# Sectoral Allocation and Pricing of Groundwater: A Stakeholder View

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**Abstract:** The approach of policy makers and planners at Central and State is to move towards a regime where groundwater resources and their uses are regulated and access and provision of resource are charged for. However, the process of evolution of such a regime is at a very preliminary stage and a sustainable policy is required to be formulated which is equitable and just for all sectors. The willingness of user to pay is subject to dependability of the resource which in turn requires integrated multi-dimensional management approach. It requires clear cut policy of entitlements, allocation, access and pricing structure. A regime of water rights and access is necessary to address the inequities arising out of various actions. The paper discusses above issues as well as suggests alternate water markets with respect to types of sources—surface water or ground water. This paper also suggests an alternate basis for cost-benefit analysis where reduction in State expenditures on mitigation, employment and poverty alleviation is considered as a sustainable benefit due to provision of water to stress areas. Water conservation, harvesting and recharge structures and treatments may be considered on par with head-works in surface schemes for the purpose of pricing as also for sustainable repairs and maintenance of these. Pricing policies and/or practices in couple of other countries have been briefly highlighted.

## INTRODUCTION

The policy thinking and approach of policy makers and planners at the Centre and to varying degrees in the States/Union Territories too, at present is to move towards a regime whereby groundwater resources, or their uses, are regulated and access to resource, or provision of resource, is charged for. In other terms, users pay for ground water. However, the process of evolution of a regime is at a very preliminary stage and a sound foundation is required for a sustainable policy that is seen as just and equitable by all users and stakeholders. The route to this is through multi stakeholder dialogue. CII is an industry association and therefore represents a segment of water use and users. This segment happens to be the one that will be among the first to be brought under the new regime and also likely to be the highest charged. CII look forward for solutions and arrangements that will address the requirements of all uses and users and bring about improvements in use practices and services across the board. It is the time to discuss the basis for a policy and important norms and goals that will guide

the policy and implementation. Therefore this paper takes a generic approach and tries to outline the various direct and indirect implications of a policy that proposes to charge the uses/users, to begin with some if not all, and also addresses the issue of allocation priorities and sectoral allocations.

As for the issues in pricing of ground water, it must be observed the world over not much experience is accrued so far. As such the policy debate refers back to the pricing policy on surface water, which is appropriate to a certain extent insofar as the structure and framework are concerned. While integrated management of all water resources, including ground water, at basin or sub-basin level is an emerging imperative, the surface and ground waters are totally different in terms of chargeable service or product. Not withstanding this, this paper will have to refer to surface water pricing as far as structure and framework are concerned.

Generically speaking, water users will be willing to pay for water service if –

- They understand the resource and are convinced about the dependability of the resource
- There are clear entitlements and allocations, and
- There is a dependable access system.

This paper examines the issues arising out of the above propositions.

## DEPENDABILITY OF THE GROUNDWATER RESOURCE

This primarily refers to the most important issue, and one most difficult to quantify, of "Sustainability". In layman's terms, and all users are essentially laymen, all water rights and allocations put together should not be larger than the available renewable resource. This brings forth the science and technology agenda of quantifying ground water and establishing the interrelationship between ground water, surface flows, static surface storages and harvesting and recharge structures. This also brings forth the management agenda for monitoring and regulating abstraction by individual users of ground water. The issue of monitoring and regulation of groundwater abstraction is very complex since, as observed by the Inter Ministry Task Group on Efficient Utilisation of Water Resources:

*"In our country, groundwater ownership is tied to the ownership of land. A person who owns land also owns the groundwater resource below the land."*

Monitoring and regulation of groundwater abstraction is expected to be particularly difficult in the rural areas. Whereas, notionally speaking, the urban/industrial areas are considered more amenable to monitoring and regulation as evident in the power sector where reforms have brought some improvements and success stories with respect to pilferage and default. The same Task Group observes:

*"This legal position, compounded with the fact that free or subsidised power to the agriculture sector is in vogue in many states, has led to rapid decline in groundwater levels in many parts of the country. During the drought years the tendency is to exploit ground water, extensively and intensively, lead(ing) to rapid decline in water levels. The water level in 306 districts in 20 states has fallen by over 4 m during the period 1983-2003. Categorisation has also been done of the blocks/taluks/watersheds in the country as over-exploited (where level of groundwater withdrawal exceeds the recharge) or dark (where the level is 85%-100% of recharge). Of the 7928 blocks/taluks/watersheds in the country, 673 (8.49%) are over-exploited while 425 (5.36%) are dark or critical."*

However, the point regarding inherent amenability of urban and industrial areas for regulatory regimes should not be taken to mean more than an inherent potential, since ultimately the will to bring in a regulatory regime and enforcing it in a way that is acceptable to users is the basic issue. The issue

of groundwater depletion is very critical in urban areas too, as evident in the documents circulated by the Artificial Recharge of Groundwater Advisory Council. Cities, and surrounding industrial areas, like Faridabad, Ludhiana, Ghaziabad, Delhi, Gurgaon, and Haldia have been targetted for Regulation of GW Development and Management on priority basis.

At present primarily the criterion of depletion of water level is being used for categorization of districts/blocks/cities. But if a comprehensive definition of sustainability is evolved, which is necessary, many more criteria will come in to picture and even more regions will be deservedly recognised as vulnerable. Following criteria, apart from what others may suggest, should be considered for a comprehensive definition of sustainability:

- The existing criterion for zoning should be made more precise in terms of water balance, i.e. recharge and abstraction
- Salination and salt water intrusions
- Presence and increase of arsenic, fluoride and iron (due to natural deposits)
- Presence and increase of chemical contaminants (agro and industrial chemicals)
- Adverse impacts on surface water bodies (streams and ponds)
- Adverse impacts on aquatic cultures (e.g. fishery)

## Need for Integrated Approach to Water Resource Development and Management

In India the inter-relationship between various kinds of water – viz. groundwater, surface flows, static water, etc. – is not being sufficiently appreciated. Most of what we call as ground water (from unconfined aquifers, confined aquifers, etc.), apart from the deep recharge that contributes to virtual mineral storages, is subject to sub-surface flows which over varying periods of time depending upon aquifer characteristics, contribute to streams/rivers as base flows. All post-monsoon river flows apart from Gangetic basin where snow melt is an important contributor apart from base flow, are solely due to base flows. Therefore, if minimum flows are to be ensured in rivers for addressing priority human needs, protecting aquacultures, etc., groundwater abstraction from contributing aquifers needs to be restricted.

It is also further important to take into account return flows from agriculture and waste water and effluents from urban areas and industry since these contribute to river flows as well as groundwater recharge. The issue of water quality for all such waters is of paramount importance and addressing this issue fits perfectly in the multi-dimensional definition of sustainability. Here, all would agree that the principle of "polluter pays" should be applied very intensively and extensively.

The need for integrated water resource management at the level of a minimum hydrological unit is underlined. The Water Policy 2002 recommends:

*"Water resources development and management will have to be planned for a hydrological unit such as drainage basin as a whole or for a sub-basin, multi-sectorally, taking into account surface and ground water for sustainable use incorporating quantity and quality aspects as well as environmental considerations."*

The recognition of the need for multi-dimensional definition of sustainability as well as an integrated approach to water management at a minimum hydrological unit level, viz. river basin or sub-basin, is implicit in this statement. As part of an integrated approach it is also important to account for water accessed through desalination of sea and brackish water. It must be recognised that it is becoming an

important source to address the requirements in the coastal regions, of habitants as well as industries. In fact there could be a proactive policy to promote industries that require high quality of water, and will any way recourse to high-end desalination process such as distillation and/or reverse osmosis, in the coastal areas and areas of brackish water.

### Monitoring and Regulation: Need for Community/User Participation

As the water issue becomes more complex, it is necessary to do away with traditional concepts of policing as the method for monitoring and regulation. It is now necessary to switch to science and technology tools for monitoring and user participation for regulation and management. The efficacy of satellite imagery as monitoring tool needs to be explored. Important will be to assess whether imagery can be used to monitor water tables, identify suitable sites for recharge structures and also monitor water use, particularly in agriculture and forestry. This will require interpretations at micro scales and methodologies that will require combining participatory and scientific techniques for generating required data for image interpretation as also for validating image interpretation through ground checks generated by local users using participatory techniques.

If communities and users come forward to participate in the monitoring of water resources, evolve required institutional mechanisms and acquire required capabilities, their participation in regulation and management will be only a few steps further. Rural communities as well as industries and urban residential users know a lot about their individual or collective sources of ground water as well as surface water. The knowledge base includes observations on inter-relationships between various water sources (wells, bores, ponds, etc.) as well as various resources (ground water, surface waters). At present there is no system that will collate all such information, convert it into quantitative data and draw out area/regional level scenarios. Qualitatively as well as quantitatively this information base will turn out to be far superior to the CWC/CGWB information systems. What is required is capacity building and S&T support to users and user organisations. However, for this to happen, the basic policy for involvement of users should be firmly in place along with the required legislative backing. The line departments in partnership with S&T organisations should be reoriented to provide required capacity building and technical support to users for their effective participation in monitoring and regulation of water resources.

## POLICY FOR ENTITLEMENTS, ALLOCATIONS, ACCESS AND PRICING STRUCTURES

Any water policy based on Constitutional principles of equal opportunity and right to livelihood will have to subscribe to the principles of equity in water management. The issue is whether the existing de facto law of "*A person who owns land also owns the groundwater resource below the land*" enables equity or not. If every family has a shelter, every agriculturist has agricultural land and every industry has an establishment then it would appear all that is necessary is to make available required capital for investments in source development and abstraction systems to ensure equitable water access. This is where ground water differs from surface water. In surface water schemes also the natural endowment factor does come in, but it is limited to feasibility of service coverage with respect to proximity to surface source (reservoir, drainage, elevation with respect to contour canals). Once the

natural endowment is confirmed, theoretically there are no natural constraints in service delivery. The fact that water does not reach tail ends of canals is due to social and managerial factors.

In contrast, theoretically there is groundwater access for all landholdings. However, the quality and quantity of access is subject to groundwater hydrology below the holding. This will determine:

- The cost of access – the water table is variable, the sub-surface strata would differ (some may encounter hard rocks formations, others may not).
- The volume of access – the yields and other aquifer characteristics are variable.
- Seasonality of access – natural aquifer depletion conditions are also variable.

The natural endowment factors create inequities at local as well as regional levels. While the two main types of regional inequities, viz. rainfall endowment and regional groundwater characteristics, are known, the inequities in endowments at micro and mezzo levels are less appreciated

### Inequities due to Natural Endowment Factors

As far as the regional hydrogeological characteristics are concerned the inequities between alluvial Gangetic plains, the Central and Peninsular basaltic regions and the western desertified areas, to name a few prominent systems, are well appreciated. However, the micro level inequities in the undulating catchment areas, which are today the primary target for watershed development, are not sufficiently appreciated.

Experience of the watershed programme over the last more than a decade indicates severe inequities in water and soil endowments at even 500 ha micro watershed level. Just as at the basin level there are poorly endowed undulating catchment areas and richly endowed alluvial or valley plains, at the micro watershed level also there are poorly endowed uplands along the ridges and better endowed valley plains. The soils in the uplands are usually poor, eroded and have low water retention capacities. The soils in the valley are comparatively better with respect to water retention and erosion. The run-off and recharge areas in a micro watershed can be clearly demarcated.

### Impacts of Differential Endowments on Urban and Rural Scattered Industry and Townships

It needs to be taken note of that the differential endowments of ground water (as also surface water) give rise to distortion in real estate and agricultural land markets with better endowed lands having higher market appreciation and poorly endowed lands having less market appreciation.

Theoretically it will make sense that lands taken up for residential townships and industrial areas should be poorly endowed rural lands where agriculture is less viable, particularly in areas away from urban habitats. In areas nearer the urban habitats the real estate market is likely to be so distorted that market values of lands could far out-weigh long term incomes from intensive agriculture on good agricultural lands having good endowment with respect to surface and/or ground water. As for poorly endowed undulating lands, if such lands are targetted for urban townships and industries, the issue of equitable access to water will be faced by residential townships and industries. It must be recognised that this issue is important as capital that could be productively invested gets spent unproductively on real estate.

## Allocation Policy as a Tool for Addressing Inequitable Water Endowments in Agricultural Watersheds and Promoting Local Water Markets for Water Access to Industries

The National Water Policy has recommended certain broad priorities in water allocation with the rejoinder that "the priorities could be modified or added if warranted by the area/region specific considerations:

- Drinking water
- Irrigation
- Hydro-power
- Ecology
- Agro-industries and non-agricultural industries
- Navigation and other uses.

There cannot be any dispute that drinking water should get a top priority. There also cannot be any dispute that irrigation should also get a high priority since a large section of Indian population is dependant on agriculture for livelihood. However, it is necessary to distinguish between basic service for minimum livelihood and economic service for commercial agriculture. The basic service may be defined as one which enables honouring the MDG with reasonable assumptions regarding land and water use choices and water use efficiency and crop management practices. The economic service would be any provision for agriculture over and above the basic service. The basic service should be minimally priced at affordable rates so that the cost of water does not affect minimum assured livelihood. The economic service may be further stratified into an incremental block structure, or any such pricing mechanism that leads to enhancement of water use efficiency, and suitable incremental pricing mechanisms should be used for defining prices of incremental blocks.

The quantum of basic service can be decided on the basis of experiences of pioneering initiatives by NGOs and communities. For example Pani Panchayat and other movements and organisations in Maharashtra define the basic service as about 5000 $m^3$ per family of five as being sufficient to ensure a minimum decent livelihood. This water must be an unfettered right of all agriculturist families and also of rural landless agricultural labour families. The latter can take up farming on leased lands or may trade their water rights.

Water rights over and above the basic service may be provided in suitable incremental pricing systems as tradeable rights. This opens up the possibility of trading of water rights in the predominantly agricultural watersheds for creating water access to industries that may be set up in such watersheds. Similar water rights may be created in the irrigated command areas where return flows from agriculture and seepage losses from canals, i.e. the technical losses, cause groundwater recharge. In such systems it is necessary to make estimates of recharge due to return flows from agriculture through irrigation water that the farmers have already paid for, and therefore are owned by them, and that caused by seepage through canals. In the former type of recharge each farmer is naturally entitled to the estimated recharge due to return flows caused by water already paid for by him. The recharge due to seepage losses should be a chargeable economic service, again in a suitable pricing system which enables required water use efficiency. These should again be tradeable rights whereby farmers can trade their rights over waters from return flows as well as economic service based on seepage losses. This will enable water access to industries in predominantly agricultural watersheds that contain command areas.

## Creating Access to Poorly Endowed Lands and Users in Agricultural Watersheds

Creating entitlements and allocations is of no use if access is absent. Typically, in the poorly endowed lands the natural access to ground water is limited to monsoon and a short duration post-monsoon. The quality of the access is not good enough for drawing allocated water. In recent times, soil and water conservation treatment based on watershed development principles has demonstrated that the access to water can be marginally enhanced through watershed based development intervention, but this is also not sufficient. Therefore it is necessary to create access through abstraction sources situated in richly endowed areas in valleys and flood plains. Such abstraction sources will necessarily have to be community owned and managed and preferably situated on common lands, but also on private lands if necessary.

This will enable year round access to water to users holding poorly endowed lands. This will also level the local agricultural land and real estate markets. With water assurance for all and levelling and lowering of land prices, there is a better possibility of emergence of rational land use and markets:

- Good agricultural land will remain under agriculture
- Lands poorly endowed with respect to water but with good agricultural soils will get productively used for agriculture and plantations, and
- Inferior lands will get diverted to non-agricultural uses.

## Water Allocation and Access in Urban and Industrial Areas

In such areas allocation system will have to ensure water allocation and access to following types of users and uses:

- High priority to residential uses/users
- Also a high priority to public facilities and establishments
- Shops and establishments
- Industries.

It should be obvious that in urban and industrial areas the water allocations will have to be on "first come first serve" basis as there cannot be any other basis. However, while the water allocations to industries will be through tradeable rights, caution is necessary while providing allocations to ensure that the water demands are commensurate with and for direct use. Thereby, when any user transfers a part of his right to new user(s), that will be on the basis of saved water. This will reflect higher technology and conscious water saving on the part of the particular user (unless it is due to withdrawal from non-viable businesses). The benefit accruing from the transfer of water right will serve as an incentive as well as compensation for technology expenditures that reflect Corporate Social Responsibility and this should be enabled and rewarded through water markets and tradeable water rights.

There are further issues in water allocation policy and pricing debates that require multi stakeholder dialogue, for example:

- An incremental allocation and pricing system for domestic users so that minimum required allocation of water is made available at affordable rates to the 'Bottom of the Pyramid" with further water access becoming a trade-off between needs and capacity to pay. The basic question here is the delivery mechanisms for the urban poor who may not have permanent shelters, and feasibility of piped delivery mechanisms to shanty towns and slums.

- An incremental pricing system for industrial allocation and use so that SMEs get water at affordable rates.
- Discounts to industries in proportion to manpower strength of the establishment as the availability of water at work place, as a utility, should be seen as part of right to livelihood.

Creating water access for poorly endowed properties in urban and industrial areas will require strategies similar to those in agricultural watersheds – viz. creating access through groundwater sources situated on well endowed areas in the watersheds. This may require that the municipalities retain right to develop groundwater sources on even private properties if well endowed public lands are not available.

### Water Related Policy for Setting Up Industries

It may be important to distinguish between industries that use water for processes and industries that consume water. In the former type large proportions of return flows, in terms of effluents and waste water, are expected. Therefore the net loss from the system is small. Treated effluents and waste water can be utilized for domestic, agricultural as well as industrial purpose and the polluting industries have to ensure requisite level of effluent and waste treatment.

However, in the latter type large proportion of water is expected to go out of the watershed and will not be available for local use. Matters arising out of this classification are as follows:

- Water consuming industries should be set up only in potentially water surplus watersheds.
- The watersheds from where "water flights" are taking place should be compensated for lost water rights over treated effluent and waste water.
- If the product is such where large proportion of water is released as return flow in the watershed where it is utilized, for example bottled water, the concerning industry should be entitled to be compensated for the return flows as these are contributing to effluent or waste water which can be potentially utilized. It must be recognised this is practically equivalent to water transfers. The compensation could be in the form of concessions and discounts in taxes and other services.

## POSSIBLE SCENARIO ON GROUNDWATER MANAGEMENT AND WATER MARKETS IN AREAS SERVICED BY EXOGENOUS WATER

Various policy statements when put together indicate a possible water future if seemingly disjointed policies are converged in the framework of integrated water resource management. This enables a concept of water markets totally different to the issues under public debate. Some of the relevant policy highlights are:

- High priority to soil and water conservation and water harvesting and groundwater recharge on watershed development principles.
- Community-based watershed and groundwater management, and conjunctive management of surface and ground waters.
- Canal water prices should reflect the real costs of service (if not opportunity costs).
- Equitable water service to canal tail areas is a priority.
- Participatory Irrigation Management is a priority.
- Water-transfer to stress areas is a priority.

The canal irrigation schemes do not reflect the opportunity costs of water service and perhaps even the actual costs of head-works, distribution systems and service costs. This is largely because of:

- Unrealistic pricing
- The target areas are decided on the basis of natural endowment that makes service coverage (distribution system) less expensive and feasible, and
- Cost-benefit analysis is based on narrow framework of value generated through water service.

The point that needs underlining is water services from reservoirs go to better endowed areas. If instead the target of water service was decided on the basis of poor endowment factors the service will cover drought prone regions and catchment areas, and uplands and ridge plains of river valleys. These are the areas where State has to recurringly spend huge funds on drought mitigation, employment and poverty alleviation. If these spendings are not undertaken it leads to very high indirect social cost. In this scenario the cost-benefit analysis will include savings on distress management and related direct and indirect costs, as tangible benefit and the cost-benefit ratios may go in favour of water service to such stress areas.

The cost of such service is expected to be much higher than service to conventional command areas. However, farmers will still be willing to pay for this service since that may mean difference between extreme distress and well-being. An important outcome of service to stress areas would be that farmers will themselves demand volumetric delivery and charging. This is because the pricing on the basis of the present flat rate systems will be prohibitively high, and will ensure high water use efficiency – something which is totally lacking in the conventional command areas.

In this framework the opportunity cost is determined in terms of mitigation of poor endowment factors rather than only on the basis of maximizing economic output as is done conventionally.

The scenario projected here is not a mere hypothetical scenario or a good social wish. This issue is coming up in the context of attempts by state governments to "utilise" water awards through projects where development and service delivery costs are high, for example high capacity large lifts where command areas are in tens of thousands of ha. The systems development costs (usually high capacity stage lifts and piped canal systems) are high and the O&M costs are also high due to power consumption.

Such situations open the real opportunity for stakeholder dialogue for developing and stabilising the system. For example, in the Krishna valley in Maharashtra there are very interesting initiatives and demands coming up from farmers, NGOs and farmer organisations. This includes co-management of water and energy as well as co-management of exogenous water with local water. Some of the demands and assertions are very interesting, as follows:

- Energy costs in the operations of lifts should not be arbitrarily subsidized and the useful framework for determining such energy cost would be matching the generation and supply costs of the oldest hydro energy schemes where generation costs are lowest as compared to other sources. This is because arbitrary subsidization is seen as non-sustainable.
- Farmers may pay for water (whole or part) in energy terms by generating energy rich biomass by allocating a part of service water for biomass cultivation. The biomass can then be used in biomass-based energy systems.
- Government should make available funds for soil and water conservation and rainwater harvesting and groundwater recharge on watershed development principles.

- Minimum entitlement to water, local and exogenous together, should be 5,000 $m^3$ and this should be made available at reasonable affordable price.
- Water should be delivered to communities on volumetric basis. The communities should be empowered to use it as they wish. They could use some of it directly or store it for later use.
- Government should provide capacity building funds and support for communities to become capable of managing complex integrated water systems.

The rationale behind such innovative thinking is that communities know that subsidization will render the schemes vulnerable to collapse, availability of energy is also an issue and lastly these are drought prone areas and therefore the social opportunity value of the water service is very high.

## Addressing the Drought Scenario through Exogenous Water

It is often found that while there are certain frequently drought affected regions, there are many periodically drought affected regions with differing periodicity. If the exogenous water schemes are to be reoriented for water service to drought affected regions, the frequently drought affected regions will become more or less permanent target and many other areas will need to be periodically targetted as currently drought affected areas. This calls for a flexible delivery system and adds to the project cost. The O&M expenses will also rise and if these are levelled over all service areas the service cost to conventional command areas will also go up substantially. To offset this, the conventional command areas may be given funds for soil and water conservation and water harvesting and recharge so that local waters are generated. This will decrease the need for exogenous water thus lowering the gross price paid for water and also free some of the tied water for alternate uses.

This is in fact a win-win scenario as the water users in the conventional command areas are indulging in excessive use of water leading to lower productivity and salination of soils. The increased water cost will create a push for judicious use of exogenous water and will enhance the productivity while at the same time prevent salination. The exogenous water will be seen as something which enables crop protection and high yields, therefore farmers will be willing to pay a higher price. Areas where exogenous water service is prohibitively costly by all standards should be targetted for special land use patterns that require high investments so that water stress is offset through investments. This may include long duration but high value plantations where labour costs of plantation establishment are taken care through employment funds and input costs are managed through part grant and part loan subsidy.

## A Possible Tiered Water Service – A Water Market based on Different Water Sources

If water sources are disaggregated with respect to nature of schemes under which resources have been generated it is possible to identify at the least 4-5 categories – watershed development schemes, minor irrigation schemes, medium irrigation schemes and large projects. Of these the first two, i.e. watershed projects and minor irrigation are very local in character whereas the medium projects enable water service to uplands in the lower valleys and valley plains in the same river valley or adjoining small river systems, and large and mega projects enable water service through water transfers between sub-basins and between large basins. If the minor, medium, large and mega projects are reoriented to provide service for drought management as discussed above, that will create a water market based on different sources where waters are priced to reflect the social opportunity cost and therefore are proportionately more costly.

A tiered water market may be something as below–

- Local water from conjunctive systems of small check dams and ponds: This is expected to be the cheapest water and under normal circumstances can take care of kharif protection and also 1-2 light irrigation for extended kharif crops and/or water efficient early winter crops.
- Water from local minor irrigation tanks: This is essentially local water but more expensive than the above. The MIT may be used as feeder source whereby water is pumped into the local check dams and ponds, and is then utilised through the local conjunctive systems.
- Water from medium irrigation systems: Such systems basically enable inter watershed transfers within basins or sub-basins and are more expensive than both the above waters. This type of water can address situations of relative distress within a sub-basin due to rainfall variations as well watershed level ground water and other local endowment conditions. Here it is necessary to have flexible distribution systems so that water can be allocated to different watersheds on the basis of current stresses. These waters will be much more expensive than the above local waters.
- Water from large and mega projects: The thrust of the water policy should be to use these most expensive water for intra as well as inter basin transfers to address the regional inequities, both current and permanent, so that maximum value is derived out of it in terms of humanitarian issues as well as economic service.

Any unused water allocations from allocations created for addressing current stress situations can be "auctioned" to communities who may use it for groundwater recharge and surface storage for later use, or for short duration water intensive crops that will fetch them immediate returns.

### Basic Approach and Framework

To conclude, a different perspective of water market is being proposed, one based on not the nature of the service provider (whether public sector or private sector) nor in terms of products being offered (special quality water to cater to specific needs) but on the basis of social opportunity cost of a flexible water service that addresses social imperatives as well as enables attaining economic objectives of viable agriculture and allocation of water to other purposes. The summarized suggestions are as follows –

- A regime of water entitlements, allocations and access that will ensure attaining the MDG by making available basic quantum of water for livelihood at affordable rates, and also enable realising the policy objective of water as an economic good through an incremental allocation and pricing system.
- A fresh look at the existing and future irrigation and water transfer systems for addressing the regional, sub regional and local inequities, current (due to droughts and floods) as well as permanent (due to agro-climatic and geo-morphological factors).
- A fresh look at the water pricing system to reflect the actual economic costs and value of different waters while at the same time honoring commitment to MDG and food security.
- Promoting water markets in the predominantly agricultural watersheds through tradeable water rights so that allocations are created for non agricultural uses through regulated market mechanism.

## WATER PRICING AND ALLIED ISSUES

To begin with the first important issue is what is being priced – water service or royalty. This issue is important from the point of view of emerging water law. Charging royalty would mean sovereign

ownership over water resources and that the revenue from water provision goes to the general exchequer as part of collection of all sovereign taxes and duties. This position is unacceptable. Water should be firmly brought under the public domain as a public good whereby the State is providing a water service and charging for it. When water is put under public domain it becomes subject to regimes of rights, entitlements, allocations and access, and it becomes the sovereign responsibility of the State to ensure these. If water becomes the sovereign ownership of the State then there are no water rights, and the allocations and access are subject to "Pleasure Principle".

With the grounding of water in the public domain the next important issues are the basis of pricing and pricing systems. The groundwater recharge, source development, distribution, and monitoring and regulation are the direct costs. There could be associated social opportunity and other indirect costs. But these should be clarified without ambiguity and the basis for such costs should be decided through multi-stakeholder dialogue.

Industries are weary since they are charged arbitrarily high for utility services and there is a serious danger of the same happening with respect to ground water. For example, the power rates to industry do not nearly match with high end generation costs in new or high end technology projects such as nuclear energy. Similarly, subsidies in agriculture or other priority uses are also equally arbitrary. The charged rates do not correspond to any low end generation projects such as oldest hydro power projects, surface water schemes in regions well endowed with respect to rainfall and hydrogeology. In fact the subsidies are so high that, for example, if farmers were to pay for electricity at cost of generation in the low end cheapest projects, even then there will be a subsidy shock.

Before going further in details, the discussion above effectively proposes that water access to industry in agricultural watersheds is predominantly through tradeable water rights of farmers. Therefore role of the government is mainly as regulator and donor for providing funds to community for watershed based development of natural resources. The pricing may be limited to that. The cost of O&M should be managed by the community on the basis of revenue from water service. In contrast, the State de facto holds the water rights in urban and industrial watersheds. Here the State will be Regulator as well as management agency. The water rates may be suitably designed taking all such factors and realities into consideration.

## Cost of Water Service for Groundwater Systems

The cost of water service, as seen in surface water schemes, may typically include following costs:

- Cost of head-works, distribution networks and other systemic requirements such as treatment units and management establishments for surface waters.
- Operation and maintenance costs of collection, transport to a treatment plant, water treatment to meet quality standards and distribution to customers.
- Monitoring and enforcement.
- There would be additional costs of treatment of effluent and waste water.

As for cost of specifically the ground water, typically the cost for source development and abstraction/ distribution systems are borne by the user, whereas in surface water schemes these are borne by the State. However, the activities of soil and water conservation and water harvesting and recharge systems may be considered on par with "head works" in surface water systems. Maintenance of such physical assets may be considered on par with maintenance of canals and other physical assets related to surface water systems.

If the sources of ground water are public sources, so as to address relatively disadvantageous endowment factors, the costs of source development, abstraction and distribution systems will be either in collective mode or borne by the State. Else they are borne by the users. All such issues should be precisely factored in deciding the groundwater pricing. As for operational costs, the costs of monitoring and regulation are expected to be significant and these could be covered under groundwater pricing. Users' willingness to pay for this will depend upon reliability of the resource, regime of clear entitlements and allocations and dependable access systems. In short the groundwater users should be willing to pay for ground water provided the State is able to provide water assurance.

## Water Pricing Systems

Following water pricing systems seem to be often discussed in international literature and debates. Here reference is not made to the existing systems in India as they are at present not meant to create push-pull factors for enhancing water use efficiency and generating water markets for displacing the existing non-scientific and low efficiency uses. Only those systems which try to strive for such objectives are being considered. Also, under pricing systems only the structure of pricing is discussed, not the numeric values.

- **Increasing Block Tariff:** Or tiered system. This is broadly based on three parameters—the number of blocks, the volume of water in each block, and the per unit prices for each block. This system seems to find favour in public debates since this is seen as having potential for cross subsidization. Wealthy households and larger industries are perceived to be using more than rational or equitable share and should be made to pay for extravagant use.
- **Uniform Price with Rebate:** In the block tariff system there is an inherent weakness that once a user enters a higher block he has no incentive to economise till the block is exhausted. In water stress areas that could amount to significant water losses. The alternative is a uniform price for a convenient volume of water, say 1 $M^3$, with rebates for priority uses and entitlements. This system also has the potential to target subsidies where they should go.

## Basis of Water Pricing

Any pricing system should have some reference to cost realities of water service, from thereon decisions can be made as to how to subsidise particular segments of users and/or uses. Following systems seems to attract international attention. However the decisions on pricing systems should be totally through multi-stakeholder dialogue:

- **Marginal cost pricing:** A marginal cost pricing (MCP) mechanism, in essence, targets a price for water to equal the marginal cost of supplying the last unit of that water. This basis of pricing will forego the tendency to under price water and can create push factors for enhancement of water use efficiency. Disadvantage of this would be the difficulty in calculating such costs as that will require intensive monitoring systems and extensive database.
- **Full cost accounting or recovery system:** For a real life example, Ontorio defines full cost for this purpose as:

*"The full cost of providing the water services [including] the source protection costs, operating costs, financing costs, renewal and replacement costs, and improvement costs associated with extracting, treating, or distributing water to the public and such other costs as may be specified by regulation."*

- **Full cost pricing:** For a real life example, the EU, as per the "Water Framework Directive", requires:
  "....member states to take account of the principle of recovery of the costs of water services, including environmental and resource costs, the polluter pays principle, and following an economic analysis which shall contain enough information in sufficient detail (taking account of the costs associated with collection of the relevant data) in order to:
  (a) make the relevant calculations necessary for taking into account under Article 9 the principle of recovery of the costs of water services, taking account of long-term forecasts of supply and demand for water in the river basin district and, where necessary:
    - estimates of the volume, prices and costs associated with water services, and
    - estimates of relevant investment including forecasts of such investments;
  (b) make judgments about the most cost-effective combination of measures in respect of water uses to be included in the programme of measures under Article 11 based on estimates of the potential costs of such measures."

## CONCLUSIONS

CII welcomes the initiative of the Government to organise multi-stakeholder dialogue on groundwater allocation and pricing. It is concluded that:

- The legal/constitutional basis for groundwater pricing needs to be established. Ground water should be brought under public domain and government may be liable for water assurance in general and providing and protecting groundwater allocations in particular. Government may charge for groundwater service. Groundwater pricing as a matter of sovereign taxes is neither desirable nor acceptable to any user.
- A regime of tradeable water rights and entitlements along with dependable water access systems needs to be created in the predominantly agricultural watersheds to off-set inequities arising out of natural endowment factors.
- Basic water service of 5000 $m^3$ water for an agricultural family of 5-6 members should be made an unfettered right for all families. This allocation should be at minimum affordable rate and water allocation over and above this should be considered as economic service and charged accordingly, preferably in incremental pricing system.
- Allocation of all exogenous water should be on watershed/community basis and prices of different waters – local, minor irrigation tank, medium irrigation scheme, large and mega projects – should reflect the real cost of harvesting and distributing the resource and the O&M costs. The watershed communities may internally create/provide entitlements, allocations and access systems and pay for all waters in volumetric terms. All entitlements and rights should be tradeable.
- In the urban and industrial watersheds water rights and entitlements would necessarily be on first come first serve basis. However, it must be ensured that the requested allocation is commensurate to planned use and that it is used accordingly. Any trading of water allocations should reflect actual water saving through improved technology.
- Monitoring and regulation cannot be achieved without involvement of communities and users. The first step in a shift towards community/user management of ground water (as also other water resources) would be their involvement in water budgeting through methodologies that combine

scientific and participatory techniques. Individual users know a lot about their own sources/resources and this information should be assimilated in databases on water resources.

- Integrated management of all water resources is necessary. This may be at basin or sub-basin level. Particular attention is necessary on inter-relationships between different types of waters – namely surface flows, surface storages, groundwater, return flows, etc.
- The existing framework of exogenous water supply for irrigation, viz. the natural endowment with respect to feasibility of service coverage at least cost, should change in favour of stress areas. The distribution network should be suitably expanded. The stress areas may include permanent stress areas (frequently drought affected) as well as current stress areas (infrequently drought affected).
- Principle of "polluter pays" should be rigorously implemented. This may include industries as well as municipalities and public utility managers.
- Cost of maintaining the physical assets of soil and water conservation and water harvesting and recharge structures should be considered on par with maintenance of head works and distribution systems and that of monitoring and regulation should be considered as operational costs.
- Different pricing systems and costing basis are possible. Final choices should be through multi-stakeholder dialogues. The pricing should reflect service costs as well as social opportunity costs. The cost-benefit should be considered on the basis of reduction in direct costs to the State for drought mitigation, employment and poverty alleviation as well as reduction in indirect costs to the society due to water assurance to stress areas.