Presidential Address

Trans. Inst. Indian Geographers
Vol. 26, No.1, 2004

Sustainable Management of Water Resources

Bireswar Banerjee
D.Lit. Dept. of Geography, University of Calcutta, Kolkata 700 019

Selection of a suitable theme of the Presidential Address appropriate to such an august audience is indeed a difficult task in view of the mutidisciplinary character of geographical science and gradual emergence of this discipline from a colonial base to its rapid transformation in assessing man-environment interface vis-a-vis to its regional diversities. Moreover this discipline continues to retain its dynamic character with change in time. There are frequent paradigm shifts of this discipline from theoretical base to applied science, from empirical studies to quantitative analysis, from radicalism to human welfare and very recently with rapid growth of information technology, a most modern web of geography has emerged, termed as cyber-geography. The ultimate objective of such paradigm shifts are to ensure sustainable development - a development which is environment friendly, economically viable and socially acceptable to the masses.

With this scenario, the subject matter of the address is selected, which is of topical interest and relevant to the overall development of the people, not only of India, but also of other developing countries of the world. The western parts of India occasionally suffer from prolonged drought. In view of the miseries faced by the people of this and other drought prone areas of India and measures to overcome the same, the Supreme Court of India directed the Govt. of India in 2002 to revive the once proposed inter-basin transfer of water from water surplus to water deficit areas to remove regional imbalances. To honour the directions of the Apex Court, the Govt. of India has taken up urgent steps to implement River-Linking Programmes (RLP). This has also been highlighted in this address.

Introduction

Water is vital to life, without which no living body can survive. It is indispensable for economic prosperity and overall development of a nation. Therefore, water is considered a prime natural resource, a basic human need and a valuable national asset. Though fresh water is available in abundance, it is not equitably distributed. Till the middle of the 20th century, the importance of water on life had not been particularly felt because of its moderate demand. But relentless increase in the demand of fresh water in recent years has led to the scarcity of this basic resource in many countries of the world. Such spurt in demand is caused by (i) rapid growth of population, (ii) increase in urbanisation and industrialisation, (iii) high intake of fresh water in irrigation for additional food production and (iv) misuse and wastage of fresh water in miscellaneous ways. These result in scarcity of water in various countries, even for drinking.

India is well endowed with fresh water resources, the source being rain and snow, glaciers, lakes and groundwater. But misuse and random application of freshwater in agriculture, irrigation and industrial purposes are causing concern. In the absence of adequate storage facilities, about 37 per cent of the fresh water is drained to the sea. This is evident from the fact that the annual availability of fresh water per capita has decreased from about 5177 cm in 1951 to 1869 cm in 2001. There are wide variations of water availability in different regions of the country. India often suffers from periodic water shortage. The classical example is the Meghalaya state, which gets the highest rainfall in the world but suffers from water shortage during late winter and early summer. On the other hand, Rajasthan suffers throughout the year from acute water scarcity. It is high time that India should formulate a National Water Policy to make judicious use of this resource. Otherwise the country is likely to face serious water famine in the course of next 25 years or so.

In view of the fact that the earth is being gradually exposed to global warming, additional environmental problems will crop up leading to the shrinkage of glaciers, the main source of fresh water, and other environmental problems, impeding the well established hydraulic equilibrium of the earth. It is therefore imperative to explore ecologically sound avenues of water management, after taking into consideration its scientific use viz., impounding the water resources from natural rain, storing flood discharge of the river basins and judicious withdrawal of groundwater. Future programmes of water management should take into consideration people centred measures to ensure water security for agricultural and domestic use and simultaneously ensuring adequate supply of water to non-agricultural uses. Equal stress is to be given on socio-economic issues like its equitable distribution and ensuring its sustainability. Giant projects like the proposed River Link Proposal (RLP), also known as Inter-Basin Transfer of Water, which the Supreme Court of India has directed in 2002 to the Govt. of India to pursue, in order to avert the water crisis in the coming years, have already raised certain questions. Will the proposal be able to mitigate the water crisis of the country ? Is it a better solution to other eco-friendly small sized programmes ? Will it be economically viable or will it cause additional ecological problems and human miseries ? In other words will the RLP be economically viable, ecologically friendly and be able to achieve its objective to provide enough supply to meet the requirements of the rural and urban society ?

River Link Programmes

The basic objectives of river link programmes are to ensure water supply in arid and semi-arid parts of the country from water surplus areas and remove economic and regional disparities. The concept of inter basin transfer of water from surplus to deficit areas as modes of development were first mooted during 1950s. Following the examples of some other countries, India also took up the idea of Garland Canals, Ganga-Kaveri Link Canal as well as the feasibility studies of linking of rivers originating from the Himalaya with those of the Deccan. All these proposals were mooted during 1950s onwards but none of them was implemented by any appropriate agency. Similar exercises have been made in case of some rivers in U.S.A. (Viz. Colorado river), Amu Darya

and Syr Darya in Uzbekistan, South-North Link Canals in China and many other places of the developed world. But none of them proved to be sustainable in nature. On the other hand, assessment Reports of the World Bank and other agencies reveal that large scale diversions create ecological and human disasters of gigantic magnitude. So the concept of "never let a drop of water go waste to the sea" was nullified by the tragic experience of the dessication of the Aral Sea which was once considered as the fourth largest fresh water lake of the world, but now turned into a sluggish marsh full of sand and rendering the adjoining fertile farm lands sterile with high salinity.

It is in this context that the present proposal mooted by the Supreme Court of India should be considered. It is necessary to ascertain whether the proposal of RLP is the answer to India's water problem. What factors have enthused the Govt. of India to implement it? Should this RLP be considered as a sustainable one?

Experts have already expressed their doubts about the ability of the project to meet the desired objectives. To start with, the grandiose nature of the project is too ambitious. Its main objective is to alter nature. The RLP starts with the proposition that rivers of North India will be linked with those of the Peninsular and West India and thereafter consider the transfer of water from surplus to deficit areas, generation of hydel power and provide other facilities associated with it. But rivers are not human artifacts. They are natural phenomena. Moreover even after linking the Ganga with the Bramhaputra, only 4 to 6 percent of water from the Indo-Gangetic Basin would be available to quench the thirst of the dry west.

Another expert group is of opinion that the claim of generating large quantities of surplus power is not based on reality. Moreover RLP requires huge capital investment to the tune of Rs. 560,000 crores at the present price level which is likely to escalate many more times during the period of its implementation. This group is of the opinion that this is not a project for people's benefit. So other cheaper alternatives should be adopted. In fact, the RLP is likely to raise more problems than mitigating regional disparities of water use. Another expert group thinks that the main cause of India's water crisis is the policies of the Govt. of India to meet the ever increasing demand rather than optimising the demand factor. This supply side policy brings in its wake waterlogging, salinization, soil-erosion and unsustainable exploitation of ground water. The policy results in submergence of forests, soil degradation and high rates of siltation in flood water storage tanks. In other words there is a need to change the existing supply - side policy of water availability to a more moderate and optimum demand-side approach.

Proposed Link Clusters of RLP

The RLP involves linking of the Bramhaputra with the Ganga-Kosi and Gandak river. This Ganga-Bramhaputra basin is fertile and rich in ground and surface water. Rainfall is moderate to high and diversion of water in this region would further aggravate flood and soil degradation.

The question of linking Ghagra-Yumuna with Indira Gandhi Canal and the Sabarmati comes in the next phase. The region is located in semi-arid to arid ecosystem. Excessive water use will render considerable portion of this moderately fertile farmland un-

productive due to increase in salinity of the surface soil. Dry farming fits well in this agro-climatic zone. There is no reason to disturb this agricultural system in favour of water loving cereals.

There are also proposals to link the Son, the Damodar, Subarnarekha, Mahanadi, Godavari, Krishna and Kaveri involving the river sytems of the Chotanagpur and Deccan plateaue. Large scale irrigation is not desirable in this fragile ecosystem as the water retention capacity of the soil is poor.

Experiences in different parts of the country have pointed out the follies of relying on excessive water and chemicals as the strategy for boosting up farm production. Future attention should therefore be focussed on better management of water resources along with adoption of better innovative methods.

Another issue associated with the riddle of river linking is the emergence of new beneficiaries in the industrial urban sector. The ever increasing demand of this sector cannot be satisfied by local resources, for whom water has to be brought from distant sources even at the cost of grave environmental peril. The high-tech farming lobby is the consumer of excessive amount of water to ensure success of high yielding verieties of cereals, vegetables, surgarcane and other hybrid crops. This new farm sector has strong control over the political lobby. This privileged sector receives water at a subsidized rate due to their close association with the bureaucracy.

Interstate Dispute over Sharing Water

This issue has both national and international ramifications. These disputes arise over the quantum of water use between the surplus and deficit areas of the concerned States and between the different interest groups. The sharing of the Kaveri water between Karnataka and Tamilnadu is a glaring example. There is also an international dimension of this issue. Where more than one countries are involved, there can be bilateral disputes and tension. Such problems lead to unending cycle of demand, agitation, arbitration, judicial review and so on.

Tension arises over the sharing of Ganga water between India and Bangladesh. In case of the Ganga and the Bramhaputra, the source lies in the Himalaya and the rivers flow from one country to other offering significant water supplies to be shared by the concerned countries. These regional and international issues occasionally create tension and misunderstanding between India and her neighbours. Water security and mutual understanding with the neighbours should be considered important along with other issues of RLP.

Sustainable Water Management Policies

There is a popular belief that water is available in unlimited quantity at virtually no cost and as such could be used by the consumers in any way they like. As a result, the developing countries pay little attention in formulating any water management policy and make its judicious use. This results in considerable wastage of water. With the population of the world rapidly increasing, the experts are of opinion that, at the rate of present consumption, many countries of the world will face water shortage in coming years, unless conservation measures are given priority. In many cases countries with abundant rainfall suffer from water scarcity

due to seasonal variations of rain. There are also many issues that government faces, like confronting water disputes between the different states within a country, which are the direct offsprings of regional scarcities of water from natural sources. There is also an international dimension of this problem where the rivers traverse through Nepal, India and Bangladesh meeting the Bay of Bengal. In this case as well as in other countries of S.E. Asia where the rivers successively move from one country to another disputes arise over sharing of water resources in the absence of joint programme of the consumption of river water resources by these riparian countries. This matter has not been given priority. This is high time that the negative attitudes should be revised in favour of water conservation in a scientific manner. Water security should be given due importance, as the overall security of the country depends on it. It is therefore imperative that all the major water issues - from drinking water sustainability to irrigation needs and urban demands should be analysed and reviewed within an overall regional development context of the society. Such conservation programme should take into account ecology, hydrology, agriculture, industrial and miscellaneous other social needs. As water is used by everybody, its management should be the responsibility of all.

Sustainable Water Resource Management - Indian Perspective

Water is often misused or wasted in India. Good quality water suitable for drinking is generally used in gardening, car washing, irrigation and other uses, which can be easily performed by nonpotable water.

It may be noted that India presently uses about 40 Mham out of 400 Mham, i.e. only 10 per cent of her total annual precipitation. But to meet the requirements in the middle of this century she has to make use of at least 25 per cent of her rainfall. Simultaneous arrangements should therefore be made to store, conserve and judicious use of this available resource. Otherwise the country will have to face water famine thereby disrupting the food and health security of her estimated projected population of one and a half billion during 2050. The total replenishable ground water resource in India has been estimated to be about 43 Mham per year. According to an estimate about one-third of the available ground water has so far been developed. It may be noted that 85 to 90 per cent of India's fresh water resources are consumed by agricultural sectors, much above the world average of 68 per cent. The industrial sectors consume another 4 to 5 per cent and the rest is used in domestic and miscellaneous other purposes.

In a country like India, there are several regional dimensions pertaining to consumption of water resources to meet the basic needs of her people. For example the Bengal Delta with its intricate networks of channels possesses abundant water resources, bulk of which drain into the sea. At the other extreme, there is complete absence of surface flow in the Thar desert of Rajasthan. The regions of heaviest rainfall are Cherapunji - Mausinram in Meghalaya and the poorest in the westernmost part of Rajasthan. Depending on soil, technology, human skill and amount of available water, the cropping patterns show diversities. Some crops can grow with minimum water input while others require waterlogged terrain. In

this whole process there is a symbiotic relationship between crop selection and water management.

A judicious combination of the two can be applicable both in water surplus and water defecit areas. In between the two extremes, varieties of crops are grown in the canvas of partially dry and partially wet areas. Within this scenario, technology helps in the manipulation of natural environment and crop production. This is manifested in the introduction of high water loving cereal crops in semi-arid and arid regions with the help of canal irrigation and exploitation of valuable ground water resources. Such an attempt of manipulating the ecosystem with new technology however is not found to be sustainable in the long run. This in many cases entails abundant application of irrigation water to ensure high productivity of water loving cereals, like HYV rice and wheat. But excessive use of water in many cases result in high salinity of the surface soil on one hand and waterlogging on the other. Thus the ultimate objective of extracting high productivity of the otherwise fertile soil becomes nullified, as the land itself is rendered unfit for farming. The existing fallacy of water management therefore requires modification and change. The traditional system of irrigation results in mass wastage of water. Some amount of this water drains out as suface run-off, some increase the moisture level of the soil thus rendering it too humid and considerable amount is evaporated and returned to the atmosphere. The efficiency of the irrigation water-use in farming still remains at the level of 35 - 40 per cent in India, whereas the said figure is well over 60 per cent in many other countries like China and U.S.A.

The existing system of flooding the fields results in large scale wastage of water, without ensuring increase in agricultural productivity. Use of sprinklers and drip irrigation have demonostrated 'on farm' water efficiencies upto the range of 80 - 90 per cent with concominant increase in crop productivity to the tune of 20 to 100 per cent depending on the crop. It is therefore necessary to adopt area-specific, season-specific, crop-specific and source specific water resource management to ensure long term sustainability.

There are rich traditions of community based water harvesting and water budgeting in India, to meet the needs of specific environment. Recent efforts of the community to harvest rainwater and recharge the acquifers in Alwar district of Rajasthan have helped in the revival of the Arvari river which remained dry during the last 40 years. Similar participatory water management programmes which are being pursued in various parts of this country have given excellent results.

Outlook

It is true that compared to many other countries, India is well endowed with rich water resources. So long there is a common belief that water resources of this country are ubiquitously distributed and the supply is unlimited. But now it has been realised that supply of fresh water is by no means unlimited. Wanton misuse results in its depletion, particularly in view of its increasing demand due to burgeoning growth of her population, and increase of her urban, industrial and irrigated areas.

The population of India is increasing at the rate of 1.6 per cent per annum and at

this growth rate it is likely to reach 1.6 billion by the middle of this century. This implies that the present food production of the country, hovering round 210 million tonnes per year needs to be doubled. The excess production will have to be obtained from lesser areas, with efficient watershed management and augmenting the irrigation efficiency of the country. Side by side, wastage and misuse of water particularly of fresh water should be considerably minimised. Urban wastage can be controlled by recycling of water and subsequently diverting the same to agriculture, industry and miscellaneous other uses. Substantial amount of total run-off from rainfall needs to be conserved by the creation of additional storage facilities in network of tanks and reservoirs. This will help in recharging the ground water and mitigate drought conditions in rainfall deficit regions. It is also necessary to rationalise ground water withdrawals, as its overdraft brings harmful salts, chlorides and other poisonous chemicals to the surface.

Along with these it is necessary to check population growth within a reasonable limit as this is the root cause of India's water crisis. Unless the population of the country is stabilised, a sustainable solution of India's water crisis will be difficult to achieve. Along with this, a detailed assessment of the fresh water resource of the country needs to be carried out with the help of remote sensing and GIS techniques. The objectives of sustainable development of water are to ensure its optimal use as well as to extract its maximum benefits. Sustainability of this very valuable resource of India can only be achieved through comprehensive river basin planning and scientific management of her surface and ground water resources. Prior to any future planning, the perception and awareness of the local people should be given due attention. It is necessary to highlight that development is for the benefit of the masses and it is their responsibility to sustain it.

Epilogue

The task of evolving appropriate strategy for the sustainable management of water resources of the country requires the expertise of different branches of physical and social sciences. In the search of sustainable management, it is necessary to blend the traditional knowledge with modern technology to reap the best benefits. Trained geographers of today are better equipped to undertake the search for suitable models of development than their predecessors. The unique nature of modern geography as propagated in various Universities of the country are producing experts in remote sensing, geographical information sytem, computer and digital mapping as well as in geo-informatics. This knowledge has given them realistic insight in assessing man-environmental relationship in the changing world.

I do not belong to the pessimistic group. On the contrary, I have great hope and aspiration on the young generation of geographers. The follies created by us can be rectified by the young generations, who are now enriched with better techniques and better understanding of the concept of sustainable development. I am not echoing any voice of concern. On the contrary, I foresee a bright future, as the legacy set up by us is now transferred to the hands of dedicated younger generation of geographers of this country.