else, concerning optimal uses of a scarce national resource. But if we feel that we may be moving towards any kind of user-based financing system, it seems that we have to try to understand how these things seem from the users' perspective.

Briscoe (1997) has emphasised particularly the idea that there can be a high opportunity cost associated with agricultural uses of water. The nub of this argument is that, where water is not abundant, low-productivity applications of it, for example to grow cereal crops, deny that water to higher-value potential users. He points out that prices charged to agricultural users are, typically, around 10 percent of those charged to urban and industrial users for comparable volumes delivered.

This is an argument that is easier to act upon in a mixed agricultural/industrial economy (or "middle-income" economy), such as some of those in South America; but it seems to carry less weight in countries where 89 percent of the utilisation is agricultural and the opportunities for transfers of use are correspondingly few. The concept of opportunity cost depends on the existence of such opportunities.

On the other hand, it is not safe for poor countries to treat the opportunity cost argument as irrelevant to their situation. In recent times, several countries in east and south-east Asia (Thailand is an example) experienced rapid economic growth continuously for more than a decade. A consequence of this was the arrival of many new investment opportunities, some of which would depend on transferring of water from a traditional low-productivity use into one of the new uses where its value (in economic productivity terms) would be some orders of magnitude more. In the absence of sound institutional mechanisms for responding to these opportunities through orderly, voluntary transfers and compensation of the prior users, these changes have occurred but sometimes at high social cost.

In the agricultural sector of developing countries, the problems of how to finance irrigation services, and how to collect irrigation service fees from users of agricultural water, have been prominent issues throughout the 1980s and 1990s. It cannot yet be said that the issues are satisfactorily solved. This experience should make us aware that the establishment of new basin organisations in developing countries is going to face similar difficulties.

Financing urban domestic water supplies is not any easier than financing irrigated agriculture. The World Bank (1993) reported its experience in lending for water projects in these terms (referring mainly to non-agricultural uses):

"The Bank has maintained the policy that cost recovery should be sufficient to pay both for operations and maintenance and for a fair return on capital investment... cost recovery was rated as unsatisfactory in 80 of 114 projects. And, in 78 percent of countries receiving water supply and sanitation loans, financial covenants were not fulfilled. In 49 of the 120 water supply and sanitation projects, fees were not raised enough to meet financial requirements due to government constraints."

We can perhaps make a guess, that these problems of investment projects whose cost-recovery conditions are not implemented in reality, happen because such projects are prepared in the bureaucratic domain, and subsequently meet strong resistances in the political domain, due to neglect (in project preparation) of the weight of the people's views. This can only increase, as more countries are inclining towards democratic modes of government.

2. Components of costs

The financing question, for river-basin organisations, depends of course on the tasks that each country may decide its river basin organisations should perform. The scope of basin organisations falls into three broad categories, which may overlap in some countries:

- regulatory organisations, which oversee the management of water, and make rules which service-providing organisations have to follow, but have no other role in service provision;
- organisations which own the principal structures and facilities for water supply, but do not provide water supply services directly;
- organisations that provide water supply services directly to the users.

It may appear that the first of these, regulation only, is a relatively cheap alternative. If we adopt that kind of organisation, perhaps if the budgetary issue will be small and easily manageable. But that is not the case. If regulation is to be done well, it needs a significant amount of finance. A short list of the primary regulatory functions would include:

- monitoring of the quantity and quality of water in all rivers and other natural water bodies in the basin;
- conserving and protecting the watershed;
- making rules about abstraction, uses, disposal and pollution;
- supervising the application of a system of water abstraction rights or licences;
- ensuring compliance with rules through monitoring of activities, public information programmes, court processes, etc.

These tasks amount to a quite formidable financial commitment. They are most urgent in basins where water resources per person are already low. On the other hand, an organisation which has no service delivery function does not have a direct customer base from which a proportion of funds can be sought. These considerations show that the design of basin organisations cannot be separated from the question of how they will be financed, at a level sufficient for them to discharge the tasks that are assigned to them.

The movement towards establishing river-basin management organisations is coming at a time when governments, in both rich and poor countries, have been trying to reduce the amounts they budget for providing water services; so the idea that these organisations might be funded from the budget of a central government ministry may not be received well in many countries. In the developing countries, the main feature of this trend has been the numerous programmes of irrigation management transfer, which began in a few countries such as the Philippines and Colombia in the middle 1970s and have since become very general, indicating a widespread perception that central subsidising of water services is difficult to sustain.

The experience of irrigation management transfers in the past 20 years has however shown some of the difficulties that can occur when governments try to transfer the responsibility for certain tasks and their related expenditures from a service-providing organisation (such as a government irrigation department) to an organisation of service-receivers.

We can distinguish four kinds of costs that are faced by water organisations which are service providers:

- capital investment (constructing facilities for capture, conveyance and distribution of water; purchasing equipment; providing the buildings and other hardware of the management systems);
- major repairs and renewals of equipment and infrastructure;
- direct recurring costs (operation and maintenance);
- overhead costs (sustaining an administrative structure, including probably higher and remoter organisational levels, national, regional, etc).

An economist might say that the first two of these belong together as one "capital" category. But it seems better to make them distinct, as they usually happen far apart in time, and by the time when the need for renewals becomes urgent, the fact of the initial capital investment has usually caused great changes in the economic condition of the users.

In irrigation management transfer, governments typically aim to transfer to organisations of the service-receivers the responsibility for some or all of the third cost category, operation and maintenance, but usually the first and fourth categories are not transferred. The responsibility for the second category is often left unclear, and has been a source of problems in a number of such transfer programmes, because it creates doubt about the borderlines between the two parties.

The overhead costs of governmental irrigation organisations are not often discussed in the relevant literature. This could be because they are very large. Especially in Asia, government irrigation organisations are among the strongest and most long-lived organisations, and have developed large superstructures, often based in capital cities far away from their client populations. This seems to make the overhead cost a special one, which is not likely to be transferable to the individual end-users.

3. Regulation and service-delivery functions

Let us look now at the three different modes of basin organisation which were identified at the beginning of the preceding section. In the developing countries, we can usually find existing organisations that exercise the functions of service-delivery for each specific use category. These are often quite old organisations, which have developed a variety of specialist skills and have large professional workforces. It seems unlikely that governments will abolish them. It seems unlikely, therefore, that basin management organisations will evolve towards direct service-provision to the ordinary citizens. A more probable path of evolution will be towards basin organisations taking up the regulatory functions, while direct service-delivery will remain the task of other organisations which manage urban water supply, agricultural water supply, hydropower, and other specific services to people, to companies and to other user organisations.

In theory, then, the service-providing organisations should become more clearly service-oriented, should behave more commercially, should become more subject to compliance with laws about pollution and other adverse social consequences of their activities, and (depending on the politics of the country) may be considered for privatisation; while the regulatory organisation exists in the public domain to ensure good laws, allocation of resources by administering a water-rights or licence system, conservation and protection of water sources, and compliance with all this.

That still leaves open the very difficult question of who should undertake new capital investments. Will it be the service-providers, or the basin organisations? There are strong arguments both ways. But it seems clear that this issue will be a vital one in determining the character of a basin organisation, and its relationships with service-providing organisations. If basin organisations are going to be constructors of major new facilities, their financial requirements will be much heavier than if they are purely regulators.

It seems that the primary reason why we need basin organisations, as the prospects of water deficits appear in an increasing number of countries, is for establishing compliance with a body of rules that will enable the people at large, through institutions, to regain some kind of control over the diminishing quality and quantity of water in their rivers. If we take that view, then perhaps we will think that this is a sufficiently huge and important task, and that we should not give the same organisation more conventional tasks, such as construction of major facilities, or even ownership of facilities that exist already.

One of the problems of establishing basin-management organisations is that there is clearly a potential conflict with existing organs of local government, which almost everywhere have boundaries that are different from the boundaries of river-basins. It is said sometimes that, since provinces or other local government units are responsible for achieving development within their specific boundaries, they must have control over such a major development factor as water. There is certainly much force in that argument. However, the separation of regulatory and service-delivery functions opens the way to escape from this problem: It is possible then to organise the regulatory functions on a river-basin (or aquifer) basis, while the

service-delivery functions can be organised on a different basis which may conform more nearly to the boundaries of local or provincial governments.

4. Sources of funds

The Dublin and Rio Conferences of 1992 enjoined us to regard water as an economic good. That seems to mean that users of it should pay for it according to the amount that they use. The way ahead, according to this view, seems to involve finance coming primarily from users of water, paying to service-providing organisations. In that pattern, it would seem practicable to finance regulatory basin organisations through some system of levies on the income of the service-providers.

On the other hand, it is difficult to see that service-providing organisations, in the poorer countries, are going to be able to behave commercially, and at the same time invest substantially in new capital facilities. The low profitability of the prime user, irrigated agriculture, indicates that, for many countries, this is not an immediate prospect.

Probably, too, the phrase "economic good" suggests that the prices we pay for water services should somehow reflect the sort of factors that usually influence prices of other economic goods. For example, if water is an economic good we might expect its price to rise in times and places of scarcity, and to fall in circumstances of low quality.

Concepts like this, however satisfactory they are economically, face many difficulties from the social and political angles. Water has been treated for long as an aspect of welfare provision, and in many places long periods of provision of water at zero price, or extremely low price, have promoted high effective demand, which is now very difficult to reduce.

However, there seem to be few alternative routes available for financing the activities. Either they must be financed from user charges, or they must be financed from central government budgets, or they will probably not happen effectively at all. The problem of central government funding, for the poorer countries at least, is that there is very little of it available, and there is strong competition for that little amount. We can see from the fate of (for example) hydrological data-collecting organisations, which in many countries have become weak and inadequate for their tasks, that centrally-funded organisations which are doing things that do not have direct popular appeal are likely to be left on the sidelines in the budget contest. Funding of river basin organisations this way may well make them unstable, and unable to pursue consistent long-range planning.

In Europe, there has been a trend in recent years towards the use of abstraction licences as a means of raising a significant proportion of the funds needed for sustaining regulatory organisations. This becomes possible when the regulatory function is clearly separated from the service-provision function. Regulatory organisations assess the available quantities of water, and issue licences accordingly. In that system, the service-providing organisation can be just another holder of an abstraction licence.

Abstraction fees are not the same as user fees. A service-providing organisation may pay abstraction fees to the regulatory organisation, and then sell the water to ordinary people or businesses, charging them a user fee, which exceeds the abstraction fee in order to cover the costs and financial risks of delivering the water. In such systems, licence fees may be graded according to scarcity.

Buckland and Zabel (1998) describe the workings of these systems, and report abstraction fees that are typically around the equivalent of 1–2 US cents/m³, but in some cases significantly more. In some countries the product of abstraction fees is sufficient to cover the cost of all regulatory functions.

In a licence fee system, there are two ways of charging the user. The charge may be based on the measured actual consumption of water, or it may be based on the amount allowed by the licence. The system of measuring actual amounts involves a higher level of regular metering of the users, whereas the licence-amount method can be implemented with only occasional checks, to ensure that the conditions of the licence are not exceeded. If the cost of abstraction licences is set high enough, they can have an effect on the consumption of water. In the German state of Hamburg, for example, a relatively high abstraction fee for groundwater licences caused about a third of the licences to be renounced, and handed back to the regulatory organisation, which could then re-issue them to others.

There are other possible sources of revenue for a basin organisation. We may note three principal areas:

- waste-water disposal charges;
- pollution charges;
- charges for other permits for other water-based activities, such as fishing, navigation, recreation, etc.

5. Methods of assessment

Funding of regulatory organisations from abstraction charges, user charges, or from (for example) a small percentage levy on the user charges collected by the service-providing organisations, does not necessarily mean that all categories of users pay at similar rates. When we examine current charging practices, world-wide, we find a tendency to charge agricultural users much less, and industrial users much more, than the average.

This leads us to the question, how should charges be assessed? If basin organisations are to draw their funding ultimately from user charges, how will those charges be calculated?

This is related to other issues, about the impacts that we may want a charging system to have upon patterns of water consumption. It also brings in some very complicated issues related to the quantity, quality and locations of disposal flows, returning to the natural system after use.

Industrial users are accustomed to pay for measured quantities of water delivered to their premises. Urban users in the better-off suburbs also probably pay on the basis of measured volumes, and poorer users, especially the very poor, also pay, though probably not for measured flows but for volumes brought by water-carriers.

But the biggest users in the poor countries, the farmers, generally do not pay by volume at all. In the countries where irrigation service fees are levied, the overwhelming majority pay an amount that is based on land area. There are many variants of this, such as seasonal differences, crop differences, and so on; but the central point about the dominant current practice is that the marginal price, the cost to the farmer for taking more water, is normally zero.

Countries vary in the way they account for water that flows back to the river systems after use. In virtually all the uses of water, there is some "return flow," but the amount of this varies, and in many uses it is difficult to measure it. Briscoe says that

"...taking the US as an example, consumptive use as a percentage of withdrawals was 56 percent for irrigation, compared with 17 percent for urban water supplies, 16 percent for industry and just 3 percent for thermoelectric power."

The United Kingdom, following the logic of these different levels of consumption and return, adopted a classification of use types into four bands, according to their average proportions of return flow. In such a system, users who consume a large fraction of what they abstract (such as irrigation) are charged more heavily than users with a high return percentage (such as power generation). There are of course quality aspects in relation to these return flows as well, which can be dealt with by the different mechanism of pollution charges.

In developing countries, water charges do not vary, generally, according to scarcity of the commodity. Water prices are usually calculated on some basis that is related to the cost of delivering it. That means that it stays the same, and does not respond to variations in available resources. In many countries, charging scales are centrally or provincially determined for large sets of irrigation systems, so that systems with water abundance and systems with local water scarcity are obliged to charge their users the same price.

Indeed, when we look at inter-country comparisons, although the variations in charging practices are enormous, there are signs of a correlation between scarcity and price policy, but it is a correlation that is opposite to economic logic. Some of the lowest charges (even when comparisons are based on purchasing power parity) are found in dry countries such as Egypt or Iran, while high charges can be found in much wetter places. This presumably represents a socio-political logic instead, which may well be stronger than economics.

There are even cases where the cost of taking water for irrigation becomes lower in the driest, hottest time of the year. The middle Niger river is such a case, simply because at that time the river level is comparatively high and the cost of pumping water to adjacent land is therefore less. This kind of anomaly results from basing

charges only on the cost of service delivery, which is effectively unrelated to scarcity, and often is only weakly related to quality, or to demand.

A river-basin organisation could reduce some of these anomalies. In many countries, water has been made legally the property of the state. It is possible, therefore, for a river-basin organisation to charge the service-providing organisations on the basis of the measured amounts that they extract from the natural system (as in the European examples of abstraction licences, noted earlier). Each basin organisation can devise its own level of charge, related to the amounts of water which it has available for abstraction. It is possible for those charges to be varied along some seasonal or even monthly scale. In this way, a basin organisation could exert some pressure on the service delivery organisations to look for ways of moderating their rates of water use, while at the same time improving its own financial independence.

6. Collection

The compliance problem, in respect of irrigation service fees, became famous during the 1980s. The Philippines, especially, made the "viability index" a central feature of its institutional reforms: this index is the ratio between fees collected and the costs of operation and maintenance. Field officials of the government agency could receive bonuses depending on the percentage of fees actually collected.

Studies of the costs of fee collection show that they can be a significant proportion of the total amount collected. "Passive" collection, meaning the kind of system where each user is expected to bring the fee to the collection office, seems prone to abuses, or at least to long delays of payment, which present serious cash-flow difficulties to service-providing organisations. "Active" fee collection, using paid collectors who visit houses or farms, incurs a significant wage cost. Both methods need accounting staff and certain facilities. Some studies of irrigation service fee collection have found the cost to be occasionally as high as 15 percent of the collected amounts.

How will river-basin organisations minimise these linked problems of compliance, delayed payment, and collection cost? The answer to this seems to be (as for some of the other issues raised above) that the separation of regulatory from service-delivery functions should substantially reduce this problem. The service-deliverer must have a direct relationship with the water users, and indeed the trend towards user-controlled service organisations assists this. The regulatory organisation on the other hand has different duties, and should collect its fees from a few major sources, principally the service-delivery organisations, but also including any others to which it grants permission for abstractions, pollution permits, or other water-related activities. On the whole, passive modes of collection may be sufficient for this.

7. Control of expenditure

As river-basin organisations come into existence in an increasing number of countries, we will face another kind of issue: how will their expenditure levels be controlled? These organisations should become, as far as possible, responsive to the interests of their own stakeholders. But the stakeholders are very diverse.

Everybody is a water user; and most of us are water users in several different modes. Some may want new storage facilities to be built; others would prefer that costs be kept down as far as possible. The interests of birds, fishes and other wildlife have to be accommodated somehow, along with other non-economic aspects of water, such as landscape beauty, waterfalls, and the like. All of these things tend to have cost connotations in some way.

These matters cannot be satisfactorily resolved by creating river-basin organisations that are firmly embedded in the governmental bureaucracy. A different and more responsive kind of organisation is needed, which will be accountable to some council in which all principal stakeholders have a voice.

In these conditions, control of expenditure can be done transparently, with budgets approved in advance not by finance ministries, but by the people of the basin who will have to bear most of the costs and receive the consequent benefits.

8. Impacts of charging

The Economist, reporting after the World Water Forum, said,

“whether it is Australia or Rajasthan, once people understand the true cost of water services, they will conserve water, and even help to dig ditches if necessary. In return, they will want transparent prices and better service from both governments and private firms.”

That is a clear statement of the standard economic view of the impacts of water charges: consumption will reduce, capital costs will be partially taken up by users, and customer pressures will cause organisational behaviour to improve. Is it true?

It is quite difficult to reconcile this optimistic view of the power of economics, with the findings from the detailed work of PMI-Niger (Abernethy and others, 2000). There, in a country that is at or near the bottom of the *per capita* wealth scale and other human development scales, the irrigation service fees are among the highest in the world. On the whole, fee collection rates are high. Farmers pay 20 percent of their gross crop value in fees. If the foregoing quotation is true, water should be used very efficiently in these circumstances. But the water productivity was found to be equivalent only to 20 US cents / m³, in terms of gross product value, at Purchasing Power Parity (less than 5 US cents / m³, at nominal bank exchange rate). No signs of reduction in water consumption could be detected over ten seasons of monitoring.

There seem to be three sources of the difference between these observations and the view quoted earlier. Firstly, *The Economist* was drawing lessons primarily from urban cases. Secondly, water is only one input to a production process, whether in agriculture or industry, and it is generally not a replaceable input; so if the user thinks that more water is necessary in order to realise the benefits of other inputs, that user will probably apply the extra water. But it seems likely that the third reason is the most influential. This is, that farmers in Niger, as in most other developing countries, do not pay for the quantity of water they use. They pay heavily, but the charge is area-based, so the marginal cost of taking more water is zero. Urban

users, whose quantitative needs are smaller and more measurable, normally are not in that situation. For them, the marginal cost of increasing their usage of water may be quite high.

This problem, that the major users of water (farmers) have no direct incentive to reduce their consumption, is not likely to change in the near future. Although we can measure pipe flow volumes acceptably, and the equipment cost for doing so is quite tolerable, devices for measuring flow volumes (as distinct from flow rates) in open channels are not available at the scales and costs required for the small land units typical of developing countries, especially in Asia. So the impacts of charging in metered urban systems can be quite different from those in smallholder irrigation.

One proposed approach to this problem is by charging, not to individuals, but to groups, for example to all the farmers along a single common channel. There is as yet little evidence that this is effective. At the level of the individual, it does not alter the incentive much. If there are fifty farmers sharing a metered source, each may calculate that, by taking an extra cubic metre of water he or she will obtain all the benefit of using it, but will pay only one-fiftieth of its cost.

For a financial system to have a strong impact on water abstractions, it must also be designed to give incentive to the service-delivery organisations to reduce the conveyance losses in their systems. Both urban water-supply organisations, and irrigation departments have until recently shown poor records and lack of concern about reducing losses. This is another area where separation of river-basin management from service-delivery is helpful.

If the service-delivery organisation has to buy the right to abstract water, it will be more strongly motivated to ensure that as much of that water as possible reaches a customer. Water leaking from a canal or a pipe, in that system, means a direct financial loss to the service-delivery organisation. The separation also makes it easier to include in the financing arrangements some reflection of the value of leakage water that can be recovered by pumping from aquifers, which varies greatly according to factors like location, quality and aquifer depth.

There is also the problem of equity. As we move more towards the principle of payment for water services, can we feel sure that the poorer sections of society will have adequate access to water? Briscoe (1997) put this problem clearly:

"The inequities of existing command-and-control mechanisms for water allocation in irrigated agriculture have been widely documented...Because water has rarely been formally managed as an economic good in developing countries, however, there is little information on the equity effects of a market-oriented management system."

We can, however, feel relatively confident that there are better chances for restoring equity, under river-basin management organisations, than under the present systems of management. Traditional water rights have been rapidly eroded by the political and economic changes of the past two or three decades, and relatively few countries have succeeded in supporting the traditional systems, or in replacing them by modern systems based on water rights that are legally enforceable by

their users. Basin management offers a way of redressing this situation, either through rights or licences. It would seem reasonable to accept the need for some payment, or increase of existing payments, in return for a better guarantee of supply or abstraction rights.

However, we should also note the need for good, transparent public information programmes when such a policy change is under consideration. If public opinion is not prepared for such changes of traditional patterns, and informed about the benefits that they are intended to bring, they are likely to be rejected.

Charges, or increases of charges, are never going to be popular. It is futile to hope for that. However sound our economic logic is, however much we may feel that a charge system can reduce distributional inequities, or improve water-use efficiencies, there will not be demonstrators in the streets demanding the introduction of such charges. It is good to keep this point in mind, as we think about possible beneficial impacts of charging policies.

The equity question can be regarded as yet another argument for keeping a separation between the regulatory and service-delivery functions. Research on equity effects will probably continue to be necessary for quite a long time. River-basin organisations should take some responsibility for monitoring these effects, and for encouraging the necessary research. They should be in the position to adjust their regulations, and the constraints on the service-delivery organisations, so as to take account of the need to limit the degree of inequity that may exist, and particularly to ensure access for all up to a certain basic level.

9. Conclusions

River-basin organisations offer a promising way towards better and more equitable management of water resources. They need to be adequately financed, and it is better that their finance should be generated locally from among the users of their services, who should also have an effective voice in influencing their policies, than that their finance and policy should be determined centrally.

The ways of generating sufficient finance, in the case of poorer countries, are not yet sure, because of the weak financial situation of agricultural users, who account for the overwhelming majority of water consumption in most countries. The lessons that can be learned from the financing systems of richer countries are of limited relevance, because of the different balance of user types.

Current systems of charging for water services have many defects. Irrigation charges are usually area-based, not volume-based, so they give no incentive for water-saving, neither for the service-delivery organisation to reduce leakages nor for the end-user to improve application efficiency. Charging rates are usually calculated on the basis of the cost of providing water delivery service, and sustaining a supply organisation, but do not often reflect the scarcity or abundance of the water resource, or the quality of the water. Often economic logic is reversed, as poor city-dwellers pay more for low-quality domestic water.

Systems of abstraction licences may be the most easily implemented method of addressing simultaneously these various problems, especially:

- to sustain the kind of organisation that is needed;
- to give firm legality to long-standing traditional users;
- to protect principles of equity during rapid socio-economic changes; and
- to make possible more flexible systems of charging that will reflect scarcity and quality, and will follow some progressive scale so that basic needs (both personal water use and food production) can be satisfied at rates that are less than those charged for levels of use which exceed the fundamental human requirements.

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