INTER- SECTORAL ALLOCATION OF WATER – NEEDS, PRIORITIES AND CHALLENGES AHEAD

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ABSTRACT

Fulfilling water requirement is a critical issue for industrial development in India without compromising on the irrigation water demand for its agricultural development. Meeting the multiple demands like Domestic, Industrial, Irrigation, Ecology, etc. has the potential to lead to intense water conflicts. In fact, this has provided a new dimension to existing water conflicts in addition to already rising number of inter-state water disputes. Deficient rainfall also lead to severe water shortages and situation becomes trickier when priorities need to be decided for water use. The problem is further compounded due to spatial and temporal variability of water availability in a basin. Some mechanisms have evolved to resolve inter- state water disputes, but there is none to take cognizance of emerging inter- sectoral water conflicts. Inter- state Water Disputes Tribunal on Cauvery and Krishna have also taken note of competing demands among different sector particularly between Hydropower and Irrigation.

Though National Water Policy indicates the priorities to be followed in allocation of water to different sectors, it falls short of indicating the mechanism to decide the competing demand among different sector. Comprehensive Mission document of National Water Mission identifies promotion of basin level integrated water resources management as one of the goals and strategies for inter- sectoral water allocation among various sectors. River basin planning is a participatory process that takes into consideration all possible uses to evolve a plan for potential development of the basin. The paper highlights the need for a comprehensive river basin level planning to determine how much water from the basin can be used for various sectors without adversely affecting each other. Further, it emphasizes to evolve some effective mechanism to resolve emerging inter- sectoral conflicts e.g. industry vs. agriculture, human needs vs. environmental flows, etc.

INTRODUCTION

Growing population, increasing urbanisation and industrialisation have led to increasing demands for water in India for diverse purposes viz. domestic, industrial, agricultural, hydro-power, thermal-power, navigation, recreation, etc. Irrigation is and will continue to be the major consumptive user of water. Water, which is already a scarce resource, will become even scarcer in future. With the competition over scarce water resources on rise, it is of increasing importance that the existing water resources be allocated more judiciously. The problems may be compounded due to likely adverse impact of climatic change.

Water Conflicts arise at every level – between different uses of water, between different users, between different areas (inter- group, inter- village, inter- district, inter- state, inter- country). Water allocation among the various sectors is influenced by the existing institutional and legal frameworks as well as the water resources infrastructure. For optimum allocation, effective specific set of laws and regulations, water resources Organisations/ Institutions are required.

Due to its unique characteristics, water has traditionally been considered as public good and the mechanism of allocating water to various sectors has been controlled by Government. Economic efficiency has seldom been adequately addressed while allocating water among various sectors by State Government. It is hard to allow

different users to directly draw water as per their requirement, and Government allocation of water is still the main mechanism to allocate it in our country.

WATER REQUIREMENTS

Developing countries require more water for agriculture and it is estimated that in India, irrigated agriculture consumes about 80% of total developed fresh water resources. Water requirement for various sectors as assessed by Standing Sub-Committee for Assessment of availability and requirement of water, 2000, Ministry of Water Resources (MoWR) and by National Commission on Integrated Water Resources Development (NCIWRD) is as under:

Sector	Water Demand (BCM)					
	Standing Sub-Committee of MoWR			NCIWRD		
Year	2010	2025	2050	2010	2025	2050
Irrigation	688	910	1072	557	611	807
Drinking Water	56	73	102	43	62	111
Industry	12	23	63	37	67	81
Energy	5	15	130	19	33	70
Other	52	72	80	54	70	111
Total	813	1093	1447	710	843	1180

Water demand management for the better use of the resources is a vital element, rather more important than the augmenting supply of water, in water resources management.

WATER ALLOCATION PRIORITIES

National Water Policy (NWP) – 2002 have laid down the allocation priorities. Drinking water is stipulated as first charge in any available waters as per the policy. As per NWP, for planning and operation of systems, water allocation priorities should be broadly as follows:

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

However, States are free to decide their own priorities and make allocation of their share of water resources as per their requirement.

Irrigation is the main water user, but it involves huge quantity of losses. Water use efficiency as well as productivity in non- agricultural sectors is considered to be somewhat higher than in agriculture. Allocating water rationally to increase its economic value is one of the main measure to increase overall water productivity. Rationalising includes prevention of overuse in all sectors especially in irrigation.

CONFLICTS AND CHALLENGES

In the coming times, most river basins in India would be stretched to meet the multiple demands. In such a scenario, water withdrawals by various sectors, especially the one envisaging heavy consumptive water use, have the potential to lead to intense conflicts. In the States, where no option for supply augmentation exists, there have been instances of giving allocation to non- agricultural activities from their share of irrigation water. There are reports of farmers' agitation in Orissa against the allocation of water from the Hirakud reservoir to industries when they were not getting water for irrigation. At the same time, lack of water may cause shutting

out of Thermal Power Plants (TPPs) in the area. Deficient rainfall may further lead to a severe water shortage, and the water allocated to some sectors may have repercussion on loss of other water demands in the basin.

Moreover, in the case of water, the local impacts matter a lot. A river basin may have enough water at the basin level, but may be overstressed in the area where the industries are located. Equally important, the availability of water varies through the year, and it may be particularly difficult to provide water to Industries in some parts of the year like the summer. Given this, and the huge quantity of water that the industries including TPPs need, a number of potential water conflict situations appear to be in the making.

SOME EXAMPLES OF PRACTISING INTER- SECTORAL WATER ALLOCATIONS IN INDIA

Tank Irrigation in India - The tanks of South India provide a clear illustration of locally- managed systems which cater to diverse uses. Many of these earthen dams and reservoirs, ranging from a few hectares to over a thousand hectares, date back to hundreds of years. Although their largest consumptive use is for irrigation, the water is also used for bathing, laundry, watering animals, and raising fish and trees. Village *panchayats*, local temples, or specialized tank associations have traditionally managed the tank resources, deciding such issues as how much water should be released for irrigation or retained for fish, animals, and domestic uses. However, since the colonial period the state has taken on an expanded role in managing the tanks, which have come under the Public Works Department for irrigation, the Fisheries Department for fish, and various other authorities.

WUA Management of the Tank in Vengal Village, Tamil Nadu - The village Vengal is located about 60 km north of Chennai city. The tank is the main source of irrigation (and, even, drinking water until recently when the village got drinking water supply through pipes). Channels that serve the command are operated by a waterman who distributes water to fields in accordance with the guidelines set by the WUA. During the first crop season (September - January) that coincides with the North-Eastern Monsoon, all land in the command receives irrigation. But during the second and third crop seasons, only about 50 and 22 per cent of the command receives irrigation (while paddy dominates the cropping pattern in the first two season, in the third season other less water- intensive crops enters into the cropping pattern). The WUA in Vengal, has a number of desirable aspects for providing incentive structure not only for farmer's involvement in water management and allocation but also for water use efficiency and conflict resolution.

INTER STATE WATER DISPUTES TRIBUNALS VIS-A-VIS COMPETING DEMANDS OF A BASIN

- Before the constitution of *Krishna Water Disputes Tribunal* I (KWDT I) in 1969, Maharashtra was diverting about 97 TMC of Krishna water out of the basin for Koyna Hydel Project which was restricted to 67.5 TMC in a gradual manner by KWDT I. The State of Maharashtra prayed for removal of this restriction before Krishna Water Disputes Tribunal II (KWDT II). KWDT II was constituted in 2004 and it submitted its report in 2010. In other words it pleaded for allocation of additional 25TMC so as to restore its generation of power with 97 TMC. KWDT II was faced with the issue of deciding the allocation between competitive need for irrigation use and hydro power generation for which water is to be diverted outside the basin. For allocating additional water for Koyna hydel works, KWDT II felt that there has to be a reasonable planning so that vital human needs are reasonably or predominantly met and other needs are not absolutely ignored. At the same time it felt that while considering different factors, place, purpose and circumstances in which water is needed, is a very important consideration. Keeping these factors in view, KWDT II allowed diversion of 25 TMC for Koyna Hydel Project in the State of Maharashtra out of 65% dependable flows.

- Before *Cauvery Water Disputes Tribunal*, the State of Kerala submitted a demand of 92.9 TMC of water for different purposes. Out of the above total demand of 92.9 TMC of water, a substantial quantity of 35 TMC was demanded by Kerala to generate hydro- power which involved trans-basin diversion. The CWDT disallowed the water for hydropower generation on the consideration that

    (i) the yield of the basin is not sufficient and it will affect the requirement of different riparian States in the basin;

    (ii) lack of evidence regarding the need and necessity of the neighbouring basins in which water is proposed to be diverted along with water resources available therein ; and

(iii) there is no such power shortage which can be said to be a ground for diversion of water from sub-basins of Cauvery like Kabini and Bhavani, outside the basin towards the western side of the ghats and alternative means of Electricity generation should be explored.

STATE WATER REGULATORY AUTHORITY (SWRRA)

States are being requested to set up their Water Resources Regulatory Authority (WRRA). WRRA has already been set up in Maharashtra and Uttar Pradesh. The Maharashtra Water Resources Regulatory Authority Act (MWRRA), 2005, has mandated MWRRA to determine the distribution of entitlements for various categories of use and to determine equitable distribution within each category of use. The three main Categories of use are domestic water supply, industrial water supply and irrigation. The Authority is also to look into the priorities. The Authority is also to establish a system of enforcement, monitoring and measurement of the entitlements for the use of water that will ensure that the actual use of water, both in quantity and type of use are in compliance with the entitlements as issued by the Authority.

STUDIES CARRIED OUT IN CWC FOR IMPROVED UTILISATION OF BASIN WATERS

Attempts have been made to carry out water balance studies of basins using simulation models like RIBASIM and PODIUMSim in Central Water Commission.

RIBASIM

The study of the Sabarmati basin was carried out using a computational framework consisting of hydrological models, simulation models; data based management systems, Geographical Information Systems etc. and integrating these as a Decision Support System (DSS) for integrated river basin planning, development and management.

The Sabarmati river basin is a typical river basin in the country where issues like water scarcity, increasing water demand for multiple uses like irrigation, industry and domestic, conflcting demands, deteriorating water quality, over-exploitation of groundwater, inter as well as intra sector conflicts etc. are occurring. The Decision Support System used in the study is DSS RIBASIM developed by WL |DELFT HYDRAULICS. DSS RIBASIM is a generic model package for simulation of the behaviour of river basins under varying hydrologic conditions. The model is a comprehensive and flexible tool to link the hydrologic inputs of water at various locations to the various water- using activities in the basin and to evaluate a variety of measures related to infrastructure & operational management. It provides an efficient handling and structured analysis of the large amounts of data commonly associated with water resources systems. The purpose of the analysis is to prepare and support decisions. The analysis is iterative and cyclic. The operational objectives for the analysis purpose as envisaged are enumerated as follows:

- Meeting Domestic, Municipal & Industrial water requirement (with particular emphasis on Ahmedabad Urban Agglomerate and Fluoride affected villages of Mehsana)
- Meeting irrigation demand in the basin; and
- Reduction/ prevention of deterioration of water quality of Sabaramati river in and around Ahmedabad city.

The measures include supply oriented measures to effectively develop and exploit existing and new sources and demand oriented measures aimed at developing more desirable levels and patterns of water use, and minimization of adverse (environmental) impacts. This involves changing water use patterns and influencing spatial distribution. The results of the simulation studies indicate that as the Sabarmati basin is a water scarce basin, inter basin transfer of water is an essential component apart from other supply and demand oriented measures. Some of the measures that can be investigated are:

- Import of water from Mahi basin
- Import of water from Narmada Project
- Creation of additional storages
- Recharging of groundwater and/ or filling up of reservoirs through surplus monsoon flows from Narmada Project

- Efficient operation and maintenance of conveyance system and improving irrigation water use
- Diverting the monsoon spill water of Kadana reservoir (across Mahi river) to Sabarmati basin through Kadana recharge canal
- Import of water through Damanganga – Par – Kakrapar – Sabarmati Link Canal
- Supply of water on volumetric basis for irrigation (pricing mechanism)
- Conjunctive use of surface water and groundwater
- Reduction in distribution losses in case of public water supply
- Recycling of industrial waste water
- Rain water harvesting and artificial recharge
- Water shed management
- Creating mass awareness and public education on efficient water use etc.

The model facilitates in taking a decision by providing various scenarios for different priorities given to multiple uses in the basin.

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PODIUMSIM

PODIUMSim enables users to explore the implications of policy options by modifying assumptions in the national context and alternative future scenarios. It is useful tool to support planning and developing various options for policy makers. The model can be used to project likely food deficits or surpluses and their scale, water development needs, the relationship between productivity and water resources available for agriculture, the use and depletion rate of groundwater aquifers, and estimating production of rainfed and irrigated agricultural produce.

In the PODIUMSim the method of analysis consists of estimation of annual production of food products from irrigated and rainfed agriculture at sub- national level in various crop seasons vis – a- vis estimation of annual demand in the target year followed by estimation of seasonal and annual water demand from domestic, industrial and environmental sectors at sub national level vis- vis availability of surface and ground water in the basin to meet the demand in the target year. These estimations enable the development of scenarios based upon various assumptions to find out deficit/ surplus of food, deficit/surplus of surface and ground water and water balance for the basin. After detailed analysis for two basins in India with the help of PODIUMSim it has been observed that by the end of 2025 Brahmani basin will remain self sufficient whereas Sabarmati basin will become severely water short so far food and water requirement is concerned

The study suggests that the total diversion of water from Brahmani basin is likely to be less than the availability in 2025. Hence, the higher Surface Water availability and Ground Water availability than required makes the basin a substantially water surplus basin even in 2025. The model output also shows that if the area under irrigation is increased to a level as envisaged by the State Government, the total grain production by the 2025 would be more than the requirement.

As regards the Sabarmati basin, study shows that Irrigation sector will be the largest consumer of the water and the Sabarmati basin will become a water deficit basin by the year 2025. This would require import of water from some other basin.

WAY FORWARD

So far the nation was familiar with water disputes only amongst administrative entities, i.e. States. Therefore, a mechanism evolved for resolution of inter- state disputes. Now, disputes have started emerging between user groups e.g. industry versus agriculture; all human needs versus environment; etc. There is no legal provision, not even guidelines in the NWP, on the mechanism to resolve such disputes. Earlier the country had to contend with inter- state problems whereas with the increased demand from other sectors, inter- sectoral conflicts have also arisen in a number of States with different stakeholders lobbying for higher share of water for their needs. Sectoral water allocation has invited demand for establishing formal water rights systems.

A general approach so far adopted to meet inter- sectoral demand includes various conservation measures, technological innovations, and changes in user behaviour through education or economic incentives. A relatively limited level of water saving in agriculture may make up for the additional needs. Experiences in the United States and Japan show that increased water prices, effluent charges, and pollution regulations have great potential to generate industrial water savings by promoting investment in water recycling and water

conservation technology. This was achieved through issuance of restrictive water licenses, introduction of water- saving technologies, and subsidized financing for investment in water-saving processes.

Comprehensive Mission document of National Water Mission identifies promotion of basin level integrated water resources management as one of the goals and strategies for inter- sectoral water allocation among various sectors. The various measures suggested for increasing efficiency with the intention to meet the demand of various sectors for different uses of water e.g., irrigation, drinking, industrial etc particularly in context of basin wise situations are encouraging water harvesting; encouraging non- agricultural type activities where not much water is required; piped surface water for clusters of villages with ground water quality problems; careful use of dual pipe supply systems to conserve water with due consideration to simultaneous planning for sewerage lines in urban areas to ensure prevention of pollution of water sources; encouraging leakage control programmes; consideration of desalination as an option for supply to urban coastal communities; regulation for in- house water withdrawals of industries through royalties and licenses; extending subsidies and incentives for recycling and recovery; revise water tariff based on cost recovery principle; option of programme based Clean Development Mechanism (CDM) in industrial and domestic wastewater as against project approach; potential of efficient water use systems; exploring bilateral joint ventures for funding CDM projects; promotion of water efficient fixtures; and incentivisation for recycling waste water.

CONCLUSION

Water has become an increasingly scarce resource and its allocation among various sectors requires careful economic and environmental management in addition to meet any particular demand. Water-demand management is highly desirable and needs attention in its judicious planning and management.

It is mandatory to increase the efficiency of water use and its efficient management to overcome the challenges being faced by the water sector. This signals the need for comprehensive river basin level planning to determine how much water from the basin can be used for any sector without adversely affecting other functions. River basin planning is a participatory process that takes into consideration all possible uses and functions of water to evolve a plan for a balanced development of the basin. Models like RIBASIM and PODIUMSim helps in taking an informed decision. A system based on predominately processes of negotiation among multi- stakeholder platforms, governance which include empowerment of marginalized social/ ethnic groups and representation of all interested parties in allocation and decision making, have the potential for ensuring fairer and smoother allocation of available water.

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