Economic Valuing of Water

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Part A – Principles of Valuing Water

Introduction

The new economic approach to water allocation is to assign appropriate value to water resources in a manner that derives maximum benefit from this scarce resource. The traditional approach to water allocation, in general, treated water as a free resource of unlimited supply with zero cost at the point of supply. With increasing scarcity of water resources and multiplicity of demand from different sectors for a share of this scarce resource, the traditional approach has been found inadequate as an allocation mechanism. However, the challenge in identifying a mechanism for better water allocation is prioritising between widely divergent demands for water such as for basic human consumption, environmental services and the production processes that include water usage in agriculture, industry, power generation, navigation and others.

Sri Lanka upholds several centuries old water-related traditions shaped by an ancient hydraulic civilization and has a significant agricultural production base that thrives on irrigation. The irrigation infrastructure, both old and new, has more significance than merely providing water for crops, as it is the foundation of human activities in the adjacent settlements and the root of survival of the surrounding ecosystem. Heavy dependence on hydropower to meet country's energy needs, large portion of population making an existence out of irrigation supported agriculture and the significance of the natural ecosystem in guaranteeing people's access to most water-related basic services make it important that economic, social, environmental and cultural values are recognized in an equitable manner in water resources planning, development and management.

The objectives of this study is to assess the present status of valuing water in Sri Lanka, recommend targets to be achieved in relation to improved allocation based on value and suggest suitable indicators and methodologies to measure progress of achieving targets. Ruhuna basin in the south-eastern Sri Lanka is used as a case study.

Water as an Economic Good

In actual use, water can be both a social and an economic good. Water satisfies several basic human needs and services, which are classified as life-support functions. Access to safe water is fundamental to the maintenance of life and many ecological and environmental services of water are critical for the existence of living systems including that of humans. But in many other instances it has definite uses of a market good of which the efficiency of use and benefits can be maximized through competitive allocation.

Water allocation decisions had been usually kept outside the market due to its special nature. However, growing problems due to the allocation of water through traditional mechanisms have prompted analysts to look for other means of allocation. Presently, the recognition of water as an economic good and the treatment of solutions to water allocation problems within an increasingly

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market-based approach has become recognized as the approach that is most promising in formulating policies to address problems in the water resources area.

The potential value of applying economic tools and principles as a means of improving national and international water priorities and policies came to the fore with the declaration at the International Conference on Water and Environment (ICWE) held in Dublin in 1992, where it was concluded that "***water has an economic value in all its competing uses and should be recognized as an economic good.***" This was further re-emphasized at the United Nations Conference on Environment and Development held in Rio (UNCED, 1992) where it was declared that "**water, as an integral part of the ecosystem, a natural resource and a social and economic good....**" (Agenda 21, Ch 18.).

In the debate pertaining to valuation of water conceptual refinements have taken place in several ways. One major refinement is the treatment of water as a resource with value as opposed to being treated a "free good."

The proclamation of the ICWE and similar forums is considered a compromise between two schools of thought prevailing in respect of water allocation. One favours treatment of water in the same way as any other private good subject to allocation through competitive markets based on value pricing. The other demands treatment of water as a basic human need and thus being exempted from allocations based on competitive market pricing. Proponents of the latter fear that managing water as an economic good may cause poor people or small businesses to be priced out of the market leaving them without enough of an essential good.

The need for the treatment of water as an economic good arise from several factors:

a. Increasing importance of conflicting and complimentary uses that extend beyond basic human-existence issues and potential for new income generation. This brings forth concepts of opportunity costs to the forefront of analysis where the framework for decision-making can only be pursued with the incorporation of economic considerations.
b. Developments of these opportunities require investments that often require non-zero costs, sometimes even substantial outlays of funds. Given the competition for investible resources, some form of valuation of benefits of water resource development becomes imperative.

Thus, by recognizing water as an economic good, a foundation is laid for developing an appropriate analytical and policy framework toward identifying effective solutions at least in respect of economic uses of water. However, probably due to inherent difficulties in the treatment of these solutions within a market framework, perhaps caused by the absence of well-defined markets for water this approach has been largely kept out of the discussion of solutions.

Probably the feature that leads to sub-optimal water utilization is its common property character where the access to water resources is not under the exclusive control of a single agent or source. In such instances, resources are exploited in 'first-in-time first serve' basis, which promotes inefficient allocation. Therefore, the thrust of the present examination of the issue will be on the functionality of adopting an economic approach to water resource management.

To be defined as an economic good allocated through competitive markets a commodity has to possess certain basic characteristics of which scarcity and existence of property rights are essential features. Scarcity of water exits in widely varying contexts and parameters. Physical scarcity is an issue in respect of spatial and temporal variation in water availability and in water supply schemes for irrigation and domestic or industrial purposes. Scarcity in terms of quality

variation is an issue in public water bodies, urban water supply schemes and in relation to actions causing watershed degradation. In practice, the existence of property rights is the condition often violated in bringing water under a market regime. Yet, there are situations where unambiguous definition of property rights to water is as feasible as with any private good.

Usually public goods are not amenable to market allocations and require extra-market measures to determine allocations. In general, there are two approaches to deal with commodities those posses strong social or public good characteristics. The first is the use of market allocation mechanisms with adequate safeguards to ensure meeting of basic needs of those adversely affected such as poor. The second is to adopt a regulatory approach. Both choices have their advantages and shortcomings.

Because of its special characteristic emanating from basic life-support services (human and ecological), a concept that allows treating of water as a social good at least to an extent where water is required for maintenance of such services has been advanced. Allocations beyond this basic need are considered more amenable to market mechanisms. However, the deficiency of this approach is that the level at which it transforms from a social good to a private good can be a subject of debate.

Valuation of Water Services

The value of water and similar natural resources resides in its ability to generate flows of services over time. Even a simple irrigation water supply project, besides providing water for crop production, supports several other economic functions such as water supply for domestic purposes, livestock production, fisheries, cottage industries and numerous environmental services such as preservation and enhancement of wildlife habitats and ecosystems. Major value domains applied to water allocation decisions recognize use or extractive values and in-situ or non-use value associated with water resources.

The services provided by water resources, following taxonomy suggested by Young, (1996) can be grouped as follows:

- Commodity benefits – Those benefits derived from extractive (or consumptive) uses such as drinking, cooking, sanitation and contribution to production activities as well as non-consumptive uses such as hydroelectric power generation and waterways transportation.
- Aesthetic and recreational values – Economic benefits derived from recreation, aesthetic and fish and wildlife habitat. These benefits have a public good nature.
- Waste disposal – Water bodies serve as a sink for carrying away and assimilating a wide-range of residuals from the processes of human production and consumption.
- Dis-benefits – Damages caused by flood waters, excesses of pollutants carried by water are dis-benefits, reduction of which increases welfare.
- Non-use values – In addition to commodity benefits, important non-use values are associated with water resources in the forms of non-marketed intrinsic properties such as option, existence and bequest values.

Total Economic Value (TEV) framework provides a systematic approach for assessing these combined economic values of varied goods and services provided by natural resource-based systems (Randall, 1991; Pearce, 1993). Many valuation taxonomies have been developed to categorize the types of economic values associated with water and other natural resources within the TEV framework (Pearce, 1993; Freeman, 1993; Dixon et al., 1994).

An additional dimension in economic valuation of water resources occurs due to existence of stocks and flows of water resources. Linking flow and stock values also requires a process of discounting. The above classification and analysis show that certain costs and benefits of water resources readily become applicable for economic valuation while some others remain arduous. Still, to a large degree water allocation decisions are capable of being brought under control of economic production and valuation criteria and institutions.

The difficulty in developing a consistent policy framework based on the treatment of water as economic good arises due to lack of development in the institutional area. Institutional arrangements developed by traditional societies based on agrarian civilizations were quite adequate to deal with the allocation decisions arising from the prevailing systems, but are quite ineffective in dealing with the range of uses extending outside the most rudimentary ones. Such institutions were sometimes particularly strong when water scarcities and accompanying problems were high, but ineffective in determining allocations across divergent uses.

The Concept of Value of Water

The value of a resource exists in its ability to provide services. Resources have value in services related to economic, environmental, social and religious considerations. In this sense, water is a resource with value in all these considerations. Yet, accepting the value of water does not necessarily require charging for water. The existence of opportunity costs in different uses changes the 'free good' character of water and requires prioritisation of water use. This priority of value of water is determined on the basis of perceived value of water and reflected in water resources policies (Briscoe, 1996). Opportunity costs of water serves as a tool to renegotiate water rights, water tenure, basin governance and inter-sectoral water allocations.

Even when water is accepted as an economic good, market-based allocations may be unacceptable due to questions of the appropriate value. One such issue is the often-observed divergence between the true "economic" value of a good and its "financial" value (Perry et al, 1997). This divergence is considered exceptionally complex and important in the case of water. Thus, even when it is accepted as an economic good, allocation of water through competitive markets may be objected to on the basis that market prices only reflect the financial value of water but not necessarily economic values.

Market valuation of a good generally accepts the principle of marginal costs and benefits as the basis of determining optimum allocation. On this basis of market allocations, welfare is maximized when water is priced at 'marginal cost' and it is used until the marginal cost equals marginal benefit. Nonetheless, the identification of appropriate value, both in respect of the cost and benefits can be controversial.

In certain instances where the life support functions of water are at issue, the marginal value of water can be infinite. Secondly, the consumers' willingness to pay for water will depend largely on the ability to pay which has very little to do with the basic need for water. Also, consumers' sovereignty expressed in the market ignores the distribution of income in the society. Thus, even when the marginal value of water is high poor may not be able to pay for it. On the cost side, actual costs may be under valued due to failure to account for environmental and other ecological costs associated with extraction, conveyance and delivery of water.

Policy Rationale

The core principle underlying a move towards establishing a price-based allocation mechanism for water lies on the simple premise that appreciation of true value of water encourages wise and responsible use and stimulates innovation. Appropriately designed water tariffs will discourage or prevent waste and stimulate water saving.

Recognition of water as an economic good means water has value in competing uses. Managing it as an economic good means that water will be allocated across competing uses in a way that maximizes net benefits from that amount of water. An economic approach to water allocation does not necessarily mean management of water as a commodity in all aspects.

In general, the scope of discussion on charging for water services used to be restricted to cost recovery of domestic or irrigation water supplies. In this context, the debate was on various options for cost recovery - from full recovery of capital and operational and management costs at realistic interest rates to partial recovery at subsidized rates. The content of current debate extends well beyond the problem of cost recovery in to the aspect of using water prices to encourage efficient use and the level of charges required to achieve it.

Secondly, the difficulty in translating experiences of traditional water-allocation institutions to present day problems seem to pose a challenge to developing a rationale for policy making. Such mechanisms functioned well under relatively less complex conditions. When the limitations of present institutional arrangements to fully assimilate economic valuation criteria are acknowledged it becomes clear that a blend of approaches is required to arrive at an acceptable alternative.

Principles of Water Valuation

Availability of water for economic and human existence functions faces an increased scarcity in respect of reduction of available water flows and stocks in respect of both quantity and quality. The demand for water from varied sectors and particularly from some new uses such as recreational purposes is increasing causing a strain in the ability of existing water resources to meet all competing needs. Therefore, an appreciation of full resource value of water in its alternative uses i.e. economic, social, cultural and environmental will encourage its efficient use. A balance between water pricing as means of encouraging wise use and social rights of access to water services must be reached.

In developing an appropriate valuation scheme for water the foregoing discussion dictates some principles that have to be given due consideration:

1. Market allocation of water can be sub-optimal as it may fail to address those demands that are primarily of a life-support nature that can be identified under two main areas:
   a. Basic human needs – Markets may fail poorly in guaranteeing socially equitable allocation of water to a degree that infringe on the basic human rights for water for living including preservation of cultural and social values.
   b. Environmental flows – Market failures are abound in meeting basis environmental flows, which are essential for the sustenance of the ecological system due to the absence of a mechanism to internalise some of these needs.

2. Market allocations can be quite effective in improving allocations between competing economic functions of water in production areas, i.e. agriculture, industry, power generation, recreation etc.

Part B – Valuation of Water in the Ruhuna Basin of Sri Lanka

The Ruhuna Basin

The Ruhuna Basin selected for the WWAP Case Study is located in the south-east quadrant of Sri Lanka and has a total basin area of 5578 sq. km. It comprises of four geographically contiguous river basins formed by Walawe Ganga, Kirindi Oya, Menik Ganga and Malala Oya and the smaller rivers and streams bounded by them. Along the southern border it is marked by the coastal shoreline it extends from the Walawe Irrigation Project in the west to the Yala sanctuary in the east, covering most of the Hambantota district and parts of Moneragala district. North and north-west portions of the basin contain parts of Badulla and Ratnapura districts.

Main Features of the Ruhuna Basin

Major part of the Ruhuna river basins is located in the southern dry zone of the country. High temporal and spatial variation in water availability is a vital aspect affecting ecological and human activities in the Ruhuna basin. The western most part of Hambantota district bordering the intermediate zone, extending east through the dry region with semi-arid sections in the central part of the basin contains one of the most diverse landscapes in the island. From south to north, dry plains in the coastal areas bordering the shoreline to mountainous landscape in the relatively wet north, the basin displays wide physical variation accompanied by diverse ecological systems.

The total population in the area is 0.98 M with wide variation in density. The Moneragala district with only 0.4 M people records the lowest population density in the country. Nearly a half of the households in the basin are classified as stricken by poverty with 50 percent of families receiving poverty alleviation assistance under the Samurdhi Program. However, the distribution of the poor is highly variable depending on the agricultural situation and availability of non-farm employment.

As presently estimated water abstractions for different economic uses is as follows:

Irrigated agriculture*	–	94 %
Pipe-borne water supply	–	1 %
Major industries	–	5 %

Agriculture dominates abstractions of water for economic uses with water resources in the relatively drier sections of the basin developed for irrigated agriculture from ancient times. There are 26 reservoirs and 11 anicuts in the basin with a total reservoir capacity of 883 MCM. All except two reservoirs i.e. Samanalawewa and Udawalawe, are operated exclusively for irrigation releases. It is estimated that 57 percent of the total runoff is utilized in the basin for different

* Abstractions for agriculture includes water for crop growth, domestic uses including livestock, local environmental and cultural needs in the community. Pipe-borne water supply includes provision through the National Water Supply and Drainage Board.

activities. Groundwater recharge in the catchment excluding Lunugamvehera is estimated at 706 MCM (WRIS, 1995).

Abstractions of water for domestic purposes account for a small share of total water resources in use with traditional supply sources such as shallow wells, streams and reservoirs being used to meet most of the needs. Annual total water demand of domestic uses is estimated at 30.5 MCM and the ground water extraction through bore-holes is estimated at 0.86 MCM (2.8% of the demand). Pipe-borne water is supplied only in a few municipality areas and meets needs of less than 20 percent of the population.

Water abstraction for industrial purposes ranks low compared with the other regions with relatively less water intensive industries located in the region. The assessed industrial water requirement in the basin is estimated at 13.85 MCM per year. The two large water-consuming industries in the basin, the sugar and paper mills use own supplies from public reservoirs or streams. Existing small and medium industries such as garment factories, hotels, ice plants etc. mostly use the public water supplies where as very small industrial units such as paddy mills, repair shops and manufacturing units use their own ground water sources.

Issues in Water Valuation in Sri Lanka

There is plenteous evidence that the value of water has been recognized throughout the history of Sri Lanka. Ancient records indicate that irrigators had to pay a fee to the King for water. A rock inscription in the 9th Century by the King dictates fines for overuse of water, late land preparation etc. However, practice of paying fees for irrigation water and related customs gradually waned with the shifting of settlements to the wet zone where agriculture was mainly rain-fed.

The social and cultural values of water are recognized and well entrenched in social customs. In the villages, community wells for water supply for drinking and bathing, washing etc. were common. Until the recent times, at the wayside resting places a pot of water was provided for travellers to quench the thirst. In both cases, the water was provided free but the value, which was not charged, was recovered in terms of the returns due for the noble deed ("merit or pin").

The neglect of irrigation-based food agriculture sector during the early periods of European rule hastened the disintegration of water related customs and value structure. When the new irrigation-based colonization schemes started, settlement of people became state driven with the development of infrastructure including free irrigation provision treated as essential incentives and state responsibility.

The recognition that water cannot be delivered entirely free arose with pressures on community water supplies and on irrigation water due to increased demand. The high cost of infrastructure development and maintenance, shortages due to wastage and excessive use and demands from new economic sectors have made the policy makers realize that the value of water has to be incorporated in to policies and strategies.

The financing of water resource development has traditionally remained the responsibility of the state. While there are legitimate public interest concerns, there is growing consensus that Government involvement is not required in all aspects of service provision. The cost of providing water services, primarily in the community water supply schemes is a widely accepted concept today. The National Water Supply and Drainage Board (NWSDB) which supplies water in urban areas has been levying for water services for many years. Recent expansion of community

management of water services through local councils etc. would transfer part of the infrastructure development and management cost to the beneficiaries.

Estimates of financial requirements for water related investments suggest that the need for and identification of alternate sources of finance will be a major challenge. The Public Investment Program, 1997-2001 (PIP) envisaged an investment of Rs. 9,146 M for irrigation and Rs. 9,040 for Mahaweli Area Development and Rs. 23,535 M for Water Supply and Sanitation, activities which involve major water related investments. An assessment of financial requirements for water-related investments carried out by the Sri Lanka Water Vision 2025 estimated a financial outlay of Rs. 115,160 M for 2000-2005 and Rs. 339,170 M (US $ 4,800 M) over the full period, 2000-2025 (SLNWP, 2000). Compared to the actual level of investments at present, these estimates indicate the need for a substantial increase in investments over a short period requiring engagement of the participation of the state, private sector, beneficiaries and donors to meet the need.

Provisions in the 'National Water Resources Policy and Institutional Arrangement' towards granting of water entitlements to farmers and introduction of levies for irrigation water were resisted by farmers, politicians and various interest groups due to a number of reasons. New proposals for issue of entitlements and introduction of cost recovery mechanisms were not preceded by a substantial public consultation or awareness making beneficiaries suspicious of planners' intentions. This led to the misunderstanding that cost recovery is introduced only on the recommendation of donors. A purely institutional approach that paid little attention to social or cultural aspects and fail to satisfactorily address causes leading to system inefficiency is another reason for poor acceptance of its recommendations.

There are formidable constraints to implementing charges for irrigation water. The very large proportion of small farms with no survey plans makes fixing of rates a challenging exercise. Ancient irrigation systems design enables most of the water to be reused. It is argued that same water should not be charged several times. Ability to pay and multiple uses of water in irrigation systems are other issues that make the subject even more complicated.

As a result, a quick resolution of issues entirely on economic and social considerations is not possible. However, several positive trends are emerging. A large number of irrigation systems are being turned over for (partial) management by farmer groups. This strategy promotes a concept of Farmer Companies taking control of all aspects of management including irrigation system operation in smaller schemes. Where conflicts between demands for power generation and irrigation are severe, improved water management practices leading to demand management are pursued i.e. Kaltota scheme. There are plans to implement better water management practices island-wide. A consensus has to emerge eventually to practice water trading as a means to maximizing returns to water.

Problems in Managing Water Resources in Ruhuna

The high spatial and temporal variation in water availability directly transmits its impacts on to the economic life of the inhabitants of the basin. These impacts can be observed in all aspects of development in the basin from patterns of residential development, distribution of agricultural activities to industry location. The current developments are sure to have an impact on the future strategy for resource development and management in the region. Key problems observed in the region are outlined below.

a. Agricultural productivity: The primary distinction in agricultural productivity arises from the availability and utilization pattern of water resources for agricultural activities as observed in the irrigated and non-irrigated agriculture in the region. Irrigated agriculture has imparted some certainty to agriculture as demonstrated by the crop selection dominated by rice in the ancient major irrigation schemes and cultivation of cash crops under lift irrigation in new schemes. Food crops with secondary importance dominate the more vulnerable highlands under rainfed cultivation.

   However, the productivity even within the irrigated systems displays significant spatial and temporal differences. Cropping intensities and average yields of rice across major and minor irrigation systems as well as different agro-ecological regions within the basin bear evidence of wide differences in the certainty of water supply. Cropping intensities in irrigation areas vary across major and minor irrigation systems and the agro-ecological regions.

   A more recent development in agriculture is the exploitation of groundwater for agriculture using shallow and deep agrowells. Unplanned and unregulated groundwater exploitation for agriculture for commercial crop production remains a potential problem with serious implications. Decreased productivity of agrowells due to unregulated exploitation and threats to permanent crops in the area due to lowering of the water table remain potential hazards.

b. Water availability for domestic and livestock needs is a serious constraint in the plains bordering the coastal south particularly during the dry months in every year. Domestic water supply schemes presently confined to the small townships and urban areas too face strains during dry months. With thin spread of population in the areas prone to serious scarcity during dry months, community water supply schemes are not likely to be a part of the solution to water scarcity problem faced by many inhabitants.

c. Other non-agricultural economic uses such as industry, power generation and recreation sectors being less intensive in the region, management problems from pollution and other environmental abuse are not serious at present. Deforestation from 'slash and burn' agriculture and illegal timber harvesting pose severe threats to sustainability of the natural ecosystems in the region with potential long-term impacts on water resources.

Therefore, at present, except for problems arising from the inability to overcome strains caused by spatial and temporal variation in water availability, human interventions have not led to creation of serious management problems. This is partially the result of relatively under-developed nature of the industry and other non-agricultural resource uses in the basin area. Sound water resources development and planning can therefore contribute significantly to success of development plans for the area.

Water Resources Development in the Ruhuna Basin

With agricultural (and associated domestic) uses dominating water demand principles adopted in planning, development and management of water resources in the Ruhuna basin are predictably dominated by considerations on improving agricultural production and productivity. Given the certain importance of agriculture in the region, particularly in the rural areas, as a source of employment and income generation agricultural considerations ought to feature strongly in all decisions pertaining to water use.

The general thrust in planning and development of water resources in the region has been to exploit all 'viable' resources for capacity expansion of irrigated agriculture. Irrigation development serves both as means of creating opportunities for poor to engage in gainful income generating activities as well as improving equity. Generally, low density of population in the drier sections of the basin is complimentary to the potential for expansion of agriculture dominated by perennial and semi-perennial fruit and orchard production systems more appropriate for water resource availability in the area.

Also, the agro-ecological conditions approaching arid climate in the basin area is well suited to intensive crop production using drip irrigation and fertigation technologies that have become extremely popular and profitable elsewhere. The scarcity of water for large, surface irrigation systems, high evaporation losses and minimal conflict with community and ecological needs act as advantages in promoting such land uses in those areas.

In the area of industrial development, choices may be restricted by the quantity and quality of water available in the basin. The proposed Southern Area Development Project led by 'Ruhunupura' covering parts of three river basins will demand development of more assured water supply for successful implementation. Water demands for the proposed harbour in Hambantota and airport in Sooriyawewa in particular will test the soundness of any water resource development strategy in the basin.

Assigning Economic Value to Water

Planning, development and management of water resources in the country, at least at the community or project level, is handled through a hierarchical and multi-sector organizational structure. At the sub-national and operator level several organizations both formal and informal exists. This structure ails from several gaps of which the most important are the following: a) absence of a single national level institution to coordinate matters, b) management at a small, sub-unit level that bypasses addressing of basin level scarcity or quality deterioration problems, and c) absence of a mechanism for water resources and environment protection.

Assignment of rights to water to majority of inhabitants in the region was dominated by assignment of rights to irrigation water since planning, development and management of water resources for economic development and livelihood maintenance in the region have been exercised through harnessing of water resources for agriculture. Because abstraction of water for agricultural purposes including crop and livestock production, domestic needs and local environment and cultural needs have been developed jointly within a framework of comprehensive irrigation settlement development, assignment of water rights to different sectors is tied up un-detachably.

Irrigation system-based, comprehensive water resource planning and development approaches practiced in the dry regions provide a complete framework for addressing all sub-sectoral needs within the micro-environment including local environmental and life support functions. However, management of water resources after their development has often failed to live up to expectations causing serious strains in the functioning of the system. Gravity controlled, surface distribution systems relying on regulatory approaches and community responsibility fail to avoid completely certain forms of market failures arising from common-property characters imbedded in such systems. Problems such as illegal tapping, wasteful use, differences in water availability between head and tail-enders are numerous leading to inefficiencies. Management procedures having

improved accountability by all beneficiaries will be essential to ensure increased efficiency in water use in these systems.

On the other hand, urban water supply schemes have clear target groups and the ability to implement institutional control measures to overcome problems due to management shortfalls. Problems such as non-metered use, waste from community outlets etc. are easily detected and corrected over time. With a large share of clients brought under the control of the management system, assignment of value to water services can be implemented in the form of cost recovery or charging for O&M expenditures.

A Framework for Water Valuation in the Ruhuna Basin

Based on the principle that the new economic approach to water allocation is to assign appropriate value to water resources in a manner that maximum benefit is derived to the socio-economic milieu of the area, the objective of the present analysis is to delineate guidelines for such a scheme. In this context, direct benefits would constitute those benefits resulting from improved access to water services in their primary uses, mainly agricultural and domestic purposes. Indirect benefits would constitute those derived through improved public health and environmental services of which the significance would be comparatively not less than direct benefits in magnitude, under certain situations.

Water governance structure in Sri Lanka is dominated state organizations operating at national, provincial and local levels. A large proportion of water resource base is in the custody of the state directly or indirectly, limiting the influences other stakeholders have with regard to its use and management. One well-known conflict situation exists with respect to prioritisation of water allocations between power generation and agriculture.

As a basis for methodology to assign value to water resources in the Ruhuna basin it is necessary to arrive at some assessment of potential improvements in direct production oriented activities utilizing water while maintaining the required flows for environmental and other services. Agricultural activities consumes the most amount of water directly in production and all land resources that could be utilized for agriculture have already been developed or even developed to an extent exceeding the carrying capacity in certain localities. Thus, it may be necessary to adopt a water balance sheet approach to decide on the potential agricultural activities that could be supported and sustained over time. The supply side of the balance sheet would include all inflow in to the Ruhuna basin including potential diversion from the adjoining regions observing surpluses during periods of high precipitation. The demand side would include existing and potential developments of agriculture and non-agriculture industries and community needs. In this context, the scope for improvements water economy through adoption of improved management technologies including changes in crop mixes, irrigation techniques and cultural methods have to be considered. Water balancing exercises at irrigation project level, micro-catchments and similar units can be aggregated upwards to elicit basin-wide scenario.

There are several aspects pertaining to future growth patterns of agriculture, industries and other production activities to be considered here. The future growth strategy in the region would likely involve a steady decline in the numbers finding full employment within agriculture, thereby making creation of new opportunities outside agriculture critical. The proposed Southern Development Strategy, which envisages significant infrastructure and industry development in the region provide cues as to the potential direction of such developments. The type of industries

proposed under the strategy will have its own pressures on the water resources and could totally alter the complexion of water resource valuation in the Ruhuna basin.

Indicators of Progress

The Second World Water Forum (2000) has established several targets pertaining to valuation of water resources to achieve at the global level. Two key outputs expected are,

1. Economic values of water recognized and fully reflected in national policies and strategies, by 2002
2. Mechanism established to facilitate full cost pricing of water services while ensuring the needs of the poor are guaranteed, by 2015.

Sri Lanka has adopted major steps towards recognition of economic values of water through the introduction of a National Water Policy that envisages issuance of entitlements to water thus enabling transfer of rights to water based on economic value. Thus, the schedule for rationalizing water uses within an economic framework is consistent with the global targets set by the Second WWF.

Towards developing a set of indicators for the purpose of comparing of alternatives and valuation of water-consuming activities a valuation scheme comprising of the following is suggested:

1. Recognition of Different Values of Water
   a. Recognition of social, cultural and environmental values in allocation decisions
   b. Recognition of water as a human right i.e. Needs of the poor
   c. Mechanism for allocation of water rights/entitlements

2. Recognition of the Concept of Water as an Economic Good
   a. Estimates of value of water as an input to different production processes
   b. Potential value of water as an input for new industries
   c. Value of water-based aesthetic and recreational sites
   d. Municipal water demands for household uses and others i.e. industry
   e. Expenditure, total and per capita on water resource development as a reflection of value

3. Reflection of Value Differences of Water in Different Uses
   a. Average levels of water tariffs for household and industry
   b. Estimates of average water tariff per capita
   c. Estimates of average water tariff per capita normalized to reflect income
   d. Percent households covered by water tariffs
   e. Tariff revenue relative to cost of water resource development and management
   f. Water tariffs applied to different economic groups
   g. Water supply to tariff and non-tariff customers
   h. Community ownership of water resources
   i. Policies and institutions to determine demand-responsive water resource development
   j. Annual investments per capita in water resource development, conservation and management
   k. Granting of water entitlements and Intra-sectoral water transfers
   l. Mechanisms for trading water across regions, industries etc. (Inter-Regional, Inter-Sectoral)
   m. Share of water reserved or released to maintain environmental services

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