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**INTERNATIONAL COMMISSION
ON IRRIGATION AND DRAINAGE (ICID)**
New Delhi, India

Irrigation and Drainage Services Some Principles and Issues Towards Sustainability

An ICID Position Paper

Principle 1 – Transparency on cost recovery

Principle 2 – User empowerment

Principle 3 – **Recovering the ‘Sustainability Cost’, an ambitious first step**

Principle 4 – Economic incentives towards ‘best practices’

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Annex 1 - Definition of the main concepts

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Task Force (TF3) *Henri Tardieu Chairman*

Socio-Economic Sustainability of Services Provided by Irrigation, Drainage and Flood Control Schemes in Water Resources Sector

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Task Force (TF3)

Socio-Economic Sustainability of Services Provided by Irrigation, Drainage and Flood Control Schemes in Water Resources Sector

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Preamble

At Cape Town in 2000, ICID set up a Task Force (TF3) for “Developing a position paper on Socio-economic Sustainability of Services Provided by Irrigation, Drainage and Flood Control Schemes in Water Resources Sector”.

As an introduction to the discussion held at the Seoul meeting in 2001, each member of the Task Force (TF3) answered the two questions below prepared by the Chairman and Hervé Plusquellec:

Question 1: Would it be fair to charge the full cost of water when the service does not meet the expectations of the users- when the irrigation administration is not "service oriented"? Is it not an important first step to fundamentally change the service organisation, to dramatically reduce the operation costs and increase the money available for maintenance?

Question 2: When maintenance is able to ensure the long term sustainability, is it fair to charge the full cost (including the capital cost) for projects designed without the farmers' say or designed on the basis of higher world grain prices? Do you agree with the comments of the 2nd recommendation of the 2nd World Water Forum ("Sustainability cost pricing" vs. "Full cost pricing")?

*At Montreal in 2002 and Montpellier in 2003, the Task Force (TF3) discussed the Position Paper itself written by the Chairman **Henri Tardieu**, the Annex 1 Definition of the main concepts written by **Thierry Rieu** and the Annex 2 written by **Harald Frederiksen** Practices and procedures for pricing services.*

The draft position paper was presented at the 3rd World Water Forum, Kyoto on 19 March 2003 at ICID's Session on “Water for Food and Rural Development”. This final draft has been revised after the TF3 meeting at Montpellier in September 2003 and presented at Moscow in September 2004.

The recommendations formulated in the Position Paper, which urge financial sustainability through adequate cost recovery, present a major challenge requiring governments to commit to political reforms in irrigated agriculture and to substantial investments. The Paper underscores the importance of making the linkage between political reform and future investment more explicit. Many irrigation systems in the developing world are presently financially unsustainable because of low profits for the irrigators and insufficient financial resources for system management. The overall strategy should be to improve the profitability of irrigation and the technical and financial efficiency of the management entities. It is a precondition to raising water charges to a level sufficient to cover “Sustainability Cost” i.e. operation, maintenance and renewal costs. It is a long term process requiring consultation and acceptance by the users and the mobilization of considerable resources.

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Position Paper

Some Principles and Issues Towards Sustainability

Introduction

In response to the ‘full-cost pricing’ recommendation of The Hague’s World Water Vision , and after the general discussion held at the Seoul, Montreal and Montpellier meetings, it is possible to present our common opinion as follows:

1. We are all aware that real, long term sustainability cannot exist without full-*financial* cost recovery : if an activity has a cost, this cost must be paid for, otherwise this activity simply disappears. The relevant question is therefore : how is the cost going to be met ? Or, in other words : who is going to pay which share of the full cost between users and taxpayers ?
2. The next step consists in identifying all the beneficiaries of a given activity or investment. It is well known for instance that, in the drinking water sector, the beneficiaries of a given network far exceed the population who drink from the newly installed taps: the new system brings about savings in public health expenditures, higher productivity among local workers, increased production and wider tax bases ; it is indeed the society as a whole who benefits from the new investment. Consequently, when it comes to sharing the costs between beneficiaries, the nation’s tax payers could (or should?) be charged as well as the system’s direct users. Besides, income-based price differentiation (‘cross-subsidies’) will take care of the poorest consumers.
3. In the irrigation sector, things are even more straightforward. The ‘side’ effects (‘externalities’) of a hydro-agricultural investment are multiple, whether negative or positive. Many examples could easily be found in every irrigation project, and we agree that charging for water should be done accordingly. Indirect benefits from irrigation and drainage can be increased employment, reduced migration to urban centers, improved food security etc. However, since it is not easy to identify the ‘end beneficiaries’ other than irrigating farmers, it is often the case for charging the community as a whole, i.e. the tax payers again.
4. Dealing with the service provision, the question to be addressed is the following : what is the link between the actual price of a service and the satisfaction derived by the user ? In principle, where direct beneficiaries’ behaviour is totally rational, farmers should be continuously weighing the marginal use of water against its marginal cost (the conventional liberal creed). Now, we know that this principle can only be effective in an approximate and discontinuous manner (by steps) in most developing world situations. Nevertheless, farmers all over the world have an intimate feeling of the relationship between the strategic value of water and the cost of its delivery service, an empirical knowledge which allows them to decide one day that “water is too expensive” or not. In other words there is a definite ‘intuitively acceptable price’, which cannot be accurately computed but slowly approached through an iterative and ‘trial-and-error’ type strategy of dialogue with farmers ; the resulting price can be more or less rationalised by the economic analysis of the value added by water.
5. It is precisely this knowledge that should be capitalised when modernizing or designing new systems involving an increase in the water price. As shown by history (cf. Annex 2) the participative approach, ending up in a solemn and formal contract, should be made absolutely compulsory,. Where a rehabilitation and/or modernisation is necessary to provide this satisfactory service, it must be carried out before contracting with farmer so that the level of

service corresponds to farmers' satisfaction and be supported by the most appropriate technology to meet development needs in a particular social and economic environments. This essential point would deserve a discussion, dealing in particular with the government accountability, but it is well beyond the topic of this paper. In any case, it is a precondition for introducing new practices aiming at the sustainability of water services.

Considering five principles consistent with the ICID's Strategy, we, ICID members, propose to address in our countries the following issues to promote sustainability in irrigation and drainage services:

Principle 1 – Transparency on Cost Recovery

Issue 1: Define and clarify the substance of the service

What kind of services are provided? It is particularly important to separate water services and extension services, and to define upstream (Are upstream dams included?) and downstream limits (What is the farmer doing by himself?). Is drainage and/or flood protection included within the service?

Issue 2: Identify all the beneficiaries

The service provided to all the direct beneficiaries can be quantified according to the quality of service. What is their contribution to the cost recovery? What is the contribution of the non-agricultural direct beneficiaries? The indirect beneficiaries are to be sought in the suppliers and clients of irrigated agriculture and also, if water services are integrated, in environment, health, nature and general services justifying a fair sharing of the costs.

TF3 advise to be very clear on the water service definition and on the identification of the beneficiaries, two of the key elements towards sustainability.

Issue 3: Master relationships (contract) between service provider and users

Sustainability needs clarity in the contracts including management and governance. Several options are possible, among which the two simplest are:

1. The Water Users Association is collectively responsible for the services provided to the farmers, costs changing along years are annually shared between the beneficiaries according to a collective contract.
2. The Service Provider (public or private) is responsible for the services, contracting with each client (or group of clients) on the basis of the price of the service related to the quality of the service. The price is chosen to be socially and economically acceptable, even better, accepted.

Development and implementation of service agreements require effective accountability mechanisms in which both service provider and clients can mutually monitor each other's obligations as formulated in the agreement.

TF3 does not recommend one or the other option but recommends that the contracts should be clarified as the very first step to create the awareness of the deficiencies of irrigation systems.

Principle 2 – User empowerment

Issue 1: Identify the effective interface for dialogue

Whatever institutional arrangement is chosen, the financial participation of the beneficiaries needs to be based on a formally organised negotiation in order to approach the acceptable price for the satisfying service. The sustainability of the service implies regular meetings between the service provider and beneficiaries with a clear agenda and schedule in order to continuously adapt the collective contract to external changes (e.g. evolution of financial context).

Issue 2: Dealing with Forces against equity ?

To reinforce the quality and the equity of the service, the organisation of the dialogue needs to protect the say of the poorest and the “true” farmers. How can the lobbying of the most powerful users be controlled? How, with which rules, can the majority’s trust be obtained without neglecting a fraction of the users (e.g. canal tailenders)?

TF3 advises to maintain an influence of the government in the decision making on service, for the role and responsibility of government is to represent the interest of society as a whole and the marginalised in society in particular.

Principle 3 – The “Sustainability Cost Recovery”¹, a first ambitious Step

Issue 1: What steps are planned to improve cost recovery?

Our experiences around the world show that in irrigation the full financial cost of the service is not covered and even, it is rarely an objective to be reached, in particular for the large schemes managed by government agencies. Nevertheless a consensus should be obtained on the necessity (i) to increase the financial participation of all the beneficiaries towards the highest acceptable price, (ii) to plan the steps towards a better balance of the service without subsidy to O&M, which is generally considered as an obligation by most governments. What kind of policy is implemented to go that way?

Issue 2: Priorities in the steps towards sustainability cost recovery

As the users’ participation does not cover all the costs, choice has to be made. What costs are covered as a first step by the accepted price. To make it simple, three options are currently observed:

1. Priority to reimbursement of the loans (banker’s option). Financially correct, this option may imply damages on the assets by lack of maintenance and usually ends up in heavy rehabilitation costs.
2. Priority to maintenance and renewal (manager’s option). This option guarantees the sustainability of the service and customer satisfaction, if a mechanism allows public funds to cover the past investments. This option has been called “*Sustainability Cost Pricing*”.
3. Priority to personnel costs (social option). To preserve the existing staff of the irrigation agency is an option which is often weighing on the operation cost and does not allow to increase the efficiency of the service. Nevertheless harsh or blind cuts in the staff can be worse.

TF3 advises to choose option 2 as a first step with consideration to option 1 and 3, each country choosing its own path, but asking the following question: is the money of the beneficiaries being used according to negotiation terms?

¹ Tardieu and Préfol (2002) Full cost or “Sustainability Cost” pricing in irrigated agriculture. Charging for Water can be effective, but is it sufficient? In *Irrigation and Drainage* 51 Wiley InterScience
-See also Annex 1 § 1.2.5

Issue 3: How to manage crises?

Each technical (collapse,...), climatic(drought,...), agricultural(disease,...), financial(currencies,...) crisis can break down the virtuous circle. What are the methods (e.g. emergency fund) to manage crises while preserving the farmers' income, but without destroying years of progress towards service sustainability? Are crisis plans discussed and written before crises?

Principle 4 – Economic incentives towards “best practices”

Issue 1: Metering the water and the performances, another major issue

The service provided to the direct beneficiaries is to be quantified according to the quality of service. What are the actual methods - legal as well as implemented - for metering discharge and/or volume of the delivered water, and for assessing the quality of service and the user satisfaction? The water price is at first an incentive for the service provider to perform in accordance with the contract.

Metering the water is also the basic mean to address the next issue on controlling water allocation whatever solution -quota or pricing- is chosen.

Issue 2: Incentives to water allocation compliance

The pricing system could be a key incentive to efficient water resources allocation between beneficiaries. Other systems could also be successful such as quotas, some form of rationing. Pricing and quotas could usefully be combined. What kind of incentives are chosen to increase water efficiency, to respect water allocations and equity between beneficiaries? Economic analyses are required to rationalise the instruments according to the water value for the farmers (marginal value and annual value) and for other beneficiaries such as environment. Several options are available in irrigation as well as in the other water sectors: pricing methods (binomial pricing, tier pricing, optional pricing,...), quota (with penalties, associated to overconsumption price,...), subsidies (poverty related, cross-subsidies,...). But the pricing system is accepted only if the rate of collection is close to 100%. This rate is an essential indicator of the quality of the negotiation, the efficiency of the organization and the fairness of the socio-political context.

TF3 advises to keep this discussion as a last step for irrigation services reaching the maturity, because a pricing system is efficient only if it is understood by stakeholders able to adjust their behaviour to the incentive.

Principle 5 – Clear Policies

Issue 1: Separation between service provider and regulation authority

Whatever the service provider is - water user association or specific external entity - , it commits itself to improve its management. What are the means to assess the quality of the management (performance indicators, benchmarking, quality control,...)? Is there an Authority, different from the service provider and accessible to the beneficiaries, in charge of controlling the government's specifications and the sustainability of the service? Is this Authority able to use the ultimate penalty being the withdrawal of the license, the cancellation of the concession contract, the choice of another service provider? But also, is this authority able to remind the government of its commitments in financing the rehabilitations?

Issue 2: Integrated water management?

All around the world, the integrated approach in water management is encouraged due to pressure on water resources, and irrigation/drainage sector is fairly taking its parts in this move. It is very useful for the sustainability of irrigation services (e.g. conjunctive use of surface and ground water to avoid competition between improved surface water service and uncontrolled groundwater pumping). However that also may blur the necessary accuracy of the analyses developed above on the issues of service sustainability. The question is: Is the integrated approach clear enough for the stakeholders, or is it confusing them and delaying the specific decisions badly needed to improve the service sustainability? Is it used as an alibi for doing nothing?

Issue 3: Separation between Agricultural Policy and Water Policy

The specific complexity of irrigation services comes in particular from the coexistence of two main and very sensitive policies: the Agricultural Policy and the Water Policy. Each one is largely influencing farmers' behaviour. The Agricultural Policy aims, in its social component, to protect the income of those categories of farmers contributing to public missions (food self-sufficiency, environmental protection, fight against desertification,..). The Water Policy aims in particular to discourage public subsidies that inhibit water efficiency. The irrigated agriculture is at the crossroads between these two policies with frequent conflicting rules and objectives. What are the side effects of one policy on the other? Is water price an option to sustain the income of certain categories of farmers?

TF3 advises to emphasise this last issue in the discussion with other water sectors in order to explain the specific complexity in approaching sustainability in irrigated agriculture.

Conclusion and Propositions for Dialogue

This Position Paper will be of some interest for progressing towards sustainability of services in irrigation, drainage and flood control, if it is discussed, improved, enriched and finally endorsed by several National Committees. After the 3rd World Water Forum at Kyoto, this paper is a modest contribution of ICID to the world-wide debate around the cost, the price and the value of water. It is too often said that "making farmers pay for water" would be sufficient to regulate all user conflicts. This assertion ignores the economic realities of irrigated agriculture. It is on the basis of a clear understanding of this point that the socio-economic and environmental stakes of irrigation and drainage can be assessed and that the adapted economic instruments can be devised to release the pressure on water resources. Nevertheless ICID family knows that progress has to be made towards sustainability. Dialogue and actions are the better ways to do so.

Annex 1

Definition of the Main Concepts

1.1 General concepts

1.1.1 Value and Charge

“*Water is more and more considered as an economic good*”² and many failures in water management are supposed to come from the fact that the value of water has not been fully recognized by users. In a context of scarcity, under pricing leads to misallocations in supplying water to the low value water uses and provides very few incentives to avoid the waste of water.

Value and charges are to be considered separately. Opportunity costs (values) provide the regulator with the necessary information to efficiently allocate the water, while charging is an economic instrument used to balance the budget of the service provider, by ensuring recovery of the water service costs and thereby the sustainability of irrigation infrastructure, Where charges are levied on a volumetric basis they may also provide incentives to users to reduce the volumes they divert.

1.1.2 Cost Recovery

The GWP considers “*the recovery of full cost should be the goal for all water uses unless there are compelling reasons for not doing so*”, but immediately opens the discussion of this principle in the next sentence “it need not necessarily be charged to the users”. In the same way, the European Water Framework Directive for Water asks for “adequate” pricing of water, leaving room for charging users a lower price than that required for full cost recovery. On the other hand these costs will be borne by someone - users or taxpayers. So, in the large debate on cost recovery there is some room for discussion, and that is why it is important for ICID to clarify concepts and wording in order to be sure that each member is speaking the same language.

The proposed definition of the full cost of water services ensures transparency in terms of who impacts on the environment, how sustainable is the irrigation infrastructure, what it costs to deliver the service and who pays for it. Clearly, this does not prevent ICID countries from deciding on a level of cost recovery and on the contribution of water users to the recovery of the costs of water services, (taking into account the social, environmental and economic effects of proposed cost-recovery and incentive pricing) that is below the “full cost”. These issues have been addressed for 4 years by the ICID Socio-economic Working Group and related guidelines will be available in the next years.

1.1.3 Stakeholders

It is usually considered that three categories of stakeholders are directly concerned with issues of cost recovery in irrigation systems:

- public authorities,
- service providers
- users.

Society at large represents the public interest (all stakeholders) and brings together the public entities, which are included here for two important reasons: they bear a large share of the producers' investment costs, as a result of their policies to support water supply or drainage schemes for agriculture, and they are involved in correcting the qualitative and quantitative impact of these policies. Separate evaluations of ‘costs’, as seen from the point of view of the different stakeholders,

² GWP TAC Background paper n°4

should be carried out so that costs borne by society at large can be compared with the costs to the stakeholders.

1.1.4 Water services, water service providers

“Water services” means all services provided, for households, public institutions or any economic activity (i.e. irrigation). It includes abstraction, impoundment, storage, treatment, and distribution of surface or groundwater, waste water collection and treatment facilities, which subsequently discharge into surface water (i.e. drainage). On the basis of this definition, irrigation and drainage clearly belong to water services, though they may be provided by separate or a single organisation. In some important cases, flood protection has to be included in the water services to ensure the sustainability of water infrastructure.

The water supply system has to be delimited in specifying all the operations needed to make the water available to the farmers from the point of abstraction to the point of delivery and, for each operation, who is the service provider:

- abstraction of the water from the natural environment,
- storage,
- transport and distribution from the storage area to the point of delivery,
- if applicable, pressurization needed for the irrigation equipment,
- drainage and flood protection.

1.1.5 Costs of water services: from financial costs to economic costs

Financial costs, which are the costs to economic agents, are a part of economic cost, a more general concept including namely environmental costs. As financial cost information is usually much more available than information on economic costs, financial costs are often the starting point for an evaluation of economic costs. The way to go from financial costs to economic costs is described in box 1 below.

Step	Identification	Action
1	Transfers for each stakeholder, i.e. taxes, subsidies,	Correct by shifting them from one stakeholder to another.
2	Scarce water resources	Replace prices by opportunity costs
3	Environmental impacts of water services (loss of biodiversity, for example)	Include all these non-priced, environmental costs, as a price market is missing.

Box 1 : Three steps to go from a financial cost to an economic cost

From a practical point of view, step 1 indicates who is paying for which services and increases transparency among the stake holders. Step 2 puts an economic value on the scarcity of water, and step 3 will rarely be used as related information is generally missing.

1.2 Costs categories

This paragraph is dedicated to the definition of the different cost categories. It is mainly derived from concrete experiences and work done by the two Working Groups: the ICID Socio-economic WG and the Wateco Group in charge of the economic aspects for the implementation of the European Water Framework Directive³, from a World Bank Paper⁴ and a GWP paper n° 24 (IWRM).

³ Bouma et alii, Cost issues in the Framework Directive, 15 November 2001.

Non water related environmental costs		Environmental cost*	Full economic cost
Water related environmental costs			
Water resource costs*			
Capital costs		Financial cost**	
Operation, maintenance & renewal costs	Sustainability cost		
Administrative and other direct costs			

* Other than internalised ** Financial in the sense of actual financial flows as opposed to the broader notion of economic cost

Figure 1. Types of costs for water (adapted by Rieu and Tardieu after Rogers et al. (1997))⁵

1.2.1 Financial costs

Following Rogers definitions (figure 1), the financial costs of water use are calculated as indicated in box 1 and are the capital, maintenance, operational, administrative and any valuable external costs involved in ensuring sustainable water service. It will be useful to distinguish between the costs made for preventive and/or mitigation measures and costs made for the water use itself. The reason why such a distinction might be relevant is that the costs of preventive and/or mitigating measures often reflect internalised environmental costs.

1.2.2 Capital costs

In water management, capital costs represent the costs of all investment expenditures, consisting of the capital investment together with all associated costs. Examples of associated costs include site preparation costs, start-up costs, installation costs, legal fees, etc. These associated costs can be substantial.

The cost of capital is the sum of the opportunity cost of the capital invested and of the loss of value of the assets over time as a result of wear and tear. The capital opportunity cost reflects the return that could have been gained from alternative use of the capital invested. The discounted rate investment reflects the opportunity cost of capital. As a result, the rate of return estimated by private and public organisations would almost certainly differ, as they have different investment opportunities and risk profiles. For the valuation of investments that have been made in the past, either the historical value or replacement value can be used. Using the historical value method, a price index will have to be used to derive the present value of the investments made.

1.2.3 Operation, maintenance and renewal costs

Operation cost are based on the running costs entered in the accounts for any given year. Operation costs are easily identifiable since they are invoiced. If the service provider's operating accounts are unavailable, general costs can reasonably be estimated on the basis of expert opinion and from the physical characteristics of the system. The main components come from energy consumption, staff costs and transfers between the various stakeholders (levies and taxes, mainly).

Maintenance and renewal costs are the costs of maintaining assets in order to provide a good service until the end of their useful life. Given that many water related assets are long-lived and often buried in the ground, it might be difficult to estimate the appropriate level of maintenance costs needed to operate the assets without their deterioration. The major cause of non-sustainability is the usual but incorrect saving on maintenance costs at the expense of long-term sustainability. In estimating these costs, special attention needs to be paid to the cost of future activities to ensure the sustainability of water infrastructure.

⁵ Rogers, Bhatia and Huber, 1997, Water as a social and economic good: How to put the principle in practice?

1.2.4 Administrative costs and other direct costs

In estimating the direct costs of water use, the administrative costs involved with the management of the water include, for example, the administrative costs of the charging system. They are often considered to be included in the operation costs. Under the heading of 'other direct costs' the costs of productivity losses due, for example, to downstream water restrictions will probably be the most important cost category. When estimating these costs, it is important to take care to avoid double-counting.

1.2.5 The 'Sustainability Cost'⁶

Based on a wide experience in irrigation water management, an innovative concept (Tardieu 2000) of 'Sustainability Cost' is proposed. It is considered to be able to ensure the long term balance of the service provision. Being lower than the full financial cost as previously defined, it will be more acceptable by users.

The "Sustainability Cost", designed to ensure the long term balance of the service provision, charges for operation, maintenance **and renewal costs** including all the staff costs linked to the service., It does not include the full financial cost of the initial investment or of past rehabilitation. To correspond exactly to financial sustainability, the price charged must cover all the costs incurred in providing the service from the dam to the farm, including the resource cost if the service exist. At this level of cost recovery, there is no further need of current subsidies for staff, for repairs, for energy and...for future rehabilitation : the subsidies 'vicious circle' is broken. Such a development is financially sustainable, even though it is not designed to recover the initial investment.

1.2.6 Environmental costs

Environmental costs are non-priced costs. Environmental costs represent the loss of welfare resulting from environmental damage. This loss in welfare may consider lost production or consumption opportunities as well as other, non-use values, which are harder to quantify and put into monetary terms but nonetheless they correspond to real costs to society.

1.2.7 Resource costs

Resource costs are related to the scarcity of resources, in the sense that they represent the value that could have been generated if the resource had been used in an alternative way. The opportunity costs of resources will already be included in the financial costs of resources. It is usually done when the upstream storage is included in the water service. However, the costs of foregone opportunities which other uses suffer due to the depletion of the resource beyond it's natural rate of recovery (for example an over-abstraction of groundwater) are often not included in prices. These costs, the actual scarcity value of under-priced environmental resources like water, should be included when estimating the resource costs.

1.2.8 Other environmental costs

Environmental costs might be water related or non-water related (effects on soil, air etc.). Information related to these costs will generally be missing. Various techniques exist for the valuation of environmental costs. The most practical way to estimate environmental costs, is to look at the costs of preventive and/or mitigation measures. By considering the costs involved in reaching the desired objectives, the resources society is willing to pay to ensure a sustainable water system, in terms of capital, labour and other resources, become explicit. These costs indirectly reflect a valuation of environmental costs: the resources society invests in preventing or restoring environmental damages reflect society's willingness-to-pay to maintain the environmental resource base.

⁶ Tardieu and Préfol (2002) Full cost or "Sustainability Cost" pricing in irrigated agriculture. Charging for Water can be effective, but is it sufficient? In Irrigation and Drainage 51 Wiley InterScience

Annex 2

Practices and Procedures for Pricing Services

2.1 Introduction

The concept of socio-economic sustainability of irrigation, drainage and flood control infrastructure and services is not new. This has been, and continues to be, the fundamental characteristic that rural societies seek to assure in all factors important to their primary economic activity -- agriculture. The extent of these services differs from one area to another, but their effectiveness in different settings is one of the primary determinants of the success of the peoples' endeavours. And without question, the adequacy of the associated institutions and financial mechanisms, in combination, is critical to 'sustainability'.

This has held true for centuries. Accordingly, we should consider what prior generations did to sustain these services, particularly those that continue today. Though societies must deal with today's situations, which reflect the investment and institutional actions of governments over the past 70 years, solutions that are still applicable may have been devised during much earlier times. During the recent period, governments in developing countries made most of the decisions on expanding agriculture and related services, including the extent and means for financing. However, in the decades / centuries prior to the recent burst of development, farmers and rural communities largely carried those responsibilities.

Meanwhile, today's increasing demands on government budgets to support the rapidly expanding urban population; improved health, education and infrastructure, are forcing governments to reconsider their financial support to rural services. There are urgent competing needs for limited funds; political influence is shifting from the rural areas to the urban sector making it more difficult for the rural sector to maintain its historic share of the nation's general budget. A consequence of these factors is the desire of many countries to transfer to the benefited farmers and rural communities the responsibility for most, if not all, of the management, maintenance and financing of the governments' recently-built systems.

In this document, the term Water Service Entity (WSE) is used to signify the service provider. Whether the organizational form of the WSE is a government agency; a quasi-government customer-owned; another form of non-profit customer-owned; or a for-profit organization the concepts of financial sustainability, financial self-sufficiency, financing mechanisms, service charges and fundamental responsibilities are similar. And in many respects, it does not matter whether the service is irrigation, agricultural drainage, storm drainage or flood control (the scope of ICID) or urban services..

One class of WSE warrants definition. Quasi-government entities have very limited government powers, but play a major role in providing services to an identified group of citizens. These entities have essentially no traditional powers of civil government and do not report to other government agencies, except where a local government body may oversee such a WSE, particularly entities such as 'country' drainage districts. They are created under legislation and monitored for fiscal performance. Their classification stems from their power, granted by legislation, to levy property taxes -- a government-only power in a country. They may issue general obligation bonds backed by these taxing powers, and in the case of water-related WSEs, may issue revenue bonds backed by power sales or other sources of revenue deemed of low risk.

As will be seen, this form plays an immensely important role as WSEs in developed countries and many developing countries.

2.2 Some Principles Pertaining to Service Charges

Several characteristics of water-related services and the principles that apply to their financing should be kept in the forefront of any discussion of service charges.

All water-related services provide economic and social benefits to easily identifiable, direct beneficiaries. It has been historical practice and a basic policy of social equity that groups within society who benefit from a given service should pay the resulting costs.

Where the government's social policies do not require beneficiaries to pay full costs of services, the government should explicitly, by a legal document, identify the sources of the replacement funds and the mechanism and schedule for payment to the WSE of the funds sufficient to cover the full cost of the services.

The objective of collecting service charges is to finance the cost of those services. This holds true for urban and rural services in both the developed and developing countries.

The following lender conditions that bear on service charges are set out in this paper because increasingly WSEs – new, existing and transfers – are going to need access to commercial bank loan/bond financing. These arrangements are common in countries where effective WSEs are financially self-sufficient, particularly the larger schemes. In the future, a country that wishes to make available the least-cost financing to its urban and rural WSEs will have to adopt the legal structures and legislation needed to satisfy these lender policies (Indeed, these features should be adopted regardless of the source of financing). However, the legislation would be most effective in lowering borrowing costs if it includes the option to create quasi-government WSEs with restricted powers of levying property taxes.

If commercial bank loans or bonds are used to finance any portion of the costs, the policies of lenders may directly affect financial policies and mechanisms adopted by the WSE. Again, with some modification, this holds true regardless of the organizational form of the WSE or its service.

Lenders will insist that the WSE has reliable and fully adequate sources of revenues for the period of the loan / bond. Government guarantees of prompt payment to the WSE of any necessary subsidies must be explicit in legal documents, since lenders are very reluctant to rely on politically adjusted government subsidies. The record of adequacy and reliability of government subsidy payments does not instill confidence.

For long-term financing of facilities construction or any other cost component, lenders will require full cost recovery and usually that the WSE has powers of taxation, a substantial emergency reserve fund or like means to carry it through periods of lower revenues due to drought or economic downturns.

Lenders want to ensure that there is a reliable full service to the beneficiaries in order to better guarantee a WSE's repayment capacity. Thus, during low revenue periods most lenders prioritize expenditures made by the WSE using its available revenues. Routine O&M is first priority, replacement reserve fund is second, emergency funds is third, interest on loan / bond is fourth and capital repayment last. (This is identical to the priority payment policies that the WSE itself should have.) Lender provisions will require automatic increases in charge rates if a prolonged revenue deficiency develops.

It should also be noted that lenders will require that a water service WSE has been granted a legal, fully committed and recorded water-use right of adequate quantity, quality and reliability. This is as important to the lender as an assured revenue stream and for the same reason – sustainability of the service, the agriculture and the WSE. Farmers' commitment of funds to improving their agriculture, including irrigation technology, depend on permanent rights.

To ensure such agreements between lenders and borrowers governments should create a professional government audit/regulatory agency to review WSE borrowing plans, particularly if they involve bonds. This is essential to help assure the lenders and bond purchasers that the specific WSE's program is sound and viable. Equally, such examinations will instill confidence within the entire country in the broader use of this form of financing.

Two other features of rural water-related services must also be considered when structuring the WSE and formulating service pricing and financing policies and mechanisms. Usually farmers require two and in some cases even all three services -- irrigation, drainage and flood control -- for a viable

agriculture. A WSE commonly provides more than one of the services at the local level. Increasingly, the local villages (often composed of farmers as well as the agricultural-related merchants and support) are beneficiaries of the same infrastructure for their services. A jointly used water delivery is common, but the village may also discharge waste into the natural and constructed watercourses, the treatment cost of which should be a village-only cost. The villagers cause the pollution of resources and the receiving channels are basic facilities of other WSEs. Any consideration of alternative approaches to service charges must understand the financing relationships. They are very real constraints on formulating practical, consistent service charge policies and mechanisms in a specific setting.

2.3 Considerations in Discussing Service Charge Practices

Before discussing existing practices concerning irrigation, drainage and flood control financing and service charges, it may help to discuss some related terms and concepts.

The terms ‘market pricing,’ and ‘opportunity pricing’ hold no meaning in discussions of drainage and flood control services. ‘Market pricing’ has very limited, if any, validity in formal transactions, even in irrigation (or urban) services. The physical, institutional, political and social restraints to market pricing of services in developing countries make it infeasible. The bulk prices of water supplies to San Francisco and from the Colorado River to Los Angeles are a fraction of the charges for adjacent irrigation water. These supplies are not marked up to any ‘market’ prices and certainly that water is not available to any ‘markets’. In the rare situation of a partial market for water use rights, the sale price for the right to use water is a separate cost paid to the rights holder – not a part of a ‘market’ service charge. ‘Opportunity pricing’ has no application in pricing any rural or urban services. It is not utilized for any services in developed or developing countries.

Finally, there must be both a political will to adopt, and society’s acceptance of, the mechanisms for any charging policy to survive. The policies and mechanisms for assessing and recovering charges must be simple, easily understood by the customer/beneficiary and judged to be obviously fair. The term used in this document is ‘service charges’ covering all methods of assessment – service tariffs, property taxes, routine labor assessment and one-time assessments.

As shown in the report, “ICID Survey on Funding of Operation, Maintenance and Management of Irrigation and Drainage Projects”, (Lee, 2000i7) those WSEs obtaining customer payments close to full funding of O&M rely on both tariffs and some form of property taxes. These may be paid in labor, common in many developing countries, particularly on customer/beneficiary-owned schemes.

As the following discussion indicates, by far the most common basis for charges for rural and urban services – and found in utility principles – is full financial cost of services. Costs include investments, replacement, O&M and repayment of any borrowing. The calculation to collect all costs on a consistent basis from all beneficiaries is straightforward and the customer/beneficiary can understand the principle as being equitable.

There are strong economic and social equity arguments for countries to have consistent policies for the recovery of the costs for all services in both the rural and urban sectors. Discussions in any one sector should be within the transparent framework of policies that the country applies to all water-related services in all sectors. Then all beneficiaries will feel they are treated equally, garnering the political support so necessary for payment of the charges.

Farmers in the adjacent areas or regions of rainfed agriculture do not believe subsidizing irrigation is equitable when they receive neither a service nor a subsidy. Nor is it judged equitable to assess any irrigation cost to adjacent village / urban beneficiaries any more than assessing farmers for village services.

⁷ Lee, P. (2000), “ICID Survey on Funding of Operation, Maintenance and Management of Irrigation and Drainage Projects.” ICID Central Office, New Delhi

2.4 Gaps in Information on Policies and Practices

ICID has developed considerable information for the evaluation of service charges. This is reported by Lee (2000). The findings are based on data from schemes representing 'best practices' secured by the respective National Committees in twenty-three countries.

Information was obtained on eighty-two water service WSEs. Fifty are 'public /semi-public' where the government sets conditions of service, sets charges and usually subsidizes the service agency. Twenty-three WSEs were government departments that provide the service and a budget subsidy to augment customer payments, if any.

However, even with such data and analysis, there is a serious gap in information. There is inadequate information on customer-owned and managed service entities. Very few entities of this class belong to the National Committees of ICID, essentially none in the developing countries. For various reasons, country water departments have little information on this class of WSE. IWMI, universities and other organizations have conducted some investigations, but even these are limited. Yet, very significant areas of many countries have farmer-constructed and owned irrigation and drainage systems. Most important they have proved over many decades to be financially and physically self-sustaining.

One fact should be borne in mind. Customer/beneficiary-owned WSEs provide the majority of water-related services – urban and rural -- in the world.

These may be a quasi-government with a customer-elected board of directors, a similarly organized non-profit entity without taxing powers, or sub-units of local government governed by a council that is elected by the customers. Typically, these are the best managed WSEs precisely because the customers set forth their service objectives and elect their representatives to the management body that has the power to hire and fire the administration and as a result, their workforce as well. The customers have a continuing 'regulatory' oversight with direct communications to those responsible.

There is another characteristic consistently found in these and other water supply and/or distribution WSEs that are physically and financially self-sufficient. The WSE, be it a municipality or customer-owned irrigation service provider, retains the entire water right and does not delegate it to the customers. Typically, and in accordance with utility principles, the charter requires the WSE to provide equitable services to all within the boundaries of its jurisdiction. But that does not constitute ownership of a recorded or tradable portion of the water right by the individual customers. The water right is the most important and an irreplaceable asset of these WSEs. The membership cannot afford to have some members sell their portion of the water right outside the WSE since it affects the financial viability of the WSE. Such sale / transfer would also directly affect the operational utility of the infrastructure for remaining members. And lenders relies upon this asset remaining in full with the WSE organization and its obligated membership. Only the WSE can negotiate changes in its water right. This aspect of WSE financial self-sufficiency cannot be divorced from other preconditions for setting service charges.

Obviously, there are a great many examples where government agencies at the state or central level provide very efficient, high quality, reasonably priced services. Caution should be exercised before judgment is rendered concerning such WSEs. There are good reasons why village, town, county and city services are largely provided by subunits of local government in most developed countries and many developing.

Nevertheless, efficiency and competence of such WSEs can be impossible to attain where the politics of high employment, inadequate civil service rules and enforcement and financial malfeasance are encountered. These conditions may change as democratic principles are introduced at all levels of government.

Very limited information on all water-related services for the urban and rural sectors is available in a common format. In some countries, subsidies for urban water-related services and sewerage are greater than those given rural services. Since the one objective of the Second WWF was full cost recovery and since equity is a universal objective, a country's service charge policies and practices should be examined on a common basis for all sectors. A full study is beyond the scope of this document.

2.5 Country Experiences with Financing Policies and Practices

As discussed, a range of historic information is required to properly analyze options and formulate fair, sensible, financing and service pricing policies. These include the experience of all classes of WSEs, the ‘sustainability’ of the various classes, the stated policies of government, and the degree of consistency of policies in both urban and rural sectors.

2.5.1 Worldwide Experience Those principles of full financial cost recovery discussed earlier largely held true in Europe and North America prior to the early 1900s after which government projects were launched with varying levels of subsidies. Indeed, the principles remain in areas developed prior to the 1900s and have continued to be applied in many of the more recent projects.

Prior to the era of international lending, construction of many existing irrigation systems in developing countries; Nepal (65%), Indonesia (20%), Morocco (55%) and India (unknown) – indeed, in just about every country – was entirely funded by the farmers organized as customer/beneficiary-owned WSEs. These continued with self-financing of the O&M.

The world-famous Valencia Water Court in Spain is but part of a very comprehensive WSE organizational structure established by the Arab Cordoba Caliphate over 1,000 years ago and respected by all subsequent rulers. This provides a water rights system that is tied to the land and not permitted to be sold separately; operating rules; equitable full cost recovery from customers and an internal enforcement mechanism. This WSE has been truly sustainable through all matters of rule, adversities and economic conditions.

In widely separated countries, people living in areas prone to inundation by storm water organized and dealt with flooding in the same manner. In the Netherlands local rural communities in 1100, in Germany in 1200 and England shortly thereafter established what became customer-owned WSEs. Many of these WSEs have evolved into multi-purpose water, waste and environmental management entities (van de Ven 1993 and others⁸). (Some countries, such as the Netherlands subsidize construction of the main drainage pumping plants, seen as a broader public good.) There are tens of thousands of these WSEs in these countries to which may be added similar numbers in the North America. Earlier irrigation, drainage and flood control developments of similar structure are found in Asia, the Middle East and North Africa.

Today, government irrigation agencies in the developing countries rationalize some level of cost recovery for setting service charges on the recently constructed schemes. By the very nature of political influence over government services, the adequacy of charges to cover costs vary greatly – but are almost uniformly below full costs of services.

The greatest variation regards recovery of the capital cost component. Most developing, but also developed countries such as Australia and UK governments have foregone recovery of past capital costs on water-related service facilities. Australia and UK policy is to recover costs on new investments – in the case of UK by the for-profit companies now operating the facilities. Through the assessment of local labor contributions, China did recover a majority of the costs of constructing irrigation and agricultural drainage and even major components of regional flood control works. The policy of the US government is to recover all capital costs of urban and power services. The only subsidies to irrigation on the US Bureau of Reclamation (USBR) projects is interest on the initial construction. However the full capital costs of irrigation is included in service charges. Recovery of capital costs of local flood control facilities have varied.

Taxes on farm produce are used in some countries, but it is difficult to ascertain the portion allocated to the water-related services. This will be discussed further in the examples of individual countries.

Local storm drainage, agricultural drainage and flood control services typically protect all property within an area. In many countries today, O&M service costs for such services are now assessed to all beneficiaries (sometimes prorated among zones of different benefits) and varying portions of capital costs are collected through a property tax or a required contribution of labor for maintenance. Local government councils and their tax collection units often function as the management agency since O&M is low and intermittent, hence, no permanent WSE administration staff is required. Typically

⁸ Van de Ven, G. P., 1993. “Man-made Lowlands” Utrecht, Stichting Matrijs.

there is no cost recovery for regional drainage or flood control in the developing countries either, though some may require adjacent beneficiaries to provide labor for maintenance.

Subsidies are common in essentially all countries. Developed countries and the developing may subsidize services for purposes of accelerating the completion of facilities and hence the service – particularly for pollution control. All countries have policies to assist the most poverty stricken with access to services for purposes of basic health and those economic activities that they pursue for economic survival. It is in the later vein that irrigation and drainage subsidies are justified in some regions. Unfortunately, political pressures in every country also result in subsidies that cannot be justified for those reasons – be it agricultural in some of the richest developed countries or irrigation in the developing.

When subsidies are deemed to be justified, some urge paying the subsidies directly to the farmers as being more efficient than reducing the service charges below actual costs of services. This obviously holds true wherever an excess water supply is available, but can be very costly to administer.

A more pressing question exists concerning subsidizing water-related services for the developing countries. Can the country afford to grant the funds adequate to ensure a sustainable service? The answer in an increasing number of countries is that the mushrooming demands on their national budgets will force the customers/beneficiaries of irrigation and drainage services to pay full O&M at a minimum in labor or fees for the services -- or there will not be any services. The financial resources available to each individual country will dictate the portion of the costs to be recovered. But very few developing countries can meet the huge need for urban infrastructure in the immediate decades without substantial customer/beneficiary payments towards the construction of all service infrastructure, including much of that in place. The governments' obligations for outstanding infrastructure related debts to international, bilateral and private lenders have a high priority.

Privatization has been touted as the solution to much and that includes the water services sector. However, China is restraining further trails in the rural sector at this time. Results of attempts in the urban sector of both developing and developed countries are also found. (Hall and Lobina 20019). The Wall Street Journal headed its July 21/03 "The Outlook Column" – "The World Bank as Privatization Agnostic." It stated that, "The World Bank, apostle of privatization, is having a crisis." Its privatization of water projects is failing. "There is certainly a lot of soul searching going on," says Michael Klein, the World Bank's Vice President for the private sector development." Subsequently, the Bank is also restraining its efforts.

China is the only country that has legislated a 'resources' charge for certain classes of water diversions. This charge earmarked for improved resources management purposes is independent of any costs of providing the services. However, at the time examined (1998), records were unreliable/unavailable regarding the application and actual recovery rate. But it appears that any funds that were collected were deposited in the provincial general revenues account. The current status of this policy and its application is unknown.

To augment the general world-wide information, the experiences of several individual countries with service charges, WSE financing and the institutional issues pertinent to these questions are offered in the following sub-sections.

2.5.2 Bangladesh. Proven self-sufficient for-profit WSEs are essentially limited to small areas for irrigation supply. Nevertheless, they are important in some countries because of the supply of source. In the delta areas of Bangladesh, small groups of farmers, most with 0.5 hectare and less, contract with an individual as a WSE to pump and distribute the water to their rice plantings. Payment to the pumper is a share of the harvested crop. He has incentives to conserve pumping fuel, hence also water, yet to secure maximum production. Each farmer makes partial payment before being allowed by the farmers' group to harvest; final payment is made upon completing harvest.

The individual provides the low-lift pump (transportable), fuel and labor. By nature of the payment, his service includes opening and maintaining the field ditches to ensure efficient water distribution. The 'pumper's' source of water is natural or government constructed channels, within large leveed areas. The government provides at no charge the bulk supply to the leveed areas by low channel

⁹ Hall, D. and Lobina, 2001. "Private to Public: International lessons of water remunicipalisation in Grenoble, France," Presented at the AWRA conference, University of Dundee, August 2001

diversion structures or low lift river pumping plants that entail relatively low cost O&M. Similar services (supply with or without distribution) are provided in many other areas outside the delta proper by well-owners'

2.5.3 China. China's particular history of traditional organization, means of construction and assignment of O&M must be understood for an evaluation of its forms of WSEs, cost recovery, service charges and charge mechanisms. China's Central, provincial and some county governments provide bulk water-related services. However, being most similar to a federal form of government, the provinces take the lead. They effectively 'own' the rights to water within their jurisdiction and are responsible to see that their citizens are served. Central government enters only on inter-provincial matters.

The traditional form of WSEs, still dominate with the technical management structure of the bulk schemes varying from two levels on the smaller to four levels on the very large (Quin 199410).. Most government WSEs are structured to match the appropriate government jurisdictional boundary. Seventy-seven percent of the nation's water service schemes are located within the jurisdiction of one county or the main portion of the benefited area is located within one county, simplifying institutional matters. This number does not reflect the great many small supply/distribution WSEs managed by the farmers also located within one political unit.

Traditionally, an irrigation area "Congress" has oversight and approval power on policy and certain operational matters and serves as the link with sub-areas and their customers. These bodies consist of representatives of the customers and hold annual or semi-annual meetings to discuss water allocation, project repairs and charges; to mediate conflicts; and to provide a degree of management oversight. The Congress is the highest authority and has powers to critique and dismiss the involved governmental WSE's management staff. It elects a small Commission composed of three to five individuals that functions on its behalf to meet regularly and provide the immediate contact and oversight of the region's management units (bureaus, departments, institutes, etc.)

Congresses may be created for every size of governmental WSE and are usually established for each branch and lateral within the bulk service area as well. Often Commissioners for the branches and laterals are elected directly by the customers / farmers. The Congresses may utilize township government to handle administrative matters and country agency professionals or direct hires to operate the scheme.

According to government reports, farmers of the land to be served paid through labor and limited fees over 96% of all irrigation and drainage construction from 1945 (indeed before that too) until recent international lending. Thus, there have been no significant government subsidies for the construction of the service facilities – irrigation and drainage – except for these recent schemes.

Government 'pricing' bureaus set service charges for bulk supply and sometimes for distribution. These often fall short of actual costs and is a major problem in the poorer political jurisdictions that cannot make up the difference by subsidies. Typically, customers pay charges with fees or labor. In some instances village government provides subsidies to the distribution WSE. In other instances, pricing bureaus have set excessive charges in village areas as a means to finance both O&M and unrelated village programs. Field ditch irrigation and management groups composed of farmers carry out elementary O&M.

In response to the international agencies' heavily promoted 'free market' concept, some provinces are experimenting with various forms of 'for-profit' WSEs to provide bulk water-related services.

Various forms of 'companies' have been introduced. One example 'for-profit' WSE exhibits the potential pitfalls. Existing government officials have been granted most or all of the stock, (in other instances the county may retain some). Farmers are closed out from any consequential stock purchases and from any management roles. There is no recognition of the fact that the farmers paid for the assets – the facilities. Dividends are paid and bonuses are provided to management for reducing O&M costs or expanding services. Obviously, delayed heavy maintenance and replacements can easily be reflected as 'savings' while emergency aid from government can cover major outages. And any expansion of service area (often cited as a virtue of for-profit operations) with the associated increase in water consumption, creates deficiencies to existing downstream or

¹⁰ Qian zhengying 1994. "Water Resources Development in China," Beijing, China Water and Power Press.

groundwater users. Indeed, the for-profit incentive encourages capture of additional water, always at the expense of downstream users.

Charge rates for these WSEs may be set by the pricing bureaus too; some charges less than sufficient for full O&M. Yet 'profits' are being recorded and dividends are being paid. Unrelated outside investments by the WSEs may be used to cover the shortfall. But in accordance with some 'for-profit' WSE bylaws, the financial records are designated as 'secret,' not open to the customers and violators can be prosecuted.

China has no effective government regulatory bodies to oversee and audit fiscal and service performance of these for-profit WSEs. A cursory review indicates that these trial 'for-profit' organizations cannot meet objectives, place facilities and services at risk, and will require substantial financial and administrative support from government. There are reasons why inadequately regulated for-profit monopoly WSE are not found in the irrigation and drainage sector of developed countries. As noted earlier, in mid-2003 most provinces placed a hold on creating more for-profit WSEs and the World Bank has reversed its policies.

Municipal and village services in China are provided by the traditional WSE sub-units of local government. A limited number of water and waste treatment plants are being constructed and will be managed by foreign firms as for-profit WSEs.

The arrangements for local drainage and flood control would appear to parallel the long established arrangements for irrigation except there is essentially no cost recovery. Regional and national flood control falls under a Central government agency and its river basin commissions with maintenance costs a Central and provincial government responsibility. In 1998, China assessed labor contributions to inhabitants of the tier of counties parallel to the Yellow River to help restore and upgrade river flood control levees.

2.5.4 Ecuador. Ecuador, several decades ago, legislated the means to form self-financing WSEs in both the rural and urban sectors. The city of Quenca has a quasi-government WSE that provides water, sewerage and electrical services. Smaller towns and villages likewise have established WSEs or sub-units of local government to provide the services. No dedicated government subsidies are provided now, though the treatment of initial capital costs are not known. But Central government passes to local government, which have limited taxing powers, 15% of tax revenues collected by Central government. Rather than tied to specific Central government programs, this allotment augments local government's general budget for its social, infrastructure, security and administration programs as they judge best including domestic supply in poor areas. The two larger cities of Quito and Guayaquil, however, suffer the corruption of non-payment of the related property taxes and much of the urban service charges.

2.5.5 Egypt. The government retains responsibility for essentially all agricultural water-related services. In spite of much study and outside efforts, farmers pay an insignificant, if any, charge for these services. Nevertheless, nominal recovery of capital costs for improvement works is scheduled over a long period with several years grace and no interest or provision for inflation.

2.5.6 India. Water resources management responsibilities reside at the state level. Except for the groundwater development, which is essentially unregulated, the 'tank' systems in the south and the numerous small local gravity supply systems, the respective state governments retain responsibilities for services. In some such as Haryana, cost recovery for O&M through direct charges and special taxes on non-agricultural users within the service areas exceed 90 percent for gravity-diverted supplies to much less for higher lift gravity systems that entail pumping. This is perhaps the highest recovery rate of any state. Gujarat and Maharashtra levy charges based on crops, but again political decisions influence charge rates and payments constitute an inadequate portion of O&M costs. Groundwater pumping by farmers is subsidized by reduced electricity charges to a varying extent and depending on the party in power.

Gujarat sold several hundred million dollars worth of state obligation bonds (the state guarantees payment) on the domestic market to replace the canceled World Bank loans for the Narmada Project. Ahmedabad likewise financed its urban water system expansion to use its new supply. The state covers bond interest payments during the construction period. However, the

adequacy of the service charges that will be applied once full water service commences to cover these and system O&M is unknown at present. Unfortunately, the Narmada power development and associated revenues flow linger.

Several Indian states are experimenting with the transfer of government service responsibilities. However, the financing mechanisms provided, condition of facilities, crop price controls, lack of water rights and politics -- all factors affecting sustainability -- place most of these transfer WSEs at risk. This is true even when no investment costs are included in the calculated service costs.

All drainage and flood control costs are covered by the state governments.

2.5.7 Peru. Peru has evolved a basic form of WSEs, essentially identical to a form of WSE found in countries as different as China, Canada, Germany and the US, that has proved highly effective and self-sufficient. The country was also early in enacting a rigorous water rights system. (Unfortunately, President Fujimora shifted administration from his office to local officials who in turn over-allocated water to favored developers. This is now a serious problem in some basins.)

Most of the urban and village services, irrigation and agricultural storm drainage have been provided by customer / beneficiary-owned WSEs, local government-owned WSEs or individuals for many decades. The remaining bulk water supply services now provided by the government agency INADE are to be transferred to such entities in the immediate future

The customers of old irrigation schemes, which serve 80% (650,000 ha) of Peru's irrigated land, pay for all O&M and replacement (OM&R) costs of their distribution systems and local storm drainage. This applies also to the diversion and bulk supply in many of these areas.

The production of high value crops for export attest to the quality of services. The Canate is an example, growing asparagus, peaches, pears, nectarines and table grapes for export to Europe. Irrigated farms vary from two to more than 250 ha.

The 15,000 ha. Canate system, built in 1923, consists of five distribution WSEs that receive supply from the valley's 'bulk' supply WSE. Each distribution WSEs is governed by a board of directors elected by the farmers that sets and collect charges, maintains its own bank account and directs the O&M staff. The Board of the bulk supply WSE consists of the president and secretary of the member distribution WSEs, and sets and levies service charges to the districts, maintains its own bank accounts and directs its O&M staff.

Essentially, none of the initial government capital investments in these distribution facilities has been directly repaid. And those old and new distribution schemes that receive bulk services from Central government (INADE) today pay little if any of the INADE's O&M costs and none of the investment cost. This holds true for both irrigation WSEs and major cities like Trujillo. Indeed, today (2002) the customers of Trujillo's treated urban water service pay lower service charges per unit of delivery than the adjacent farmers pay for untreated water delivered to their land.

About 20% (180,000 ha) of Peru's irrigated area is owned and served by individuals and small groups that have paid all investment and pay their ongoing O&M.

A similar record of cost recovery is found in the water supply service charges in the smaller villages, cities and urban centers. Customers pay to cover the investments and O&M for water supply service, and in the older areas of major cities, for sewerage services.

Most of the larger flood control works and those that are entirely rural facilities have been constructed and financed by Central government. The beneficiaries have not contributed to the investment, but have provided minor maintenance. However, several facilities for local flood control near or within cities and urban areas have been constructed and funded by the local government. This is also the case for urban storm water drainage. In such instances, the beneficiaries pay the cost of the service through taxes.

Drainage to control groundwater levels near the ocean in several Peruvian river valleys is sorely needed. It is anticipated that the irrigation WSEs of each valley, coupled with farmers in the immediate areas of distress will have to finance most if not all costs of such works.

2.5.8 United States. Most water services in the United States constructed prior to 1900 were self-financed by the customers except the many very small local well systems built by village entrepreneurs. The quasi-government form was the most common, but non-profit mutual companies

were created, particularly in the mountain states. Eighty percent of California's current irrigation distribution systems are quasi-government WSEs constructed prior to 1990. Then, local quasi-government WSEs were formed to finance, construct and operate systems serving up to 100,000 hectares. (Davis 1984) (Barnes 1987¹¹).

'For-profit companies' that constructed major surface water irrigation systems in the late 1800s universally failed. The primary purpose of several investor-owned irrigation companies in the western US at that time was to improve lands to enhance prices for their subsequent sale.

Many thousands of self-financing storm water drainage and groundwater control quasi-government WSEs (now serving over 60 million hectares) were established in the US during the 1800s and early 1900s. The urban water, sewerage and storm drainage of then existing cities were self-financed by similar WSEs.

State governments assumed a portion of the bond and loan payments for a limited number of local agricultural drainage WSEs during the severe economic depression of the 1930s to avoid a reduced bond rating for all special districts in the respective states. The special property taxes on the beneficiary farmers for repayment were fully restored in the 1940s and projects constructed since received no assistance with financing.

The USBR was created in 1906 to develop irrigated areas and assume some failed for-profit schemes within the seventeen western states. The Congressionally mandated USBR repayment, budget, ownership policies were shaped to recover all capital and OM&R costs; fund adequate OM&R to ensure sustainable services under all conditions; require customer-owned WSE's to be structured with full self-financing capacity; and isolate its service charges from subsidy/charge rate pressures. (Features of these policies would be appropriate for the transfer of government systems in the developing countries.)

The USBR proceeded to construct storage and bulk water delivery conveyance systems and constructed distribution facilities to those areas that sought the bulk services and would organize, before any construction started, as a quasi-governmental WSE with taxing powers under the appropriate laws of the state in which they were located. The USBR charges full cost of the bulk services, including capital, to the distribution WSEs. Congress did not require irrigation WSEs to pay interest on the capital investments, this being the only subsidy on USBR projects and services. Urban customers and power customers are charged interest as well as all other components. (Given the period of most construction, 1906 though 1970, interest rates on Federal borrowing were very low.)

OM&R of USBR-built distribution systems is entirely the responsibility of the farmer-owned WSEs which must charge customers to cover all associated costs including the USBR's capital costs of the WSE's distribution facilities and the USBR bulk service charges. The USBR monitors the adequacy of the WSE's OM&R with the right to remedy deficiencies and charge any incurred costs to the WSE. The USBR retains ownership of the WSE's USBR-built distribution facilities after capital cost payoff, but will negotiate a transfer of ownership of those facilities to the WSE if the WSE so desires.

All revenues from power and water-related services generated by the USBR are deposited in the federal general revenue fund. Independently, Congress appropriates bi-annual budgets to fund the USBR OM&R at levels to ensure sustainability and compensate for any subsidies or repayment delays that Congress may impose. The USBR retains ownership of all bulk service facilities after the capital costs have been paid off by service charges, with the exception of one facility that was transferred to the sole distribution WSE served by that facility. After capital cost payoff, the bulk charge rates are reduced to only OM&R costs.

During the depression of the 1930s, full repayment of USBR-built water supply facilities was postponed for their urban and irrigation WSE customers as were the charges for any Federal-constructed irrigation distribution schemes. But the repayment obligations remain and in the 1980s, rates were increased to full cost recovery.

Areas served by the Hoover Dam under the Boulder Canyon Project received special provisions forced by political, water rights and economic considerations. The three benefiting states, including the Southern California urban areas pay a nominal amount for water from this source. The 180,000

¹¹ Barnes, D. H. 1987. "The Greening of Paradise Valley where the Land Owns the Water and the Power," (Modesto Irrigation District) Fresno, Crown Printing

ha. Imperial Irrigation District does not pay for water passing Hoover Dam since it holds prior water rights on the Colorado River awarded before the dam was contemplated.

The California Water Project constructed in the 1960s through 1970s recovers all costs of services, including construction of facilities, for bulk deliveries to agricultural and urban WSEs in the Central Valley and Southern California. There are no subsidies provided for services from this immense system.

Beginning in the early 1900s, the US federal government launched 100 percent subsidized regional flood control in the US while later, local flood control projects received 75 percent Federal grants for construction, but none for O&M. In recent decades, Congress reduced grants to 25% of the cost for regional flood control and local projects, but ironically continued high subsidies for repeated storm damage to coastal second-home residential developments.

From the 1970s until today, significant Federal assistance programs fund certain urban and village service expansion. These have focused on pollution and waste treatment, but even supply systems for smaller towns have received loans or grant subsidies. However, the vast majority of all urban water-related services are funded by the customers through the usual mechanisms of property taxes and service charges.

Except for a few situations in the Western USA, there are limited examples found where adjacent non-farmers contribute to the cost of the irrigation service. Some cities formed as part of the land development schemes were included in the WSE district from the onset and the property is assessed for services, which also includes low cost electricity generated by WSE facilities. In others, the WSE provides the city's water and electrical service, but follows the usual utilities principles.

A related situation is found when common facilities provide service to a variety of classes of beneficiary. Often, non-irrigation users pay far higher charges because they receive a more reliable and higher priority service. This is not a cross-subsidy among beneficiaries, but reflects services that can support different economic activities or serve domestic uses.

Though water deliveries are closely managed due to the limited water rights available to the WSEs, particularly with the government's reallocation to environmental uses, only one example was found where pricing was used over a period of time to influence water use. The Button Willow district in California's San Joaquin Valley has serious drainage-related problems caused by the leached salts from the soil profile. To reduce excess applications and hence drainage, the farmers agreed on the quantity of water adequate for each crop grown in the service area. Their WSE set the charge rate for these quantities of water to a level for full cost recovery. However, they raised the normal crop charge rate substantially for water delivered in excess of the agreed quantities to a crop. This seems to have worked well with good control of drainage since the policy was adopted over ten years ago.

One of the conditions of quantifying water use rights is the appropriateness and reasonableness of the use and that includes unit use. This, together with the government's issuance of use rights to return flows to downstream users has provided the high basin 'efficiencies' without introducing the complicating and costly administration of price incentives in a highly diversified cropping often variable soil types.

2.6 Experiences with Creating Financially Self-sufficient WSEs Responsible for Schemes Transferred from Governments

The transfer of varying levels of responsibilities for system operation and maintenance for government-constructed systems, and hence service charges, has been underway for several years in a number of countries. Unfortunately, in a many instances, the transfer of responsibilities for these complex services that form the foundation of the agricultural economy to newly created local WSEs are treated in a rather simplistic manner.

The objectives of transfers may include increased operational efficiency, reduced costs to government, improved services or just removal of government responsibilities for such services. Sometimes it results from the popular view that stakeholder involvement is 'good'.

Unfortunately, the steps required for sustainability of the transferred services and responsible WSE are seldom fully rationalized. An array of approaches has been applied. Experience shows varying results depending on government policies, condition of the system, service potential, customer organization, financing powers of the WSE, reliability of water rights, politics and other factors. In a

majority, basic proven principles have been ignored and several of the many essential prerequisite actions were not taken. Some examples were noted earlier. Several studies have been conducted and for the purposes of exploring the extent and adequacy of pricing services under transfer programs. The findings of one will be cited (Frederiksen and Vissia, 1998¹²).

Selected transfers in six countries were examined at length to assess results and note causes of any inadequacies; Sri Lanka, Indonesia, Nepal, Mexico, Turkey and USA. (This study also reviewed results provided in a number of other reports by various international organizations and individuals.)

In all cases, water charges to the extent levied, were based on the costs of some portion of the service. The results were mixed. One recovered no costs; two were inadequate in all categories of costs; one was adequate to cover most of O&M only; one was adequate in O&M and rehabilitation, and one was adequate in all categories of costs.

The referenced study includes a detailed guideline of policy, legislative, bureaucratic and social conditions that must be in place before a transfer can be successful. The transfer failures can be attributed to the absence of one or more of the listed mandatory conditions that include basic data programs on the country's resources so that it can establish and effect a water rights program and ensure a reliable supply.

Transferred farmer/ system water rights were inadequate for all countries but one. Of the six, only one had a fully adequate legal form of organization for the WSEs that would allow it to become financially self-sufficient. Other gaps in the preparation and implementation of the transfers were also evident. Thus, there were logical reasons why charges had not or could not be increased to the level of full cost of services. The permitted financing means and capacity is a key issue coupled with government constraints on pricing by the WSE – usually for political reasons. In these cases, the WSEs are doomed to failure or to be subsidized by others.

2.7 Findings

An attempt has been made to describe example methods that are currently used for charging for services in irrigation, drainage and flood control. The primary focus was to determine policies and mechanisms for charging that have been successfully used over a long period by self-sufficient WSEs.

The experiences from this investigation indicate that:

1. Irrigation and drainage systems constructed by farmers or local villagers prior to the era of major government involvement and where an informal or formal water rights system existed, remain physically and financially self-sufficient.
2. Users of both the very small informal WSEs and the larger formal WSEs devised and funded the construction of the facilities and their operation, maintenance and replacement.
3. One characteristic of physically and financially self-sufficient WSEs is that service charges are levied to all beneficiaries/customers at a rate that recovers all financial costs of service – construction, operation, maintenance, management, replacement and borrowing -- and nothing more. The only excluded cost may be recovery of investment if it did not remain with the WSE. None include a component to provide for 'profits' nor any representation of the opportunity cost of the water
4. Charges for bulk water supply provided by another WSE are incorporated together with the distribution WSE's costs into the charges that the WSE levies to its individual customers.
5. There are no example WSEs of any type that base service charges upon the free market, opportunity costs, marginal costs, economic costs or assessments against bordering properties. This is also true of urban services except for a few cases where WSEs charge a modified marginal cost to urban areas located outside of the WSE's legal service area.

¹² Frederiksen, H and R. Vissia, 1998. "Considerations in Formulating the Transfer of Services in the Water Sector," International Water Management Institute, Colombo, IWMI

6. A characteristic of the vast majority of the world's WSEs proven to be physically and financially self-sustainable is that they are directly or indirectly owned and governed by local customers/beneficiaries of the service(s).
7. The vast majority are formally organized as quasi-governmental WSEs or local government subunits governed by elected representatives of the customers/beneficiaries.
8. Proven, successful, for-profit, irrigation WSEs in developing countries are almost exclusively small, serving a cluster of farmers with well supply or low lift pumps from open channels. Usually they have no formal rights to the water.
9. Successful, farmer-owned WSEs for irrigation created as a part of government construction programs were simultaneously created at the time of or before the major works were constructed and are of the quasi-government form of organization. These receive bulk supply that may be subsidized or at full cost from a government system, and in addition, cover all internal distribution system costs of service.
10. Irrigation WSEs recently created by the transfer of responsibility from government for government-built systems usually levy charges based on some component of the cost of services, however, results are mixed and the vast majority are heavily subsidized or their facilities and services are deteriorating from lack of adequate funds.
11. Central or provincial government-operated irrigation WSEs in developing countries base charge rates on the recovery of some component of service costs, however, with few exceptions political influence introduces various subsidies or underfunding.
12. Successful, self-sustaining drainage WSEs continue to be constructed in developed countries that have legislation providing for quasi-governmental forms of organization, but they receive no government financial support and in developing countries using forms of WSE similar to the irrigation WSE.
13. Local and regional flood control has a mixed history with government increasingly carrying all costs as the protected area increases.

All factors in a given situation affecting the quality of the services must be considered and fully addressed by the government to ensure the financial and physical sustainability of a scheme. The actions must be within the payment capacity for the customers and the ongoing subsidy commitments government can guarantee in the future. The physical factors affecting quality and cost of services and the life of the scheme include:

1. the specific provisions of present and future water rights and access to supply,
 2. the reliability and nature of services within the scheme adopted where water is insufficient for the total scheme as constructed
 3. the existing condition of facilities, quality of construction (original and rehabilitation) and anticipated life.
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