DYNAMICS OF INTER-BASIN WATER TRANSFER: LESSONS FROM SARDAR SAROVAR NARMADA PROJECT

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ABSTRACT *Given the macro reality of significant mismatch in the availability and demand for water with respect to space and time, inter-basin transfer of water through inter-linking of Indian rivers is presently being considered by the Government of India, though at a conceptual level. The Sardar Sarovar Narmada Project (SSP), which is a complete example of inter-basin water transfer project in modern India, has spanned across generations between conceptualization and execution and is still evolving to respond to the changing socio-economic and hydro-ecological conditions inside the basin area and the regions that are likely to receive its water. A review of SSP is necessary to learn about the benefits, costs, issues and challenges involved in large-scale inter-basin water transfers, in the face of the changing cultural, physical and socio-economic landscapes of Indian basins. The rapid growth in groundwater draft in the donor and recipient basins, the associated economic, hydrological, environmental, ecological considerations, lack of emergence of alternate strategies of meeting the growing water demand in water deficit regions, and the difficulties in rehabilitation of project-affected people have brought about major change in the way, major water resource projects are being evaluated today.*

Key words Sardar Sarovar Narmada Project; inter-basin water transfer; hydrologic issues; economic issues; virtual water.

INTRODUCTION

Major mismatch in natural availability and demand for water with respect to space and time is a macro reality in India even today (Patel, 2005). In regions, where water resources are in abundance, the aggregate demand is low (Kumar, 2003), with lesser chances for future growth in rural and urban areas, due to stagnation in agricultural sector, low level of urbanization and industrial backwardness. On the other hand, regions that are naturally water-scarce are characterized by high economic growth, with consequent increase in water demand in rural areas for agriculture and urban areas for domestic and industrial uses (Kumar, 2003).

Though still at a conceptual level, inter-basin transfer of water through inter-linking of rivers is presently being considered by the Government of India. The project envisages transferring water from water-surplus basins of the country to regions of deficit, especially western and Peninsular India, with the larger aim of tackling recurring droughts and floods and simultaneously increasing the utilization potential of the available water resources in the country, and expanding irrigated agriculture and hydropower generation (GOI, 1999). The National River Linking Project is already shrouded in a major controversy with polarized debates between the pro dam lobby and opponents of large dam projects, with diametrically opposite views about the costs and benefits that the projects could induce. This debate is poorly backed by scientific evidences and facts. Such polarization comes from the enormous difficulty in assessing the real costs, benefits and challenges of a project, which has mammoth size, complex dimensions--hydrological, engineering, financial, economic, social, environmental, cultural, political, legal and institutional--and great planning time horizons, leading to major speculations.

The underlying premise is that with changing time, the hydrologic, engineering, financial, economic, environmental, legal, institutional, cultural, and social imperatives of the project, and the challenges posed by the project would eventually change dramatically. In this context, it is worth reviewing the SSP on Narmada River as a learning exercise on the benefits, costs, issues and challenges involved in large-scale inter-basin water transfers in the face of the changing hydrological and socio-economic conditions in India's river basins. This project has spanned across generations between conceptualization and execution and is still evolving to respond to the changing needs of a region, which characterizes the transitional economy of the country in every sense.

The plan for harnessing the river for irrigation and power generation in the Narmada basin was initiated in 1946. During subsequent years, arguments about economic growth based on irrigation and power generation - justified large water projects in Narmada valley. But the new rationale revolves around the concerns of sustainable use of natural resources, social advancement and environment enhancement, with water at the core. The SSP was conceived as a mega project to bring water to the parched lands in Saurashtra, North Gujarat and Kachchh, thereby finding a lasting solution to the miseries of millions of farmers, whose fortune is decided by the erratic monsoon. But today we find that political support for the SSP is generated to a large extent by the drinking water scarcity and groundwater declines which the SSP promises to mitigate (Kumar and Ranade, 2004).

Over the past few years, there have been dramatic changes in the views held on major water resources projects in the developing world (Vyas, 2001; Varghese, 2001; Varghese, 2002; Gupta, 2001). To a great extent, the way SSP had evolved it facilitated a change in the overall thought process among intelligentsia engaged with discussions on water. The rapid growth in groundwater use experienced during the past few decades by Gujarat and Madhya Pradesh and the consequent changes in groundwater socio-ecology in the regions, the associated changes in economic, hydrological, environmental and ecological considerations involved in major surface water transfer projects, lack of alternate strategies of meeting the growing water demand in the vicinity, complexity involved in rehabilitation of Project Affected People (PAP), particularly the increasing recognition that complete rehabilitation may never be possible, have brought about major changes in the way mega projects are now being evaluated for their costs and benefits. The evolution of SSP is examined and some lessons are drawn for inter-basin water transfer projects.

NARMADA: THE DONOR BASIN

The Narmada, the largest west-flowing river, rises near Amarkantak range of mountains in Madhya Pradesh (MP). It is the fifth largest river in the country and the largest one in Madhya Pradesh. It traverses MP, Maharashtra and Gujarat and meets the Gulf of Cambay (Fig. 1). The total length of the river from source to sea is 1,312 km while the length up to Sardar Sarovar dam site is 1,163 km. The width of the river channel at dam site during high floods is 488 m and that during summer is 45.70 m. The maximum recorded flood on Sept.7, 1994 was 70,847 m^3s^{-1} while minimum recorded flow in summer was 8.5m^3s^{-1}. Approximately 91.5% of flow occurs during June-September.

The total drainage area of Narmada basin is 97,410 km^2 comprising 85,858 km^2 in MP, 1658 km^2 in Maharashtra and 9894 km^2 in Gujarat. The drainage area up to SSP dam site is 88,000 km^2. The mean annual rainfall in the basin is 112 cm. The flow series estimated by Central Water Commission on the basis of rainfall for the period from 1891 to 1990 and rainfall-runoff relationship estimated using the data of observed runoff for Narmada at SSP dam site is shown in Fig. 2. The annual flow estimated at 75% dependability is 34.5 km^3 (28 MAF). According to some estimates, the utilization of surface water from Narmada River basin today is hardly about 5.85 km^3 (Kumar and Ranade, 2004).

KACHCHH, SAURASHTRA, N. GUJARAT: THE RECIPIENT REGIONS

The projected population of Gujarat up to the year 2025 is shown in Fig 3. By then population is expected to be around 59 million. Estimates of water resource availability and utilization, both region-wise and in per capita terms for the year 2001 are given in Fig 4. It is seen that South and central Gujarat have the highest water resource potential, whereas Kachchh has the least. It is also seen that utilization of both surface and groundwater is highest in North Gujarat, which is "absolutely water-scarce" according to Falkenmark's indicator of physical water scarcity (IRMA/UNICEF, 2001). In nutshell, the use of water, lion's share of which goes to irrigation (Kumar, 2002), has so far not been constrained by the physical limitation of water resource in this region.

North Gujarat manages to draw more water for intensive irrigated agriculture than its annual renewable water, primarily through mining of deep aquifers (Kumar and Singh, 2001). The primary reason for the higher water withdrawal in North Gujarat, as compared to water-rich South and Central Gujarat, is the greater availability of arable land, a major driver of consumptive water demand, in the region (Kumar and Singh, in preparation). Same is the case with Kachchh, and Saurashtra (Singh *et al.*, 2004).

Therefore, if North Gujarat, Kachchh and Saurashtra have to take the hard path of economic development through growth in the primary sector, and urbanization, physical transfer of water from the surplus South and Central Gujarat is necessary. Subsequently, it will be shown that this is also justified by considerations of equity and the overall development of Gujarat State. It is also important to keep in mind that both North Gujarat and Saurashtra export virtual water through supply of dairy

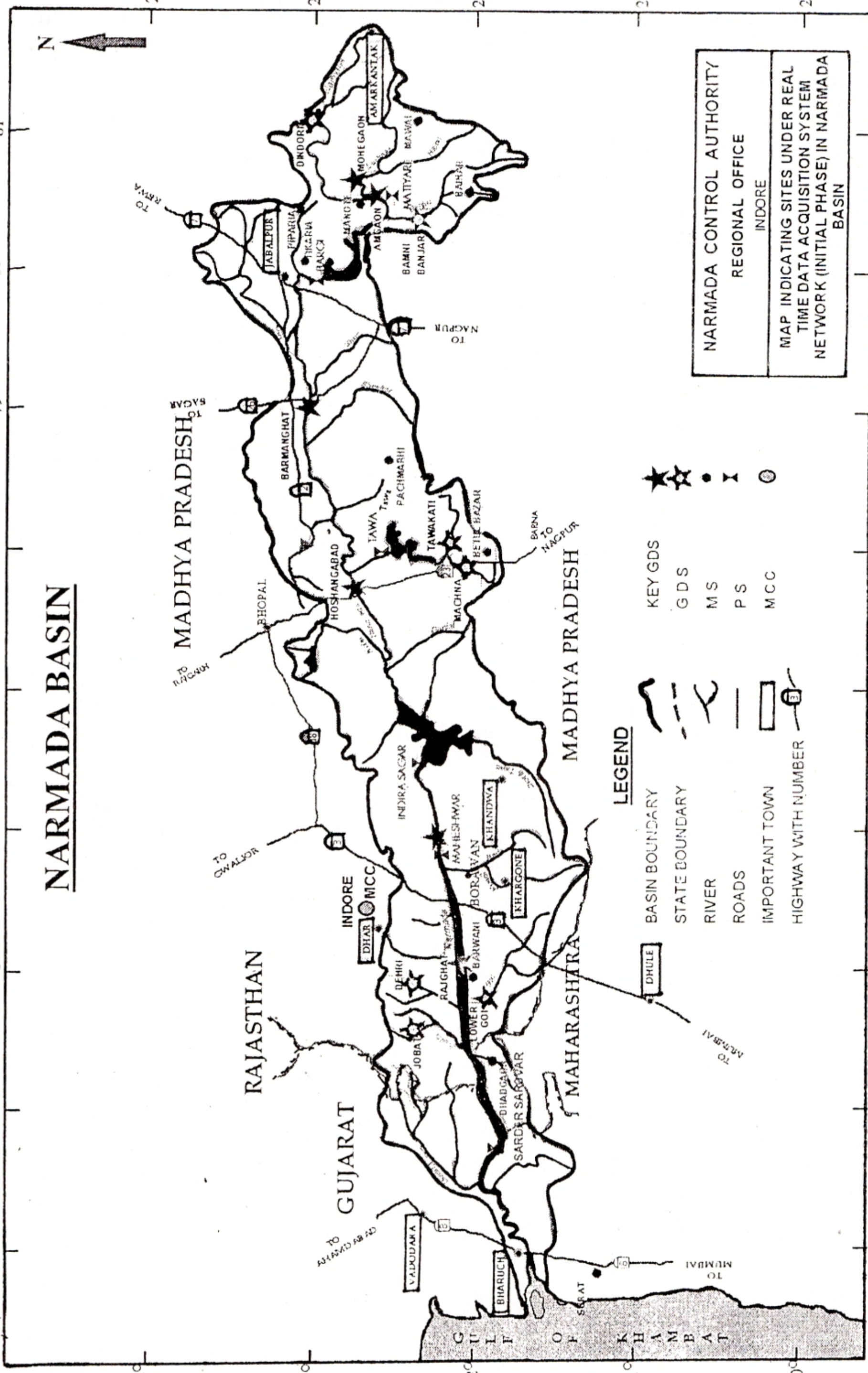

Fig. 1 Map of Narmada Basin (Source: http://www.ncaindia.org/nb_index.htm).

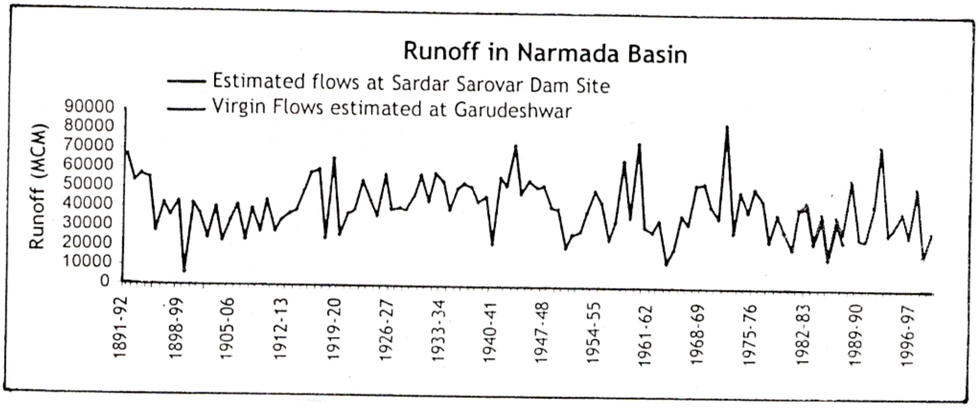

Fig. 2 Runoff series of Narmada basin.

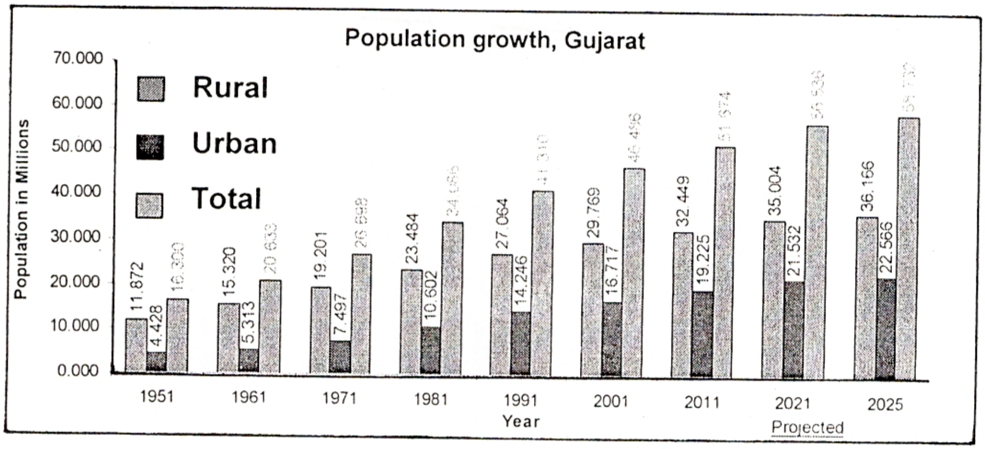

Fig. 3 Projected population growth in Gujarat.

products to many other regions, including water-rich South Gujarat. In fact, according to a study by Singh (2004), it takes nearly 3.2 m^3 of water to produce one litre of buffalo milk and 2.5 m^3 of water to produce one litre of milk from cross-breed cows in north Gujarat, which is known for its intensive dairy production. Given the large quantum of milk flowing out of the two districts of North Gujarat, the net virtual water export from the region was estimated to be nearly 2,000 MCM/yr (Singh *et al.*, 2004). This is far more than North Gujarat's groundwater over-draft.

Geo-hydrologically, Narmada, flowing through South Gujarat happens to be the only river with large surplus of uncommitted water that could serve as a donor basin for Kachchh, Saurashtra and North Gujarat. In fact the heterogeneous hydrogeology of Narmada in its upper reaches, comprising Basaltic Deccan trap formations, crystalline rocks, sandstone and limestone aquifers belonging to Vindhyan series

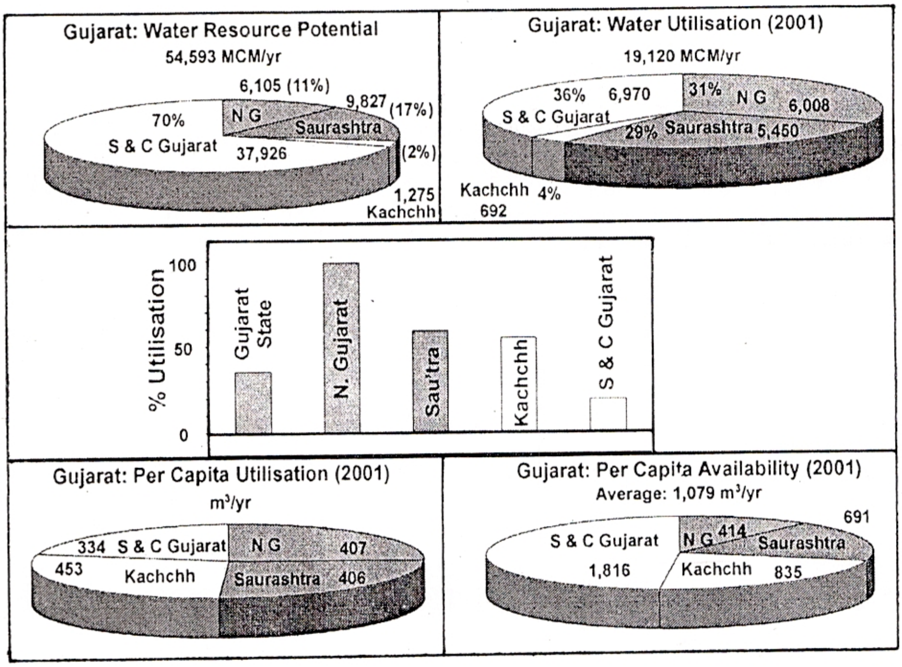

Fig. 4 Status of water resource potential and utilization in different regions of Gujarat State during 2001.

and alluvium in valley fills providing limited arable land precluded utilization of available surplus water within the Narmada basin in MP. Since Narmada is an interstate river, a tribunal was setup to adjudicate and its award, published on Dec 12, 1979, allocated the estimated utilizable 34.5 km^3 (75% dependability) flow between (a) MP (22.5 km^3), (b) Gujarat (11.1 km^3), (c) Rajasthan (0.6 km^3), and (d) Maharashtra (0.3 km^3).

THE CONTROVERSY

The SSP is the most meticulously planned mega, multipurpose project in modern India (Patel, 2001). The planning is unique in many ways: it used advanced scientific knowledge and concepts in the hydraulic design of water distribution and delivery system; it carried out micro planning of canal network up to the sub-chak level; the canal systems up to the distributaries were designed to be automatically controlled from centralized control facility; it used rotational water supply system for distribution of water to each and every farmer in the command area to ensure equity and reliability (Kumar and Ranade, 2004). These had major implications for irrigation efficiency, and therefore economic viability of the project. But with the controversy surrounding the SSP, this has been hardly recognized (Patel, 2001).

But, the fact remains that no other river valley projects in the world has perhaps been held up for decades and locked in such fierce controversy as the ones in

Narmada basin. The list of causes and factors contributing to this state of affairs is long. But the chief among them are inadequate rehabilitation package, uncertain funding arrangement and doubts about the feasibility of high dams (Sardar Sarovar in Gujarat and Narmada Sagar in MP), inter-state rivalry and conflicting claims over its irrigation, water and power benefits. The principal opposition to construction of various dams and reservoirs on the Narmada has been based on rehabilitation and resettlement (R&R) of PAP, with most of these being in MP.

Other grounds of opposition being ecological and ethnic and a growing global opposition to large dams in general (Kumar and Ransade, 2004). The anti-dam lobby calls large dams 'a development disaster' (McCully, 1996). According to them, large dams are not only unnecessary but are causing all round damages. Therefore, future water requirement should be met through very small dams and through watershed development and there is no need for construction of any large dam.

The latest twist to the controversy has come with the MP Govt. contending that the average availability of water in the river is 27.7 km^3 as against the tribunal estimation of 34.5 km^3. In short, this calls for a corresponding reduction in the height of both the Sardar Sarovar and the Narmada Sagar dams and the corresponding reduction in submergence area and human displacement. The MP Govt. has been arguing for a lower height of the two dams for a number of years now. Figure 2, giving estimated historical flows for the period 1989-90 and virgin flows (based on observed flows and the estimated diversions through storage and diversion head-works) for the period 1980-81 to 2000-2001 has been used to suggest that the flow has decreased in recent years (Kumar *et al.*, 2005a). This diagram, however, fails to confirm the above contention beyond the natural statistical variability, particularly in view of the estimated low flows during the two decade interval of 1895-1915.

To be able to draw meaningful inference, one needs to examine the flow data in conjunction with the data of rainfall in the basin. Using rainfall-runoff regression analysis (both linear and exponential), it has been further contended (Kumar *et al.*, 2005a) that part of the reason for the reduced surface flows in Narmada basin is the change in dynamics of interaction between surface flows and groundwater system in the basin. This has been induced by drawdown of groundwater, which results in increased induced seepage from the riverbed. The groundwater abstraction in the Narmada basin in MP is estimated to have increased from 1,008 MCM in 1985 to 2,582 MCM in 1999.

During the last two decades, as result of the slowdown of execution, consequent locking up of the investment and escalating project costs without tangible benefits being realized, the water crises in Kachchh, Saurashtra and North Gujarat worsened with declining groundwater levels and deteriorating water quality. Figure 5 shows the large area of groundwater mining in Gujarat, defined as the area where annual groundwater draft is greater than the net groundwater recharge plus inflow. With the growing problems of groundwater over-draft in North Gujarat, SSP is being viewed as a project to ensure sustainable groundwater use (Kumar and Ranade, 2004). Figure 6 shows parts of Gujarat having groundwater quality problems in terms of higher than permissible content of fluoride, nitrate, and salinity.

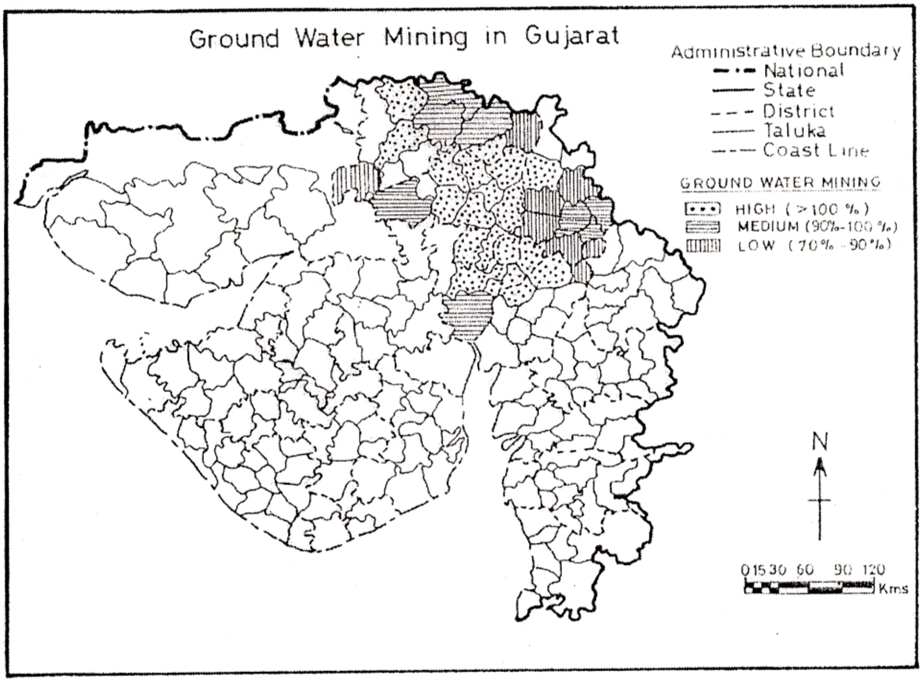

Fig. 5 Areas of groundwater mining in Gujarat (Source: Gujarat Ecology Commission).

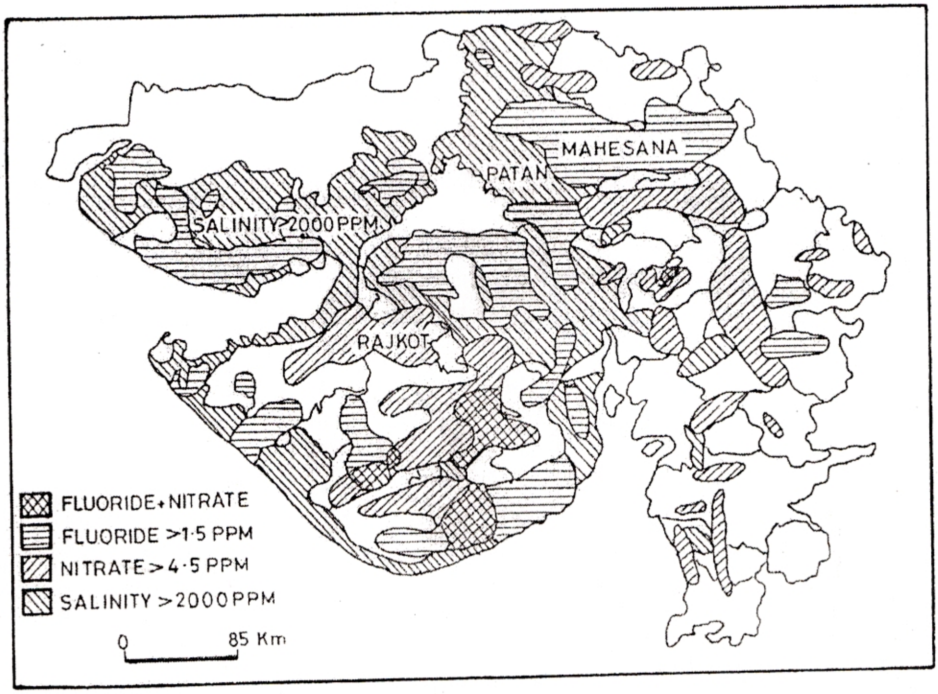

Fig. 6 Parts of Gujarat having groundwater quality problems.

The two figures (Figs. 5 and 6) show why the political support for the SSP is generated today by the drinking water scarcity and groundwater declines which the SSP promises to mitigate. One of the most ambitious drinking water supply projects in Gujarat has been built around Narmada to provide freshwater to areas where no reliable sources exist (Talati and Kumar, 2005). People's faith in SSP went up after its water reached Ahmedabad city, and remote villages of Saurashtra and Kachchh (Kumar and Ranade, 2004). The planned and partly operational network pipelines based on Narmada water intended to form the backbone of drinking water security system for Gujarat is shown in Fig. 7.

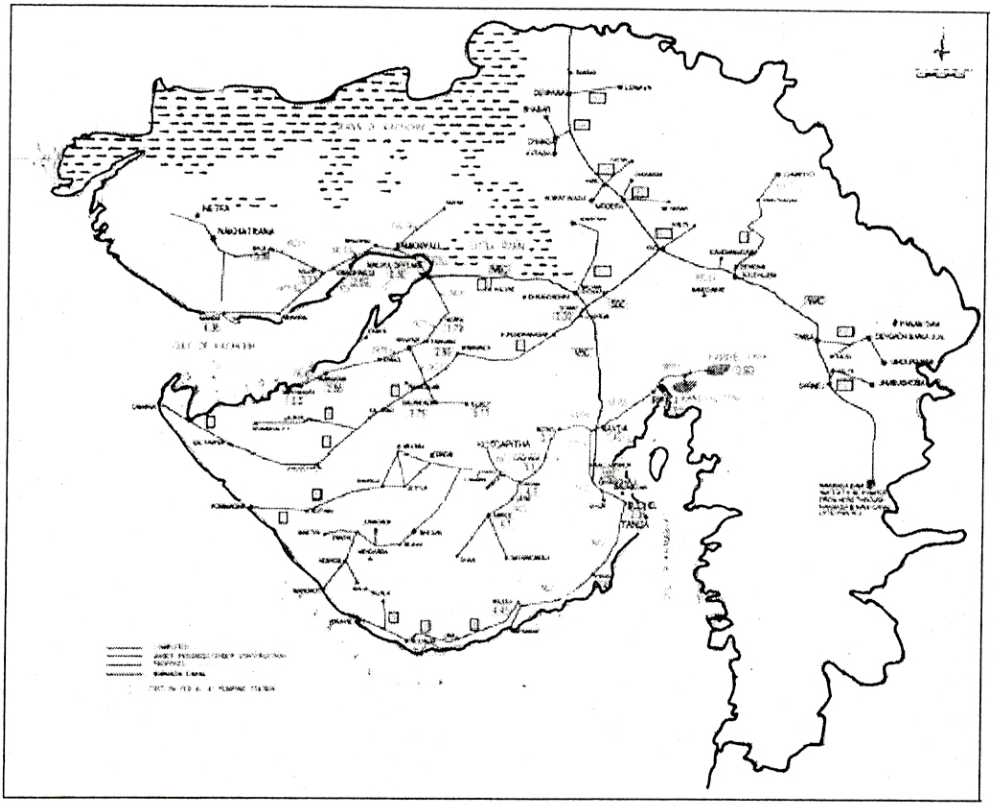

Fig. 7 The planned network of drinking water supply in Gujarat based on water from SSP.

The additional value to be realized from increased groundwater recharge, and ensured drinking water supplies could be significant in view of the fact that the economic and environmental costs of groundwater exploitation (Kumar *et al.*, 2001) and public health consequences of drinking water shortage are really huge. A preliminary study (Ranade and Kumar, 2004) showed that the direct economic benefit from using Narmada surplus flows for recharging aquifers of North Gujarat alone could far exceed the costs of infrastructure required for bulk water transfer if used within existing irrigation command (Ranade and Kumar, 2004). In addition to the potential for ameliorating the water scarcity in Gujarat, there are many other sound hydrological and economic reasons for supporting the inter basin transfer of water through the Narmada basin development in general and SSP in particular. These are enumerated in the following sections.

HYDROLOGIC AND ECONOMIC ISSUES AND CHALLENGES

Already possible indications of change in flow of Narmada in response to enhanced groundwater exploitation have been seen. Groundwater exploitation induces additional recharge from surface water or reduces groundwater outflows into streams. Lifting of surface flow (largely unauthorized) has also grown significantly and this too could pose threat to meeting the design goals. Area irrigated through river lifting and canal lifting is a significant share (36%) of irrigation in the basin (Kumar and Ranade, 2004; Singh *et al.*, 2005).

The slow pace of implementation of Narmada Valley Development Projects (NVDPs) in MP has to some extent been due to political economy of growth based on decentralized governance; heavy focus on watershed management and water harvesting. In some ways these became impediments to project implementation. This period has also seen the growing power crises both in Gujarat and MP. It may be noted that as of now only 90 MW out of 3605 MW power generation potential has been created. MP is also entitled to get 57% of the power generation from SSP. Further, the total water utilization is only 5.5 km^3 against the allocation of 34.5 km^3. MP's power deficit was nearly 1975 MW in 2003. Today, growing power crisis is also at the centre of political agenda in both the states. Growth in power demand mainly comes from farm sector due to widespread growth in electrified wells and tube wells (Kumar and Ranade, 2004).

In addition to finance, R&R of PAP continues to be a major impediment to speedy implementation of SSP and other projects in the Narmada valley. Effective opposition has come from people whose concerns include threat to local cultures and autonomy of communities. Arguments about agricultural production, power generation and economic growth have never really been questioned. But new concerns on protecting ecological services, downstream ecological impacts and in-stream use of the river by rural people along the banks of the 1,300 km stretch have also been raised (Kumar and Ranade, 2004).

No one really questions the fact that every development project has its cost not only in purely financial terms but also in social, environmental and ecological terms. It is also nobody's case that development of our Nation can be achieved without exploitation of its natural resources. But every development project, in principle, is designed to have more 'benefits' than the 'costs'. The problems arise when some costs are either ignored or under stated and benefits artificially inflated. Even when this is not the case, the problems will arise if the PAP and the beneficiaries are polarized in their perception. A common feature of all inter-basin water transfer projects is that beneficiaries and PAP are geographically separated and in many cases linguistically and culturally distinct.

A perception that a group of people will benefit at the cost of another group has always lead to conflicts at some point of time. Therefore, rather than divide the people into beneficiaries and PAP, the effort has to be to create a 'win-win' situation and have only beneficiaries, as it happens in most commercial deals. Let it not be forgotten that in most cases, because of geographical and historical reasons, beneficiaries of inter-basin water transfer projects are likely to be relatively more prosperous than the PAP, therefore, equity and justice not only demand sharing of natural resources but sharing of benefits of the development process as well. If this paradigm is accepted, there is no reason why various projects can not be designed taking into consideration available alternative strategies at appropriate scale of intervention with nearly full knowledge of the eco-environmental impacts and most importantly benefits.

In the specific case of Narmada and SSP, following challenges have emerged. The first, is about ensuring catchment communities, comprising 1,41,700 ha of land under submergence and 80,000 families, as beneficiaries of the project and the ongoing development process. This calls for generating accurate information about the actual economic and social costs due to submergence. The second, is about achieving design goals of irrigation and power benefits. It has been argued that hydrologists over-estimated dependable flows and under-estimated siltation and flood discharge. The available data is of short duration and given the natural variability is not conclusive. But one can anticipate that with increased development based on local harnessing of water resources in upstream areas of catchment, both average and flood flows may decrease with time. It is necessary to understand the changing hydrology and account for it in the planning process.

MP has gone with the winds of change towards local water harvesting and decentralized governance. This has taken heavy toll on implementation of Narmada Master Plan and led to a decline of growth in irrigated area (Kumar and Ranade, 2004). It must be emphasized that local water harvesting and decentralized governance has its own place in the total water resource development process but is no substitute for large scale multipurpose basin development projects. Moreover, water harvesting is not a benign technology or approach and can cause several undesirable consequences (Batchelor *et al.*, 2002) if it is not a part of the overall development strategy. Some studies suggest that in many naturally water-scarce regions, characterized by low rainfall with high variability in magnitudes, high aridity and having high demand for water in agriculture, rainwater harvesting offers little potential (Kumar *et al.*, 2005b). Though, rainwater harvesting may still be important for ensuring drinking water security.

OPPORTUNITIES

First: Hydropower is the cheapest of all sources of power. If all projects of phase I in the valley are completed, it would give an additional 2025 MW. This is close to estimated present power deficit in MP. Of this only 90 MW power is presently generated. MP is also entitled to get 57% of the power generation from SSP.

Second: Farmers in North Gujarat want Narmada water to recharge depleted aquifers and raise water levels thereby cutting down cost of irrigation. In this case energy saved will really amount to energy generated. In MP too the emerging groundwater crisis could force farmers to demand quick implementation of NVDPs.

Third: Age old arguments like water logging and salinity in command areas could become non-issues with groundwater over-draft and, therefore, real possibility of balanced use exists. As a matter of fact, most of the designated command area of SSP lies in regions where groundwater tables are very low.

Fourth: Rivers in North and Central Gujarat such as Sabarmati, Watrak, Meshvo, Saraswati, Banas and Rupen are dry and do not carry any flows in lower parts of their course during most of the years resulting from over-appropriation of water diversion through reservoirs and diversion structures upstream (Kumar, 2002). This had major negative implications for riverine ecology. These rivers can receive water, thereby improving their riverine ecology (Ranade and Kumar, 2004; Kumar and Ranade, 2004).

Significant improvement in groundwater ecology due to recharge can be achieved (Vyas, 2001; Ranade, and Kumar, 2004). These need to be properly planned and quantified. Positive health impacts due to dilution of mineralized/ polluted groundwater (Kumar and Ranade, 2004) can also be expected.

LEARNING FROM THE EXPERIENCE OF SARDAR SAROVAR PROJECT

A major issue in planning and implementation of water resource development project concerns the process of decision making (Fisher, 2001). Whereas smooth execution of the project had been tampered by delays in environmental clearance from Supreme Court for raising the dam height, Fisher (2001) argued that part of the delay was because of lack of vital information about the social impact on the affected people in the submergence area. Since water resource have a wide social and ecological consequences the process followed in arriving at a particular decision is as important as the decision. The process must ensure a 'win-win' consensus. In this connection accuracy and reliability of data and studies depicting growth scenarios based on such data and models followed by sharing of benefits can play a vital role in arriving at a consensus between the various stakeholders (Kumar and Ranade, 2004).

Very little information was shared on the nature of the project; its design features, assumptions, scenarios; also no effort was made to involve the stakeholders in negotiating a deal. Tribunal also listened only to the views of government officials and experts whose primary business was to get the best deal for their respective State Governments. Hindsight tell us that this mechanism was inadequate and of limited nature, particularly in terms of information on the affected people and led to delayed R&R and clearance from the Supreme Court. Additionally, lack of adequate planning and accountability on the part of the irrigation bureaucracy led to supplying water to the command areas without proper infrastructure in place.

The experience of MP in local rainwater harvesting and decentralized governance tells us about the limitations of this strategy. It has to be restated that every measure of water resource development has a scale and a place in the overall scheme of development that must be recognized in any future plan.

The fact that Narmada project is still evolving is an indication that enough advanced planning was not undertaken. But then it also goes on to show that the infrastructure to make water and power available, if in place, can respond to changing needs. However, it is worth giving a thought whether SSP and the rest of NVDPs will ever qualify as commercial successes; alternatively, if these had been conceived as largely commercial projects, would the society have missed on any of the perceived benefits?

CONCLUDING REMARKS

Development of water resources of a large region is a multi-dimensional endeavor requiring a holistic view of available natural resources, primarily land, water and biomass on one hand, and demand for water and biomass on the other. It also requires understanding of the hydro-geological and geographical opportunities and challenges wherein the social and economic issues are also intertwined. Societies are used to inter-region and international transfer of raw materials, or finished goods, energy resources, services and even intellectual property as part of normal trade and commerce. In all such transfers, involved political and social issues may not be as complex as in case of water. But, to the extent these factors have an impact on tradability, these are better resolved in such a manner that a 'win-win' situation is created both for the seller and customer regions.

Water is a natural endowment of a region or basin. Traditionally, it has not been viewed as a tradable commodity. Perhaps it should never be fully tradable, as it is part of the basic necessities of life and also relates to the heritage of every civilization. But, as agricultural and horticultural produce, hydropower, water supply for industries, household and drinking, societies are already viewing water as a tradable commodity.

Many scholars worldwide had looked at virtual water import, i.e., import of food grains and other agricultural commodities that require a lot of water for production from water-rich countries as an economic instrument for dealing with water scarcity in naturally water-scarce regions as an alternative to using the scarce water in their own territory or indulging in physical transfer of water for producing more food (Allan 2003; Hoekstra, 2003). But, recent analysis by Kumar and Singh (in preparation) suggests that virtual water trade cannot be an effective tool for water-scarce countries or regions to achieve total water sufficiency, as globally, virtual water flow is from regions which have low renewable water resources to regions that are endowed with the same. This is because, as the study shows, the effective water withdrawal for agriculture production and food production levels are primarily driven by access to arable land, which ensures water from soil profile for food production in many water-scarce regions.

If it is so, opposition to inter-basin water transfer projects and support to virtual water import on the ground that such projects could deprive water-rich areas of their share of renewable water and therefore livelihoods, may not be quite valid. It is because these projects would not merely attempt to reduce the major regional imbalance in natural water endowments, but would address the issues of the untapped potential of water for crop production and other economic activities (GOI, 1999; Yang, 2002).

This makes it an attractive proposition for water-rich regions as well. This is because water-rich regions would not be in a position to achieve food self sufficiency due to lack of sufficient arable land. At a broader scale, inter-basin transfers of water, no doubt are intended to create a 'win-win' like situation for donor and recipient basins, for example flood protection for donor and drought protection for the recipient basins. But, if we extend the concept of "virtual water", the water-scarce regions can compensate to their donors for the quantum of water they part with, through export of agricultural produce. The amount of agricultural production from unit volume of water could be the basis for negotiating water and commodity transfer agreements.

But, unlike in average tradable situations, the property right to water, however ill defined, also reside with the donor community, both up- and down-stream of the dam or diversion structure. These rights pertain not just to the volume of water intended to be transferred or diverted, but also to the ecology, environment and other in-stream uses, as also to share in the anticipated benefits such as hydropower from the total project. Further, it must be recognized that project affected people have a special right and the project beneficiaries a special responsibility to ensure that a just and adequate R&R mechanism is reached. If these and related aspects are understood and explicitly recognized, there is no reason why the communities, both from the recipient basins and the donor basins, should not be involved in hammering out a conflict resolution package to take advantage of the opportunities that a particular inter-basin water transfer scheme may provide. Other issues such as accuracy and reliability of data, taking account of the intra-basin development of the water resources, disclosure of hydrological data in public domain for voluntary criticism and evaluation, accounting for ecological and environmental services and costs, then become part of the process of exploiting the opportunity and pre- and in-project conflict resolution.

The governments of the regions involved in any inter-basin water transfer scheme too have or will have right on the water and benefits. They are also expected to provide experts and bear the financial and administrative burden at all stages from conceptualization to realization of the project. Therefore, during feasibility and planning, the role of the involved governments is not just that of bankers and project stakeholders but also that of facilitator of agreements between the stakeholder communities and in subsequent stages that of guarantors of agreed benefits to all the involved communities under their respective jurisdiction and finally that of bankers ensuring return on the invested capital. Nevertheless, water transfers from surplus to deficit regions should exploit the available opportunity for economic and social gains both in the donor and recipient basins. Like all successful commercial deals, these must create 'win-win' situations for all involved stakeholders.

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