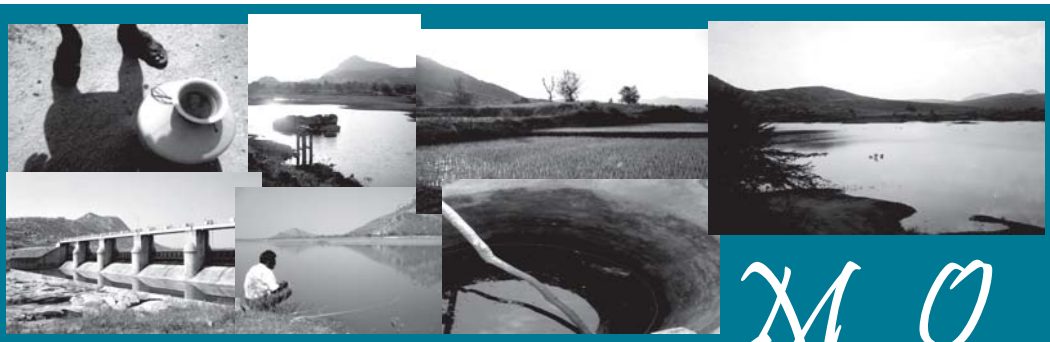

Water MOVES

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Basin Governance and Livelihood Issues in the Context of a Sub-basin in Godavari River Basin of Maharashtra

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Background

It is being increasingly felt that water governance, which concerns the formal and informal institutions through which authority is exercised to allocate and regulate the resource, should be looked at from an integrated resource management angle. Like many other Indian States, Maharashtra has initiated water sector reforms through the Maharashtra Water Sector Improvement Project – MWSIP. A key component of water sector reform is to separate irrigation water delivery from the resource's management. A combination of policy, legislative and administrative measures is being stressed for improving financial performance of the sector by economizing costs and improving functional efficiency. The emphasis is on adopting modern technology, effective accountability arrangements and decentralized participative decision making in design, operation & maintenance of the water storage, conveyance & distribution system, and on improving recovery by instituting water rights, rational water allocation through administrative/market mechanism and appropriate pricing. Though some of the components of water reforms like volumetric supply of water, etc., have been suggested and experimented upon way back in the early 1900s, these in the view of socio-economic and political changes have acquired different meanings and are being contested.

The debates on various aspects of water governance in the absence of specificity tend to be abstract. There is a need to study how the particularities of the livelihood systems, agrarian structure and institutions in the various regions (basins) shape the actual formulation and implementation of programmes and policies. It was therefore thought appropriate to take specific sub-basin level projects and involve various sections (stakeholders) on issues of water governance. Outcomes from the research and actions at specific locations may help evolve a greater universal valence.

This article is an interim outcome of an action research project being done on Water Governance under which an analysis of the sub-basin is being done to understand the dynamics of water allocation and regulation in practice. It studies inter-sectoral water allocation, planning and management in the last decade in the small sub-basin (Waghadi) in Painganga basin of Godavari River in Maharashtra.

Yield and Inter State Allocation from Painganga Basin

Waghadi is a sub basin of river Painganga (G-7) in the Godavari river basin. Painganga basin lies mainly in the southeastern part of Maharashtra with a small catchment area in Andhra Pradesh. The river has six main tributaries - the Kiodoh, Pus, Arunawati-Adan,

Waghadi, Khuni, and Vidarbha. The river is perennial but dwindling in volume to mere stagnant pools during the hot weather season. It constitutes about 7.64 % of the catchment area of the entire Godavari basin. The yield of the river at 75 % dependability is 138.5 TMC, which amounts to about 4.62 % of the yield of the entire Godavari basin. Yield from Painganga available to Maharashtra as per the Godavari Water Disputes Tribunal (1980) is 105.6 TMC. The issue of inter-state allocation was resolved when the waters of G-7 were allocated to the states of Maharashtra, Andhra Pradesh and Madhya Pradesh through the 1975 agreement on the principle of just and equitable apportionment. As for Waghadi sub-basin as per the GWDT agreement Maharashtra has been allocated the entire yield up to the Waghadi project site.

The decision on allocation of groundwater resources of the inter-state river basin (Painganga within Godavari) did not take into consideration the close connect between surface and ground water. There were no limits to the use of groundwater to prevent reduction of downstream water supply as its flow was not fully calculable from the technical point of view as yet and hence was not yet fully perceivable from the legal point of view. Situations may not be the same today given technical advancements that have taken place in the field of groundwater assessment. The main interstate issue today in river Painganga is related to the Lower Painganga project, a joint project between the states of Maharashtra and Andhra Pradesh proposed to irrigate an ayacut of 2.27 lakh hectares, 88% of which is in Maharashtra. A broad consensus was reached on issues like sharing of costs, sharing of waters, creation of a Joint Control Board between the two states during the course of several meetings. Agitations against the project continue and at one point project-affected persons (PAPs) had filed writ petitions in the Aurangabad High Court Bench opposing the project making Maharashtra and Andhra Pradesh as parties. The environmental and forest clearance of the project was got with difficulty in 2007. A barrage was acceptable to the project affected as there would be no need for locals to be displaced. While reliance on dams has created unsustainable cropping patterns in other regions of the country, reservoirs in these areas though designed for kharif, rabi and hot weather season, have barely any demand during kharif leading to vast quantities lying unused. The reservoirs serve as evaporation pans and large carry over storages from the previous season have more recently in 2006 led to floods. According to a CWC report of 2007 while the extreme drought conditions and the lack of availability of water for irrigation has resulted in numerous farmer suicides in the Vidarbha belt, reservoirs in the region are choked up with excess water which apparently never reached the poor farmers. The report cites data for the four main reservoirs in the Painganga-Wardha-Wainganga basin with carry over storages way above the norm of 10 % or less of the capacity such as -the Upper Painganga (44% on June 16), Kamthi Khairi (88%), Upper Wardha (33%) and Arunawati (28%). The spur in irrigation projects in the region needs to be seen in this context. Experts have increasingly highlighted the need for a transparent and accountable reservoir policy and reservoir operation rules.

Waghadi Sub-basin

Waghadi is one among the six tributaries of Painganga River. The river has two tributaries with the same name. One of them (Waghadi II) emerges just below Yavatmal town in the northern edge of Yavatmal plateau and flows south as Waghadi for a certain stretch beyond which it is called Akhpuri river. The river Akhpuri meets another rivulet - Waghadi I at Ghatanji. The river continues as Waghadi and flows across areas of Yavatmal and Kelapur till it joins the Painganga river. The river is nearly 80 km in length and contains water for major part of the year. The soil type in the catchment of the basin is shallow coarse and in the reservoir command of medium black type. Main types of land use in the sub-basin catchment are rainfed kharif crop area, deciduous forest, and degraded forest and scrub vegetation. In the catchment area kharif crop, deciduous and degraded forest and scrub vegetation are the main land use categories.

The area is marked with agricultural distress even leading to suicides and the immediate trigger has been traced to yield and price fluctuations in cotton and discontinuation of monopoly procurement of the crop by the Maharashtra State Cooperative Cotton Growers Federation (MSCCGF) during early 2000s. Prices offered by private traders were more than 30% lower. The introduction of Bt cotton in rainfed areas and use of spurious seeds have led to a sharp drop in yields. The lag in energisation of pumpsets in the district whose stage of groundwater development stands at 24.48 % is leading to low irrigation. The cost of cultivation of cotton, the major crop of the basin is very high as compared to the price received. As per the Planning Commission's report the average production cost per hectare in the case of Bt cotton is Rs. 16000 and the income Rs. 20100 for a yield of 10 quintal/ hectare. As of 2008-09 the Cotton Corporation of India, NAFED and MSCCGF are procuring cotton at favorable prices thus serving as a means of relief to the farmers. However the breakdown of the cotton economy during the last decade has led to a shift towards crops like soyabean which are less risky both from the yield and price angle. Though oranges are a major diversification in the Vidarbha region they have failed to catch up in both in the catchment as well as command. There is a need to renovate the malguzari tanks constructed way back in the 16th -17th century to provide supplementary irrigation to cotton and soyabean. The implementation of the watershed programme has failed to take care of this. The thrust in the region to remove backlog in sectors such as irrigation (backlog of the order of 55.04 % as on 1994) has led to a sudden stimulus in construction of dams of all sizes.

The basin lies in the Amravati division, formerly known as Berar. Like the rest of the State it too has passed through a couple of land reform measures post 1947. The land revenue system prevalent in the basin prior to independence was ryotwari wherein each plot

was surveyed, the soil classified and its assessment settled. Field study indicated that apart from ryotwari, a large part of the basin area comprised of izara villages which were held under the 'Waste Land Rules of 1865'. Under the izara system entire villages were leased out to individuals at a low rental for a period of about 30 years. The lessee could opt for keeping the whole village in perpetuity on payment of 50 % of the fair assessment if successful in bringing a third of the land under cultivation. Even today the former izardars of the area own several hundred hectares of land and continue to dominate the local politics of the area. During the process of land reforms people were allotted lands in parganas - a unit larger than village. The work of consolidation of holdings during the eighties was aimed at mutual exchange of holdings to make them as compact as possible but was discontinued as the Record of Rights was not up-to-date. Our field study revealed that most people had small and scattered fragments of holdings across several villages. The pattern of land holdings indicates that concentration of land still continues and inequality in land holding among the agricultural population is very marked even after the implementation of land reforms.

Water Resource Development in the Waghadi sub-basin

There is a medium irrigation project 1.5-km upstream of Yelabara village on Waghadi II river in the Yavatmal tahsil of the same district. The catchment area of this seasonal river upto Waghadi dam site is 238.40 sqkm (23,840 ha). The project has a reservoir and a 35.7-km long contour canal, which is divided into a number of distributaries. In the first stretch, the canal runs towards the south with 24 minor distributaries (minors). There are two major distributaries after this stretch: one running for 11 km with 5 minors towards east and the other running for 12 km with 2 minors towards west. The command area is 6110 ha, spread in 17 villages in Yavatmal and Ghatanji tahsils of Yavatmal district. A river gauging station was established at Yelabara and gauging was done from 1964 to 1966 after which it was discontinued. There are four minor irrigation projects in the catchment area, these are: Anji, Bhari, Chinchghat and Deo-nalla projects. After accounting for upstream reservation for all these minor irrigation projects and local sector minor irrigation tanks, the net yield available at the dam site is 56.594 MCM or 1.999 TMC. There are 13 villages in the catchment, 17 in the command and 4 villages under submergence (780 ha, 500 PAPs). Two of the villages under submergence were forest villages (government lands) and hence no compensation was provided. In the revenue villages compensation provided amounted to upto Rs. 1000/ ha for both irrigated and unirrigated lands. The project started functioning in 1988. The State of Maharashtra had in the Godavari Water Disputes Tribunal and the agreement in 1975 negotiated for entitlement of the entire yield till the Waghadi project site. The project was included in the master plan of the Krishna Godavari basins prepared by the Committee of Engineers appointed by Government of Maharashtra and is widely projected as a model project in the area. The actual command today stands at around 1000 ha [14 % of designed command] and is not very high as compared to the submergence area. The designed discharge of 200 cusecs at the dam headworks has reduced to a maximum of 80 cusecs now. This is the situation in most structures in the region.

A project is proposed on Akhpuri rivulet of Waghadi II river in the sub-basin by Vidharba Irrigation Development Corporation (VIDC) and is estimated to cost around Rs. 34.88 crore. This has raised a controversy since as many as four irrigation projects all a few kilometres from each other, already exist in the area and there is no need for a new project. Nilona and Chapdoh projects have already been commissioned on Waghadi I river and Kolambi and Warud projects on Waghadi II river

The projected benefit-cost ratio for the Waghadi project was 2.76 as per Detailed Project Report. Norms indicate that schemes are accepted if the benefit-cost ratio is more than 1.5:1 even if financial statements suggest that the scheme is unproductive. Further in the case of projects located in scarcity (drought prone) and backward areas (SC and ST areas as notified by the State government) a lower ratio of upto 1:1 is acceptable.

Since the construction of the Waghadi project in 1978, the irrigation functionary (Gatekeeper) in charge of the reservoir has kept a record of discharges and yields. The following information is recorded and passed on through wireless to the Division Office on a daily basis - (a) water level in the reservoir, (b) daily rainfall, (c) level of water in the Standing Wave Flume downstream of the canal headwork (d) discharge of water, (e) level of water over the waste weir, and (f) discharge from the waste weir. The releases are decided accordingly for irrigation requirements of agricultural crops. In spite of these demands on the reservoir, it is surplus and not scarcity that marks the case of Waghadi and most other reservoirs in the basin. Though administrative mechanisms to secure a statement of demand from the beneficiaries may have been followed, what is clear is that there was no economic demand from the people to construct the reservoir. Ordinarily before the construction of a reservoir, a Collector Certificate stipulating that there is a keen demand for irrigation (and other uses like drinking and industry) and that the beneficiaries are willing to come under agreement and pay water rates and betterment levy is issued. The low percentage of assessment and lack of demand in kharif season indicate the poor economic demand. The water available in the reservoir is sufficient to meet the increasing demand for drinking and irrigation at least in the normal rainfall years.

Table I presents a picture of actual irrigation versus potential created for all the structures in the Yavatmal Irrigation Circle. Actual irrigation in kharif is 9 percent for the major project and in the range of 1-2 percent for medium and minor projects. Irrigation in rabi is around 30-40 percent of the potential created for all categories of projects. The actual irrigation in hot weather season is in the range of 90 to 210 percent but being less in absolute terms cannot alter the total utilisation which stands at a mere 23.3 percent.

Name (Construction Year)	MAJOR Pus (1971)	MEDIUM Goki (1988)	Waghadi (1988)	Saikheda (1972)	Upper Pus (1990)	Borgaon (1991)	Total Medium %	Total Minor %	Total %
Kharif	8.9	0	0.6	1.9	4.8	1	1.7	1.1	2.3
Rabi	36	20	25	85	42	40	36	32	34
Hot Weather	218	372	266	48	122	7	148	97	168
Total	47.3	12.9	13.9	29	33	13.1	21	17.8	23.3

Actual Irrigation vs. Potential Irrigation

Source: *Data accessed from Irrigation Department, Yavatmal Irrigation Circle, 2006-07*

Waghadi reservoir does not have direct reservations for municipality or industry like most other medium irrigation projects but has to provide releases to a Kolhapur Type (KT) weir about 10 km downstream for drinking water supply of Ghatanji nagar parishad. The KT weir is downstream of the confluence of Waghadi I and Waghadi II and normally gets sufficient yields from Waghadi I apart from surplus flow from Waghadi II. The construction of Chapdoh dam for supplying water to Yavatmal city on Waghadi I has led to a reduction in yields at the KT site. The Waghadi dam on Waghadi II has to make releases given the poor yields from Waghadi I. To augment drinking water needs of Ghatanji town the availability from the KT weir is being supplemented with groundwater extracted through deep tubewells. The groundwater is being directly added untreated to the distribution system by pumping into the Elevated Service Reservoirs (ESR). Apart from releases to the KT weir, the Waghadi reservoir has to regularly release water during the scarcity period through the canal system as well as the escapes. This is done as per Collectors instructions during the period February to June to cater to human and livestock drinking purposes for villages downstream.

Drinking and Domestic Water Supply

Drinking water needs of urban areas like Yavatmal city and Ghatanji nagar parishad are met mostly from surface water sources in the Waghadi sub-basin. As for rural areas, about 50 % of drinking and domestic water supply needs are met from groundwater and the rest from surface water mostly through single village schemes with KT weirs on the Waghadi river or its tributaries. Yearly releases are also made through the canals and escapes of the reservoir to meet scarcity conditions during the summer months.

Yavatmal is situated on the ridge of Wardha and Painganga rivers though most of the area falls in the latter. To meet municipal water demands the Nilona project, an earthen storage dam on Waghadi had been commissioned in 1972 and was meant exclusively for drinking water purpose of Yavatmal town. It was designed for an intermediate stage capacity of 8.4 MLD (1972) and ultimate stage capacity of 13.60 MLD (in 1984). Since the project has limited storage capacity and yield it could not cater to a demand greater than 13.62 MLD. The city, which had a population of around 10000 in 1901, has grown over the period and currently has a population of around 2.5 lakh. The projections for municipal water demand were worked out for two supply situations – to the 70 % population on house connection – either 150 lpcd per day or 115 lpcd per day. In both the cases water supply to the remaining 30 % of the population is on a stand post basis @ 50 lpcd. The commercial fire demand for the city is 15 lpcd. The composite figures for the cases come to 135 lpcd and 110 lpcd respectively. The projected demand for these two options were worked out for the years 2001, 2011 and 2026 by the Maharashtra Jal Pradhikaran.

To meet additional demands of the town Maharashtra Industrial Development Corporation (MIDC) provided 4 MLD to the Municipal Corporation from its reservation of 8 MLD at Goki project (located in Arunawati-Adan sub-basin of Painganga river basin) as they were barely using 1.65 MLD. Initially MIDC allowed the Municipal Corporation to take 2 MLD from its treatment plant and subsequently following the augmentation of capacity of the treatment plant increased the Municipal Corporation's allotment to 4 MLD. MIDC expected an increase in industrial water use and was not willing to spare its reservation at Goki to the Municipal Corporation for a period of more than 6 years. Thus the total shortfall of about 12 MLD (as per 2001 projection) necessitated the construction of Chapdoh reservoir. As augmentation of the capacity of Nilona was not possible a study of alternative sources was done before taking up Chapdoh project. The alternatives considered include -

· Waghadi project - The project lay at an elevation lower than the city and involved lift; also Irrigation Department refused to provide reservation

· Run of river project on the Wardha river - About 30 km away from Yavatmal; was rejected as the river did not have perennial flow at locations studied

· Bembla project: About 28 km away from Yavatmal is on the Bembla tributary of Wardha. The project was under construction and at the time of the study (of alternatives) had not got technical clearance from Technical Advisory Committee (TAC), Planning Commission (PC) as well as Ministry of Environment and Forests (MoEF). So despite its ability to provide a reservation of 15 MLD, the Municipal Corporation decided to go for an assured source.

· Sharad nala project: Capacity of 7 MLD was inadequate to augment Yavatmal's drinking water supply requirements

· Goki project: Irrigation Department refused reservation and MIDC was not willing to spare their reservation for more than 6 years.

Chapdoh being a dependable source with sizeable quantity of water was finalised for the augmentation plan. However, Chapdoh, which had been proposed earlier by the Irrigation Department had been initially conceived as mainly an irrigation project. After the project got sanctioned in 1994, farmers had surrendered their lands on the assumption that the area was for an irrigation reservoir. However, in 1995, the government did a turnaround and modified Chapdoh into a supplementary drinking water source for the city. Chapdoh also faces technical problems which engineers have not been able to rectify. In spite of the improvements made to the city water supply, the duration of supply is 2 hours on alternate days in normal year.

Institutional Arrangements

There are several agencies involved in drinking water supply provisioning to urban areas. The Town Planning and Valuation Department prepares population projections for the town and Maharashtra Jal Pradhikaran (MJP), the execution and formulation agency for water supply schemes in rural and urban areas uses this as a basis for planning for water sources. In the Waghadi sub-basin the Vidharba Irrigation Development Corporation (VIDC) along with the MJP and Zilla Parishad act as nodal agencies for planning and execution of water supply schemes in urban and rural areas. The Municipal Corporation is placed lower in the hierarchy and acts as an operational agency for provision of drinking water supply to the city. Maharashtra Water Resource Regulatory Authority (MWRRA) is the regulatory body. In the case of Chapdoh project, VIDC executed the dam headworks while the water supply system and transmission lines up to the water treatment plant were commissioned by the MJP. These were done for the Municipal Corporation, which raised finances from Life Insurance Corporation of India. Overlapping of roles of these bodies has led to a conflict between the Municipal Corporation and the MJP since the latter went ahead with provisioning of water to Rural Water Supply Schemes in villages that are present on the way. This is strongly contested by the Municipal Corporation on the premise that since it is providing the finances for the project it should have the right to decide on the matter. The Municipal Corporation would have preferred to negotiate with the rural local bodies for an arrangement for providing the surplus waters of the reservoir.

In Maharashtra the MJP identifies the location and details of storages to be created and indicates it to the Irrigation Development Corporation like in the case of Chapdoh reservoir in Waghadi sub-basin. It does this based on requirements put forth by the Urban or Rural Local Bodies.

In most reservoirs in the Painganga sub-basin the lack of adaptive mechanisms to manage discharges and unutilized reservation for either irrigation/ drinking/ domestic/ industrial use is leading to a lot of wastage of water. MWRRA's Draft Approach Paper on Tariff's (prepared recently by ABPS Infra) suggestion that command area irrigators should pay half the water charges when they do not take irrigation has drawn a lot of criticism from farmers and their representatives. There is a demand that Municipal Bodies and MIDC pay for their unutilised reservation in the reservoirs. In case of a lag in construction of a particular component for either drinking/ domestic/ industrial/ irrigation use mechanisms do not exist for transferring the reservation to other categories. Water reforms underway see the operation of market mechanisms as the only way of allocating the resource.

The legal framework for water resource management in the basin comprises of Maharashtra Management of Farmers Irrigation Systems (MMISF) act, 2005; MMISF Rules, 2006; MWRRA Act, 2005; Maharashtra Irrigation Act, 1976; Maharashtra Project Affected Persons Rehabilitation Act, 2001; Maharashtra Fisheries Act, 1960; Water (Prevention and Control of Pollution) Act; National Water Policy; State Water Policy etc. The Irrigation Department (now called Water Resources Department) through the five Irrigation Development Corporations (1997) set up under the IDC act of 1997 manage surface water and allocate it for various uses like irrigation, drinking water and sanitation, industrial purpose etc. The WRD can decide on allocating a maximum of 15 % of the reservoir storage to industry and municipality for drinking water; in case of reservation exceeding this the matter is referred to a Committee headed by the Chief Minister for decision. Groundwater is regulated and monitored by the Water Supply and Sanitation Department, GoM. Industrial water in the MIDC areas (including townships) is supplied by the MIDC. MJP executes urban and rural water supply schemes. Urban local bodies are responsible for urban water supply whereas Zilla Parishad is responsible for rural water supply schemes. There a lack of clarity of roles of these agencies often leading to conflicts and mismanagement of water.

In order to increase the economic demand of water and recover costs legislations like MMISF and MWRRA have come up in 2005. MMISF Act places the responsibility for maintenance of the system on WUAs. WUAs are to get bulk water entitlements on a volumetric basis from the reservoir and will be charged in return. The individual irrigators will not be assessed as earlier and the responsibility has been shifted to the WUAs. WUAs are permitted to mix groundwater with surface water and can charge the irrigators for it. WUAs in the basin are not in a position to supply water

volumetrically to the retail units. This means that WUA will assess on a crop-area basis. In the case of Waghadi project, which is undergoing a system modernization, no arrangements have been made for volumetric measurements. The provisioning of water on a volumetric basis to the WUAs is itself suspect though the agreements between the WUA and Irrigation department (Executive Engineer) show entitlements. How the entitlements will be ensured is not at all clear. Experiences of the WUAs in the basin suggest that wherever the WUAs have been effective in recovering costs they have not received their share on a timely basis. The current tariffs are uniform throughout the state and do not take into account the actual returns from irrigation. Further the tariffs suggested in MWRRA's approach paper are based on cost and do not take the capacity to pay into account. The question as to why a farmer collective could not be formed to demand water and pay for it has not been probed. The Act itself is not an outcome of a demand from the people. The responsibility of ensuring equity has been thrust on WUAs without studying problems like tenancy, fragmentation of landholdings and the different returns which are available from irrigation because of physical (topographical and soil differences) as well ability to match other inputs because of inability to invest capital or because of insecure land tenure.

Conclusion

The two major inter-related aspects of basin management in the present context are allocation of water resources (area-wise and sector-wise) and integrated water resource management. The GWDT award to settle inter-State dispute has done area-wise allocation/ apportionment of water for each basin. Below basin level, area-wise allocation for irrigation and other sectoral uses gets determined administratively through project planning and design and in view of the priorities set under the State Water Policy. Though the quantity and quality of water depends upon natural resource management in the basin, water utilization by different sectors takes place both within and outside the sub-basin. Accordingly there are different administrative units dealing with water working on different geographical scales.

Integrated water use management involves integration among (a) sectoral uses and environmental requirement (b) rainfall, surface water and groundwater (c) structures [larger/smaller] (d) institutions, and (e) different land uses in catchment, command and area outside the command. The integration is necessarily required to ensure sustainability of water utilization through appropriate natural resource conservation and management in the basin and for equitable distribution in order to realize social justice and to avoid conflicts that have the potential to affect bio-physical condition of the basin negatively. At present the focus of water resource management is sectoral water allocation and price determination for different uses. The question is - how does one conceptualize both integration as well as allocation. The amount of water required for different sectors in any unit changes with time owing to changes in economic activity, demography, urbanization etc. Water from the surface storage structures is utilized for irrigation, fishery, industry, domestic use and drinking purposes. As for irrigation one cannot divide areas geographically even taking villages as a unit into catchment and command. There are large areas within villages below the reservoir that do not get any irrigation. Similarly there are areas within catchments of the reservoir that get irrigation because of structures made under catchment treatment. Rainwater and groundwater are used both in catchment and command for various uses. Different departments or sections within departments manage watershed development and different reservoirs depending upon their size. Each department/section tries to involve communities through formation of community/users groups. Technical interventions in the catchment and command and changes in land use affect hydrology and hence availability of water in different periods and locations. The integration requires mechanism to assess and discuss with all concerned the impact of each intervention on hydrology and in turn on each sector and sections/communities within sectors. Leave alone integration there is not much coordination among different departments, not to talk of sections/community groups.

Allocation among different sectors from storage reservoirs is done following different approaches. In the case of drinking water requirement it is done on the basis of projections from the past trends, in the case of irrigation projecting required agricultural growth and in the case of industry it is done arbitrarily in terms of percentage share out of each reservoir. The new capacity creation through construction of reservoirs is being done in the name of removing the backlog in irrigation sector and on the assumption of greater requirement of water for industries as a result of projected growth in the manufacturing sector. It is assumed that the availability of water would help in attracting capital to the region. These assumptions and projections may not necessarily be true. As of present, the industrial water reservation does not match the capital investment in the manufacturing sector in the basin with the result that there is a lot of unutilised water by the sector. At the same time agriculture too is unable to use its water entitlement properly largely because of system deficiencies as well as low water demand by the command area farmers. Adaptive mechanisms are required to shift the allocation on a sectoral basis based on the needs. In order to move towards proper basin management there is a need to periodically carry out an analysis of the hydrological aspects, develop adaptive mechanisms for allocating water resources sector-wise and build capacities of the stakeholders at various levels to help evolve institutions that can match the task at hand.

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In Conversation with Dr. Himanshu Kulkarni, ACWADAM, Pune on Aquifer Management in India

Surya Prakash Rai, *SPWD, New Delhi*

The article on Groundwater: Towards an Aquifer Management Framework, by Dr. Himanshu Kulkarni and P.S. Vijay Shankar, published in the Economic and Political Weekly (February 07-13, 2009) was very insightful. The current debates on groundwater issues are quite encouraging as better solutions are being sought to cope through the crisis. The need for a National Groundwater Management Programme proposed by the authors though ambitious is achievable. The ideas have been extended to a new stage and the debate is now open. Himanshu Kulkarni strongly proposes that aquifer mapping and delineation is not that difficult a task as one would imagine. If a small organization like ACWADAM can do it in each project it has undertaken, Dr Kulkarni is confident that it is practicable for most organisations. Dr. Kulkarni shared his views on aquifer management in India with Surya Prakash Rai.

SPR: *Time and again, we have been wondering whether it is really feasible to delineate the aquifers? If so, there can be two major parameters for it; physical and institutional. The physical parameters comprise of aspects like the scale on which aquifers are to be delineated, the hydro-geological mapping and its detailed description and the relationship between exogenous processes (climate, surface flows etc) and the endogenous processes (porosity, transmissivity, storativity etc). Being clear on the conceptual framework and methodology, one moves on to the institutional parameters, which determine the success of any programme/ exercise. You are very clear on the methodology of aquifer delineation, but is it really possible to do it within a 'time framework' (considering the pace of deterioration in both the groundwater quantity and quality and the diverse agro-ecological and topographical conditions of India)?*

HK: In short, if one understands the scale on which to delineate aquifers in an area, it is perfectly possible to do it within a time framework. Again, it does not matter if aquifers get delineated with lower confidence levels. Currently, they are not delineated at all! What is the harm in attempting to delineate them? However, one ought to be careful in not rushing the institutional parameters. Often, we put the cart before the horse and there are examples of institutions developing on groundwater management practice but there is no sense about the scale on which we fit them.

SPR: *Further, the resources and the skilled manpower required for this task is again a major issue. This is quite crucial as in field conditions, one really needs to be motivated to do the task. For instance, in some of our project areas in the Water Governance Project, we tried to establish groundwater monitoring stations for selected wells. But, none of them could be operationalized so far; a reason being that only one or two monitoring wells could not be useful to determine aquifer properties at basin level (in fact, it is even not appropriate at a watershed scale!), especially in areas like Rayalseema and Vindhyas. Rather, an inclusive approach would have been suitable, whereby well owners should be trained and they disseminate this to others, forming a sort of 'chain reaction'. It still may have some loopholes, but could be a reliable solution to bring in the stakeholder involvement.*

HK: Agreed! Today, people are turning to groundwater as it is a 'hot topic'. When I began work, people called me crazy - going around measuring water levels. But that is precisely the point. Unless we look at and into wells, we cannot identify and delineate aquifers - and that itself is a challenge that few are ready to take on. We have had mixed experiences in stakeholder involvement. In Purandar (near Pune), it has worked, in some other areas it has not and we've had to mobilise a dedicated person / team to do the job. Somehow, Indians today are caught up in a different time-wrap - people acquire analytical skills but very few of these have data acquisition skills. Groundwater resources

are viewed in the GIS framework - the G and S are very strong but the I is a big....?

SPR: *As far as our interactions with various government officials (implementing officials at local level) in various states are concerned, they are over burdened, there are numerous schemes/ programmes being implemented in recent years and Departments are understaffed. And it won't be surprising if the Government Departments merely take the responsibility of collation and managing records and stop implementation activities in the coming 15-20 years! At macro-level, we should hence focus on policy issues so as to bring a legal framework for the most practicable solutions to any problematic issue and at the micro-level, it should be the responsibility of civil society and academia in matters relating to aquifer mapping, data generation and other related crucial aspects.*

HK: Agreed again! However, there is a need to change all that and that is precisely the reason for making a call on a 'groundwater management programme' that will attempt to integrate policy and practice in a more proactive manner through participative processes. Personally, I don't agree with regulation on groundwater - at least not in the way it is being shaped at the moment!

Book / Report Updates

Preliminary Consolidated Report on Effect of Climate Change on Water Resources; Ministry of Water Resources, Government of India, New Delhi, June 2008

Central Water Commission (CWC) and National Institute of Hydrology (NIH) have jointly prepared the Preliminary Consolidated Report on Effect of Climate Change on Water Resources. The report begins with defining climate change and its causes both natural and human induced. It summarizes various studies on climate change carried out so far by different international and national institutions and outlines contours for further research. It describes the available methodologies for carrying out studies and their limitations. The report underlines the importance of understanding the likely impact of climate change on the hydrological cycle that may intensify temporal and spatial variations in water availability in different basins. A need to create River Basin Organizations along with generating data on all the constituents of the hydrological cycle and water uses and requirement on basin scale has been emphasized. The report is organised into eight chapters: (1) Introduction (2) Water resources of India (3) Global scenario (4) Initiatives taken by Ministry of Water Resources (MoWR), GoI (5) Trends of climate change in India (6) Impacts of climate change on water resources for selected basins (7) Adaptation strategies and (8) Future directions.

World Climate Impacts Assessment and Response Strategies Programme (WCIRP), one of the four sub-programs of the World Climate Programme (WCP) of the World Meteorological Organization (WMO) was constituted following the First World Climate Conference in Geneva, Switzerland in February 1979. Its aim is to assess the impacts of climate change on economic and social activities and thus to contribute to the development of a range of socio-economic response strategies that could be used by governments and communities. United Nations Environment Programme (UNEP) contributed substantially to fulfilling the WCIRP goals. In view of the scope, importance and potential of global climate change and its impact on the society, the WMO and UNEP established the Intergovernmental Panel on Climate Change (IPCC) in 1988. IPCC does not carry out research nor monitors climate related data or other relevant parameters, its mandate is to make a comprehensive assessment of the peer reviewed and published scientific, technical and socio-economic information relevant to understanding the scientific basis of risk of human-induced climate change, its potential impacts and options for adaptation and mitigation. IPCC has come out with four assessment reports since 1990.

The First Assessment Report played an important role in establishing the Intergovernmental Negotiating Committee for the United Nation Framework Convention on Climate Change (UNFCCC) by the UN General Assembly. Negotiations began in 1991 under UN auspices to formulate an international treaty on global climate protection. The negotiations resulted in the Convention, and was opened for signature at the Earth Summit in Rio de Janeiro in June 1992, and it entered into force in March 1994. The Second Assessment Report (1995) provided key input to the negotiations, which led to the adoption of the Kyoto Protocol. According to the protocol, industrialized countries have to reduce their emissions of six Green House Gases (GHGs) at least by 5% below 1990 levels in the commitment

period of five years (2008-2012). The Kyoto Protocol will enter into force ninety days after it is ratified by fifty-five industrialized nations, which contributed about 55% of total carbon dioxide emissions in 1990. The United States, the world's largest emitter withdrew from the Protocol in March 2001, arguing that there was not enough sound scientific basis in support of climate change. The Third Assessment Report (2001) provided information to the Conference of Parties (COP) to the UNFCCC for deliberating on agenda items. The Executive Summary of the Fourth Assessment Report has been released in February 2007. The reports point out that the major impact of global warming is on the hydrological cycle, agriculture, biodiversity and the general eco-system. Transfer of environmentally sound technology to contain the GHG remains a complex issue. IPCC has developed a wide range of future emissions scenarios in its Special Report on Emission Scenarios. Anthropogenic carbon dioxide emissions are virtually certain to be the dominant factor causing the observed global warming. It is observed that the extent of snow cover on the global scale has decreased by 10% since late 1960s. The global mean sea level has risen between 0.10 m to 0.20 m during the twentieth century. Scenarios of future climate change are usually developed using the complex 3-dimensional (land, atmosphere and oceans) Global Climatic Models (GCMs) with different scenarios of GHG emissions. These models can provide aggregate estimates such as globally averaged surface temperature with some degree of confidence but cannot adequately resolve factors that might influence regional climates, such as the local effects of mountains, coastlines, lakes, vegetation boundaries, heterogeneous soils etc. Based on the global simulations, IPCC observed that glaciers in the Himalayas are receding faster than in any part of the world and, if the present rate continues, the likelihood of them disappearing by the year 2035 and perhaps sooner is very high. However the findings of the Geological Survey of India (GSI), which is continuously monitoring the Indian glaciers, are not that alarming. Other agencies like UNDP, UNESCO and World Bank have also included impact of climate change in their reports. UNDP developmental report (2007-08) has indicated that seven of Asia's great river systems will experience an increase in flow over the short term, followed by decline due to reduction in the glacier melt. One of the important programmes under the natural science sector of UNESCO is the International Hydrology Programme (IHP) that has entered its seventh phase. Theme-1 under the programme proposes to address issues of climate change particularly with respect to water resources under its five focal areas that include among others hydro-hazards, managing groundwater systems' response and global change and climatic variability in arid and semi arid regions. According to the World Bank report on India, the best preparation for managing unpredictable future changes is to put in place a water resource infrastructure and management system which is driven to a much greater degree by knowledge (not limited to hydrology), and which is designed to be much more flexible and adaptive and operated as such. The World Bank has also published a Policy Research Working Paper on 'Estimating Global Climate Change Impacts on Hydropower Projects: Applications in India, Sri Lanka and Vietnam' wherein from India it particularly studied Vishnugad Pipalkoti Hydroelectric Project. The report states that the results are still tentative in terms of both methodology and implication. It states that the amount of energy generated would be affected to a certain extent, but the project viability may not change so much. It concludes that more case studies are necessary for drawing general implications, such as hydropower design alternatives.

Prime Minister's Council on Climate Change (PMCCC), in its first meeting held on July13, 2007 decided that MoWR mandate institutions to initiate studies for major river basins of rivers whose water comes from snow melt. MoWR constituted a Committee for 'Snowmelt Run-off and its Assessment' under the Chairmanship of Member (River Management), CWC in March 2006. Realizing the importance of impact of climate change on water resources, the MoWR re-constituted this committee as standing committee for 'Assessment of Impact of Climate Change on Water Resources' under the Chairman, CWC on September 27, 2007. The committee decided to compile (a) works done by different organizations in the field; (b) data availability with the organizations; (c) list of experts and manpower available for such specialized studies/works; and (d) proposed action plan. Information has been received from CWC, Brahmaputra Board, National Remote Sensing Agency (NRSA), National Water Development Agency (NWDA), Survey of India (SoI), NIH, Central Ground Water Board (CGWB), Wadia Institute of Himalayan Geology (WIHG), Geological Survey of India (GSI) and GB Pant Institute of Himalayan Environment & Development (GBPIHED). CWC has attempted 'Trend analysis of flows in major Indian rivers in the context of climate change'. A Climate Change Cell has started functioning in the CWC under the Chief Engineer, Planning and Development with seven Director Level Officers as members. Similarly Brahmaputra Board has created a Climate Change Cell though no work has been carried by it so far.

NRSA is carrying out work on 'Seasonal snowmelt runoff forecasting in Sutlej basin'. NWDA, CGWB and SoI have carried out no work so far. NIH, WIHG, GSI and GBPIHED have done substantial work in the field of glaciology and snow-melt over the years. Necessary provisions have been made under the XI Five Year Plan (FYP) scheme 'Development of Water Resources Information System (WRIS)' for establishment of site and monitoring of the glaciers, snow and river flows. A national workshop organized by National Water Academy (NWA), Pune on December 5&6, 2007 listed the following issues that need immediate attention: (a) existing storages require enhancement and provision of carry over; (b) whether design flood of existing projects need to be reviewed; (c) whether any change is required in methodology of computing design flood for future projects and in the procedure for assessing water needed for different uses. A brain storming session on 'Effect of Climate Change on Water Resources and Adaptation Strategies' organized by NIH on April 24, 2008 recommended among others a need of additional storages for meeting various demands particularly for the rain-fed areas of the country in the light of the possible impacts of climate change. NIH has prepared a special edition of 'Jalvigyan Sameeksha', which has compiled technical Papers on the theme of 'Impact of Climate Change on Water Resources'. There are other organizations such as Centre of Studies in Resource Engineering (CSRE), IIT, Bombay, Defence Institute of Advanced Technology, Pune, Indian Institute of Tropical Meteorology, Pune etc. which are studying the effects of climate change on water resources. The working group on water resources for XI FYP recognized the impending climate change, caused by CHG emissions as an established fact. The discussion on climate change is mostly taking place in the domain of atmospheric physics. The hydrologists are yet to translate what it means for water availability, its distribution in time and space, and changes in demand. The working group accepts it as a fact that even in the post climate change scenario, systems that are more controlled will fare better than systems that are less controlled. In water resource parlance, control means engineering infrastructure that enables water managers to store and transfer water with greater certainty, thus reducing the impact of uncertainty. Therefore, dealing with climate change is going to require more infrastructure.

The chapter on Trends of Climate Change in India refers to several studies carried out to determine the changes in temperature and rainfall and its association with climate change. NIH (2007) has carried out Basin-wise assessment of temperature variability and trends in nine river basins of northwest and central India. The trends of changes in temperature suggest that majority of basins (Ganga, Indus-lower, Mahanadi, Mahi, Narmada, Brahmani and Subarnarekha, and Tapi) have experienced an increasing trend in mean annual temperature over the last century, while two basins (Sabarmati and Luni and other small rivers) have experienced cooling trends. Seasonal and annual trend of changes in rainfall and relative humidity show maximum increase in rainfall in Indus-lower followed by Tapi. Most of the river basins have experienced decreasing trend in annual rainy days with maximum decrease in Mahanadi basin. Like rainfall, majority of river basins also experienced increasing trend in relative humidity both on seasonal and annual scales. Eight inter-related research projects were carried out by MoEF and Department of Environment, Food and Rural Affairs (DEFRA), UK as a part of collaborative programme. A Regional Climatic Model (RCM) was set up for the South Asian domain and run to simulate the climate for the period 1961-1990 and 2071-2100. The high-resolution regional simulations generated using the RCM were compared with observed regional climatological data to verify the model's ability to realistically represent the regional climatological features in India, especially for the summer monsoon season. The scenarios developed are indicative of the expected range of rainfall and temperature changes, the quantitative estimates still have large uncertainties associated with them.

The chapter on Basin-wise Impacts of Climatic Change on Water Resources takes stock of the situation particularly of Indus, Ganga and Brahmaputra basins incorporating water resources availability, development in context of irrigation, hydropower, flood management and glacier retreat position. Chapter seven looks at adaptation strategies, which include assessment of water resources, hydrologic design practices and dam safety, operation policies for water resources projects, flood, drought and coastal management strategies, temporal and spatial assessment of water for irrigation, land use and cropping pattern.

The possible future directions (chapter 8) include data collection; scientific studies; networking of institutions; watch on impacts on other sectors; river basin-wise studies; mitigation measures; need for river basin organizations; flood management; involvement of academicians, capacity building and awareness programmes.

Hardeep Singh, SPWD

National Water Mission under National Action Plan on Climate Change Comprehensive Mission Document

A National Action Plan on Climate Change (NAPCC) has been drawn up by the government on realising the degree of dependency that India's masses and economy have on the climate. This is with the objective of best charting out India's adaption techniques to the changing climate as well as to enhance it's sustainability initiatives.

Released by the Prime Minister of India on 30th June 2008, the NAPCC seeks to meet the challenges posed by the onset of Climate Change through eight National missions that are:

(a) National Solar Mission

(b) National Mission for Enhanced Energy Efficiency

(c) National Mission on Sustainable Habitat

(d) National Water Mission

(e) National Mission for Sustaining the Himalayan Ecosystem

(f) National Mission for Green India

(g) National Mission for Sustainable Agriculture

(h) National Mission on Strategic Knowledge for Climate Change

With respect to the water resource, varying availability of which could gravely impact livelihoods of the rural poor, the National Water Mission (NWM) has identified several direct implications of climate change which are:

~ Decline in glaciers and snowfields in the Himalayas

~ Increased drought like situations due to overall increase in the number of rainy days over a major part of the country

~ Increased flood events due to overall increase in the rainy day intensity

~ Effect on groundwater quality in alluvial aquifers due to increased flood and draught events

~ Influence on groundwater recharge due to changes in precipitation and evapo-transpiration

~ Increased saline intrusion of coastal and island aquifers due to rising sea levels

Chapter II of the mission document highlights the need to better allocate and use water resource to meet both rural as well as urban demands in the most efficient way possible. They have sought to integrate the concept of Integrated Water Resource Management (IWRM) for better inter-state distribution while developing a framework to increase water use efficiency and optimising water usage through the imposition of tariffs regulatory mechanisms. Recycling of wastewater is viewed as a means by which urban water demands can be better met and appropriate technologies are to be considered to better meet the need of coastal cities that lack adequate sources of water. The mission also seeks to implement these regulatory mechanisms in the rural areas as well with the primary motive of optimising the efficiency of the irrigation systems in place including rehabilitation of run down systems as well as expand irrigation in a bid to increase storage of the resource.

Functioning of the NWM will be at a ministry level with there being constituted inter-sectoral groups that shall combine resources from other relevant ministries, industry, academia and civil society. The 11th and 12th plan periods are seen as crucial to reprioritise activities and enhance allocation of the water resource as is feasible. The Prime Ministers Council on Climate Change is the reporting body as far as NWS is concerned and annual performances are to be reported publicly.

NAPCC sees the building of public awareness as a crucial part of its campaign and a role in its success. This is to be carried out by engaging with media, civil society; bringing out national portals, reforming curricula as well as constitution of awards and recognition for positive steps taken towards combating climate change by an empowered group. Development of appropriate technologies and relevant indicators to monitor progress of avoided emissions, etc. along with means of assessing adaptation benefits of actions undertaken.

Chapter III of the document highlights the strategies and methodologies for the implementation of actions outlined by the NAPCC. Given the nature of implementation of water resources scheme that span many departments and ministries of the government thus making it important to have in place a consultative mechanism for coordination of work. Six sub-committees have thus been formed to look after the various aspects of water resources management which are:

~Policy and Institutional Framework

~Surface Water Management

~Ground Water Management

~Domestic and Industrial Water Management

~Efficient Use of Water for Various Purposes

~Basin Level Planning and Management

Recommendations from these six sub-committees has resulted in the charting out of strategies to be pursued in the following four areas:

§ **Assessment of Impact of Climate Change** :It is of prime importance to assess the impact of climate change on the availability as well as quality of the water resource from both surface as well as ground resources which requires undertaking data collection, modelling of potential outcomes and impacts and development of techniques for efficient utilisation.

Several activities have been identified under the NAPCC for better monitoring and management of the resource and this seeks to implement strategies identified through collaborations with several nodal agencies such as Central Water Commission, Central Ground Water Board, Indian Meteorological Department, State Governments to name a few.

§ **Changes in Policies and Practices** : Based on various studies and projections, impacts of climate change on the hydrological cycle seem evident and likely to jeopardise the availability of the resource. Thus a review of policy and practice with respect to water resources (irrigation, cropping pattern, etc.) would be of utmost importance to identify measures for mitigation.

The Ministries of Water Resources, Rural Development, Agriculture, Urban Development along with the Planning Commission and State Governments would be roped in for work on policy and practices.

§ **Measures of Mitigation** : Conservation, efficient use and adoption of better management practices of water resources form the primary measures of mitigation of impacts of Climate Change. The list of measures drafted under the NWM comprises of sixteen measures that cover aspects of irrigation, ground and surface water, rainwater and different management systems that surround the resource. Ministries of Water Resource, Rural Development, Agriculture; along with State Governments and organisations such as Central Groundwater Board and Central Water Commission amongst others have been identified for implementing identified strategies.

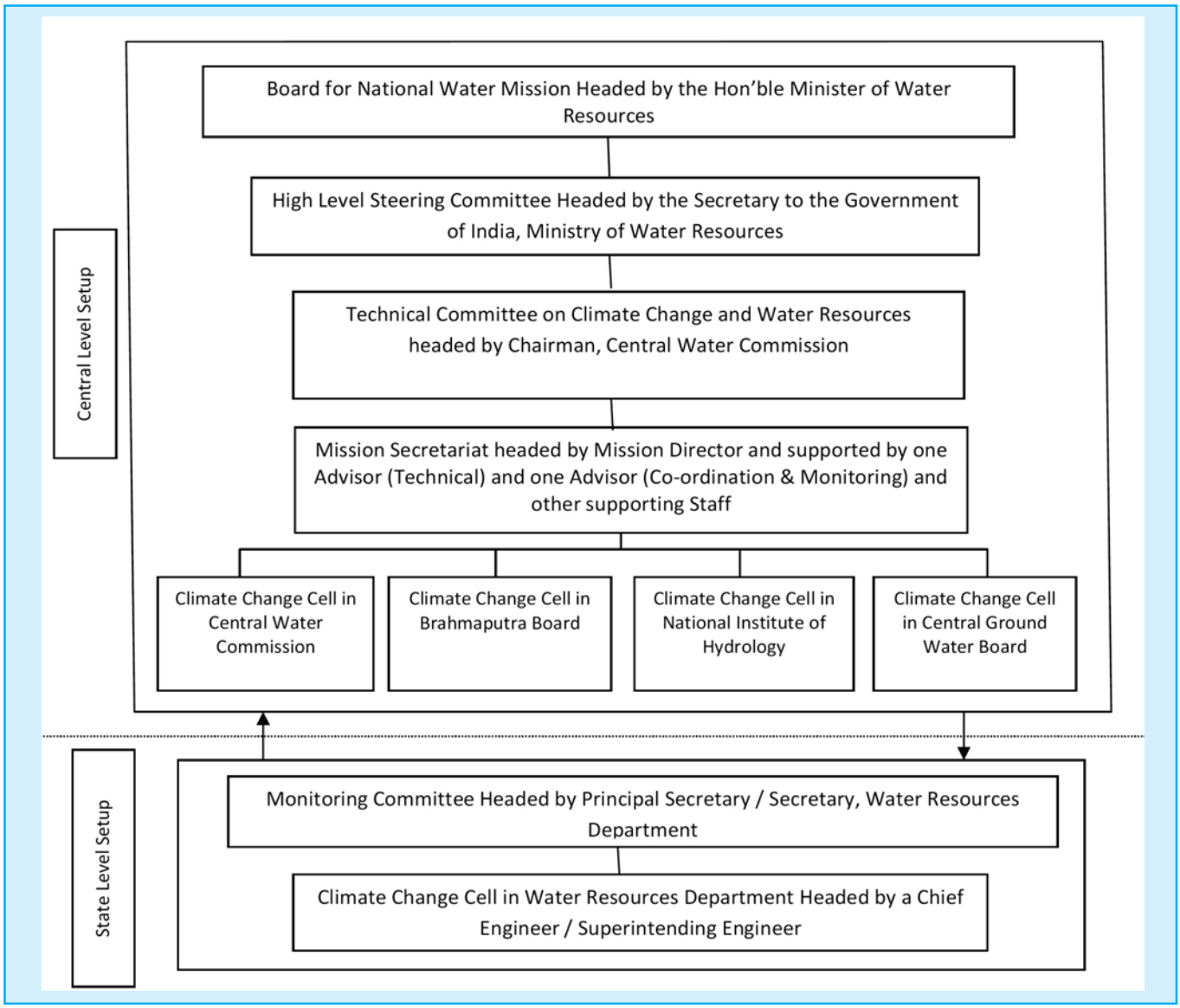
§ **Measures for Adaptation** : Creating awareness as well as identification of measures for adaptation through suggested changes in practices in design and planning stages of projects, agricultural and water usage practices would be key measures for adaptation. Again Ministries of Water Resource, Agriculture, Rural Development, Urban Development along with State Governments and bodies such as the Central Water Commission shall be involved in the framing and identification of measures.

Chapter IV outlines the Monitoring and Evaluation Mechanism, Institutional Setup and Plan of Action. Establishing impacts of climate change on water resources having been identified as the primary need to base further activities on, to carry out research and studies for a realistic assessment of the impact of climate change. Thus for optimisation of the resource and to encourage its judicious use at all levels, the need for policy reviews and constant monitoring measures being implemented and the need for a critical review in order to identify and rectify inappropriate measure has been expressed.

Such a large scale monitoring of the water resource calls for the partnership and proper coordination between many ministries and bodies to monitor various aspects of the resource at all levels. Thus a two tier set up has been proposed with M&E measures being undertaken at the central as well as state levels with the Minister of Water Resources heading the Board for National Water Mission and the Principal Secretaries/Secretaries of Water Resources Department of every state heading the Monitoring Committees at the state level. Currently a technical Committee on Climate Change and Water Resources headed by the Secretary to GoI, Ministry of Water Resources has been constituted comprising of members from concerned ministries, experts, NGO's and it seeks to further involve members from state governments, professional and private organisations working in the water sector.

A dedicated Secretariat is to be set up with a compact Mission Secretariat headed by a Mission Director (Additional Secretary GoI level) and supported by two advisors, technical evaluation and co-ordination and monitoring. Specific cells created in NIH, CWC, BB and one proposed at CGWB for research and impact studies will feed into and provide support to the Secretariat.

Research and development as well as training and capacity building activities to be undertaken given the pressing need to identify affects on water resources by climate change have been highlighted in Chapter



Institutional Setup for National Water Mission

Source: *National Water Mission Document*

V of the mission document. In addition to studies being conducted at NIH, BB and CWC; professional chairs are to be set up by MoWR in order to integrate research already being done by premier academic institutions such as Indian Institutes of Technology and National Institutes of Technologies, Indian Institute of Science amongst others.

Capacity building is to be carried out for research, water and land management as well as academic institutions identified as a target group in the various states of the country. Awareness programmes are to be carried out for both the masses as well as policy makers and professionals with more evidence based projections rather than the current assumption based facts used to make the impact be known.

Lastly chapter VI looks into additional fund requirements with the Working Group foe XI Plan on Water Resources being set up. Additional funds required for the operation of the National Water Mission has been estimated by it's six sub committees as Rs. 28,651 Crores with Rs. 10,038 Crores and Rs. 18,613 Crores being needed for implementation at the Central and State levels respectively. Expenses for the Secretariat to be set up at MoWR are Rs. 5 Crore thus pegging total costs at abour Rs. 28,656 Crores.

Given the fact that state governments would play a key role in the implementation , it has been considered necessary to seek views aof the State governments on additional fund requirements and modify them as needed in the mid-term review of the XI Plan.

Alisha Vasudev, SPWD

Mountains of Concrete: Dam Building in the Himalayas; Shripad Dharmadhikary; International Rivers, December, 2008

In the last few years several works have looked at the political economy of dam building and argued against its centralised, bureaucratic nature. Shripad Dharmadhikary's Mountains of Concrete is an engaging addition to this literature in the particular context of dam building for hydropower generation in the Himalayan region spanning the four countries of India, Nepal, Bhutan and Pakistan. The huge stock of water in the region in the form of glaciers is being increasingly looked upon as having large potential to generate hydropower leading to a renewed push to build hundreds of dams with over 1.5 lakh megawatts of additional capacity in the next twenty years. Climate change leading to accelerated melting of the glaciers will increase the yields in the rivers and hence hydropower potential in the short run. These very dams will aggravate the risks of climate change in this seismically active zone because of the increased risk of dam failure due to Glacial Lake Outburst Floods. At the same time the depletion of glaciers in due course would reduce the river yields and affect the performance of huge investments in the projects. Dam building, the author contends, will not only pose a threat to dam safety but will fundamentally transform the landscape, ecology and economy of the region and will have far reaching impacts all the way down to the river deltas.

These hydropower dams are being constructed to deliver electricity to lead centres far away and in the case of Nepal and Bhutan for electricity exports to India. These energy sources are not being developed with a focus on livelihood and energy sources of the poor. The book discusses the differing social, political and economic contexts for dam building in the four countries of the Himalayan region and outlines the issues at stake and the civil society response so far. The projects are being pushed despite opposition from affected people and doubts on their development effectiveness. Assessments of potential and feasibility of dam construction, be they of individual projects or of series of projects in a river basin, are not being done, subjecting people of the region to huge risks. The established procedures of dam building are being circumvented and the social, environmental and cultural costs of such projects are being ignored.

At the regional scale these projects are being justified on the ground of economic development and electricity needs, in the case of Nepal and Bhutan the driver is attraction of huge revenues through electricity export to India. The Indian market is expected to back the funds and thus India's policies and incentives associated with the sale of electricity would influence the funding of these projects. Pakistan on the other hand is justifying massive storages primarily for irrigation, power generation being a secondary benefit. India is justifying these projects on the grounds of demand for hydropower. Private capital looking for profit is acting as a driver for this and is being supported by power sector reforms which are providing it an enabling policy framework through open access and the freedom to sell power on a merchant basis, the transfer of hydrological risks to the public and the cost plus approach to profit. A large number of players have entered the arena of hydropower development in the last few years in this region. The source of financing of these projects would be IFIs like World Bank and ADB, Government of India, Indian companies and bilateral donors in the case of Nepal and Bhutan. In Pakistan, these would be financed through IFIs, China and their domestic capital while in India the major funding would come from the government, public and private developers, Indian banks and financial institutions. With the entry of private developers the need to recover investment would fundamentally change the power sector leading to increase in tariff, elimination or phasing down of direct or cross subsidies and development of an electricity market with open access and merchant sale. The book states that the government may need to provide comfort to the lenders / SEBs / DISCOMs by signing or operationalising satisfactory escrow agreements or through required changes in other project documents (Power Purchase Agreement etc). The book discusses how power sector reforms have brought in new players and institutions into the picture like electricity regulatory commissions and private developers. Power trading companies

and power exchanges have gained importance with provision of open access and merchant sales to bulk consumers without a long term PPA. With the decrease in cost of production over the years once the debt repayment is complete, developers can make huge profits by selling power at prevailing market prices.

The book states that trans-boundary water issues in the region will benefit tremendously from network building between civil society and affected people's groups from the countries in the region. The alternative approach suggested in the book covers a combination of demand-side management, efficiency in generation, supply, transmission and energy use and developing renewable sources of energy. It concludes by offering the recommendations of the World Commission on Dams as the best possible framework for reviewing the dam building program in the region.

Amita Bhaduri, SPWD

Training and Capacity Building of Water User Associations at Bahuda Sub-basin Level; December 23, 2009 and February 28 to March 01, 2009

Surya Prakash Rai, *SPWD, New Delhi*

Two training exercises on 'Capacity building of Water User Associations at the sub-basin level' were conducted by SPWD in collaboration with Krushi Samstha in Madanapalle (December 23, 2008) and Kothakota (February28-March01, 2009) mandals of Chittoor district, Andhra Pradesh.

The first training targeted the WUA members of Bahuda irrigation project, Nimmanapalle, Pedda Cheruvu in Angallu, Kurabalakota and Kadiramma Cheruvu of Madanapalle mandal. The trainees comprised eighteen members of WUA, three progressive farmers, three members from CBOs, four members from Krushi Samstha and one from SPWD, New Delhi. This was the first training of its kind to provide the inputs from the findings of the project to the existing stakeholders in the Bahuda sub-basin. The training aimed at maximum awareness generation at the WUA level about their own knowledge on the existing situation of the tanks and their water management systems, livelihoods, cropping pattern; roles and responsibilities of the WUAs.

1st Training: December, 2008

The second training was imparted to WUA members, progressive farmers, livestock rearers and artisans from Madanapalle, Kurabalakota, Nimmanapalli, Thambalapalle, Sadum and Somala mandals that fall in the sub-basin, and CBO's from Madanapalle, Nimmanapalli and Kurabalakota. More than 100 participants were present for this training. The resource persons involved in the training were: Gayathri: Agriculture officer, Nimmanapalli Mandal; Prasad Reddy: Veterinary doctor, B.Kothakota Mandal; Diwakar: FES, Madanapalle; Nandgopal: Krushi Samstha, Madanapalle; Balaji: Krushi Samstha, Madanapalle; Sudhakar: Krushi Samstha, Madanapalle and Surya Prakash: SPWD, New Delhi.

2nd Training: February-March, 2009

This training was aimed at improving the knowledge and awareness level amongst the WUA members; about the existing situation of their tanks and water management systems, livelihoods, cropping pattern; roles and responsibilities of the WUAs; to strengthen their awareness of APFMIS Act-1997; to identify the issues to be worked out in future and to create awareness on various government schemes being implemented by the departments like agriculture, horticulture, animal husbandry etc.

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We look forward to your feedback and in case of wanting to subscribe/unsubscribe, do write in to us at **info@watergovernanceindia.org; wgp_spwd@yahoo.com**

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