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River linking projects-national perspectives

Jaydip Mukherjee

Introduction

Water is the most essential resource in every country. India is fast moving towards water scarcity as the average per capita water availability will continue to decrease. Water scarcity increases with population explosion, expansion of economic activities and rapid urbanisation. The population of India is around 1000 million and is hopefully expected to stabilise around 1500-1800 million by 2050, that would require about 400-450 million tonnes of food grains at the present levels of consumption. Therefore, a production of no less than 500 million tonnes is to be achieved by 2050 which warrants stepping up of irrigation development with multiple cropping for increased production. The Central Electrical Authority has assessed the country's hydropower potential as about 84000MW at 60% load factor. About 14% of this is developed so far and the potential that can be developed from ongoing and planned projects is about 7%. Thus about 79% of country's hydropower potential remains still untapped. The projected demand of power by 2050 AD would be 8. 3 million MW and energy of about 44000 billion units. Keeping in view the increasing demand for power on domestic and industrial fronts, there is every need for tapping of this vast potential.

Annual demand of water by 2025 for all purposes including domestic, irrigation, energy and industrial use would be about 110 million ham against the utilisable water resources of about 116 million ham. Thus it can be seen that the growth process and expansion of economic activities inevitably lead to increasing demands for water for different purposes. The source of water that is available in the country is mostly rainfall and snowfall. Combined input is 4000 BCM from this source, 1869 BCM is available as surface and groundwater. Considering the water demand scenario of 2050 AD, a significant deficit is likely. The problem is rendered more acute by the fact that the precipitation and consequently the water availability suffers from nonequitable distribution. Rainfall varies from less than 50 cm in parts of Rajasthan, Gujarat and Andhra Pradesh areas to more than 200cm in eastern part (Ganga-Brahmaputra Basin) and West Coast areas. Moreover availability of water resources in Ganga- Brahmaputra Basin is 60% whereas it is only 0.2% in Sabarmati Basin. Normally water availability less than 1000CM per capita in a river basin is considered as water scarcity condition. Based on this fact, some basins have already become scarce in water, and other basins are likely to become scarce by 2025. This situation calls for an efficient water management strategy for utmost efficiency in water conservation and optimum utilisation like control of conveyance and evaporation losses, adoption of drip irrigation methods, interbasin transfers, etc. Implementation of river linking scheme will

EG Divn., Geological Survey of India, Samar Vila, Arbuthnot Road, Laitumkhrah, Shillong 793 011

provide some respite from the distressful and inequitous situation and remove the regional imbalance and water availability in different parts of the country.

Bakground history

Interlinking of rivers is not a new concept at all. The proposal to link the rivers of North India to those of South India is around 150 years old. In 19th century, Sir Arthur Cotton pleaded for interlinking of rivers for National Navigation Plan. The Periyar Diversion Project across the Western Ghats to Tamilnadu is century's old examples of interbasin transfer. Moreover, Kurnool - Cuddapah canal in Krishna Basin, Telegu Ganga Project for augmenting water supply to Chennai Metropolitan areas and Indira Gandhi Nahar Pariyojana benefiting Rajasthan with the help of Sutlej, Beas and Ravi waters of Indus Basin are few more examples. In Sardar Sarovar Project, the diversion of Narmada water is being proposed to different parts of Gujarat and Rajasthan. Dr. K. L. Rao (1972) envisaged the construction in stages of Ganga-Cauvery Canal, drawing 60000 cumecs of flood flow of Ganga near Patna for about 150 days in a year and link up with Cauvery River. Captain Dastur suggested construction of garland canal - one for the Himalayan Watershed and the other for Sayadri (Western Ghat) watershed. These concepts were not materialised due to certain technical deficiencies. A National Perspective Plan (NPP) for water resources development was formulated by the Union Ministry of Water Resources envisaging interlinking of rivers by water transfer from surplus basins to deficit basins with a view to minimise the regional imbalances and optimally utilise the available water resources in country. Subsequently, National Water Development Agency was set up in 1982, which with a view to carryout this plan held studies in respect of interbasin transfer of water. National water Resources Council adopted National water Policy in 1987 - which has subsequently been updated. This National Water Policy rises to the challenges and an issue related to water resources demand in the country and enunciates scientifically evolved concept of sustainable water resources management, and will create balance between drought prone deficits and flood ravaging surpluses.

Project components

National Water Development Agency (NWDA) has been entrusted to study the feasibility of the national perspective of the river linking projects. The organisation has already identified the links, which could be implemented based on the numerous water balance studies for different basins, reservoir sites and link alignments. Field surveys and investigations for preparation of feasibility reports for such identified links are currently under progress and planned to be completed by 2006. The National Perspective Plan has divided the river systems into two broad components:

A. Himalayan component

Envisages construction of storage reservoirs on the principal tributaries of the Ganga and the Brahmaputra in India and Nepal, along with interlinking of Canal systems to transfer surplus flows to the eastern tributaries of the Ganga and the Ganga to Mahanadi. It would also provide the necessary augmentation of flows at Farakka to interalia flush the Kolkata Port and the inland navigation facilities across the country. The subcomponents are:

1. Manas - Sankosh - Tista - Ganga Link.
2. Kosi - Ghagra Link
3. Gandak - Ghagra Link
4. Ghagra - Yamuna Link
5. Sarda - Yamuna Link
6. Yamuna - Rajasthan Link

7. Rajasthan - Sabarmati Link
8. Chunar - Sone Barrage Link
9. Sone Dam - Southern tributaries of Ganga
10. Ganga - Damodar-Subarnarekha Link
11. Subarnarekha - Mahanadi Link
12. Kosi -Mechi Link
13. Farakka - Sundarban Link
14. Brahmaputra - Ganga (Jogighopa - Tista-Farakka Link)

B. Peninsular component

It envisages construction of storage reservoirs and liversions across river basins having surplus water in peninsular part and planning for distribution of water surplus to adjacent water deficit basins. Mahanadi and Godavari basins are assessed to have interlinks to transfer surplus water of Mahanadi and Godavari to the deficit basins. Construction of storage structure at potential sites, linking of west flowing rivers between Bombay and Surat (Ken, Betwa, Parbati and Chambal) and diversion of other west flowing rivers of Kerala and Karnataka towards the eastern side have been envisaged. These linkages (25 to 29) besides providing water to the water starved areas of Kutch and Saurastra of Gujarat will also have plans to provide drinking water to the ever expanding Mumbai City. The subcomponents are:

1. Mahanadi (Manibhadra) -Godavari (Dowaliswaram) Link
2. Godavari - Krishna (Nagarjunsagar Tail Pond) Link.
3. Godavari (Inchampalli) - Krishna (Nagurjan sagar) Link.
4. Godavari (Palavaram) - Krishna (Vijayawada)
5. Krishna (Almati)-Pennar Link.
6. Krishna (Srisailam) - Pennar Link.
7. Krishna (Nagarjun sagar) - Pennar (Somasila) Link.
8. Pennar (Somasila) - Cauvery (Grand Anicut) Link.
9. Cauvery (Kattalai) Vaigai- GundarLink.
10. Ken - Betwa Link.
11. Parbati - Kalisindh - Chambal Link.
12. Par - Tapi - Narmada Link.
13. Damanganga - Pinjal Link.
14. Bedti-VaradaLink.
15. Netravati - Hemavati Link.
16. Pamba - Achankovil- Vaippar Link.

Merits and demerits of the scheme

The characteristics of interbasin transfer link schemes will be no different than any conventional irrigation projects. Like conventional project, it will also store the flood/monsoon water of a river basin in the potential storage sites and transfer a part of surplus flood water after meeting all the inbasin requirement of the area in the foreseeable future, to deficit areas through link canals generally by gravity and lifts not exceeding 120m. Basic objectives of the interbasin transfers are equitable distribution of available water resources within a region or the nation, increased economic efficiency, self sufficiency in basic water related outputs such as food and hydroenergy and providing livelihood and employment opportunities. Next 50 years in India would witness further accelerated urbanisation. Most of the urbanised areas would have to depend on surface water from distant reservoirs. On completion of this project, the following will be coming out:

1. Surface irrigation facilities to 25 M ha land and 10Mha by increased use of ground water..
2. Generation of 34000MW hydroelectric power.
3. Delivery of 173 BCM of water.
4. Augmentation of dry weather flow in river channel.
5. Employment facilities in agriculture, power, transport and construction sectors.
6. Regulate uneven hydrology into

uniform flow condition.
7. Promote inland navigation facilities.
8. Promote regional and international co-operation.

Though the megaproject has several advantages, the following pitfalls are also noticed:

1) Proposed water transfers by their nature are interbasin and may violate the basic premise of basin as a hydrologic unit for water management. These transfers allow the diversion of water to the noncobasin states of India. Conformity of these proposals may need review of existing legal system. Moreover, Ganga and Brahmaputra are both international river involving China, Bhutan, Nepal and Bangladesh. If one of the countres object to the proposal-it will be difficult for the Indian Government to implement the project, and as on today Bangladesh is against the proposal.
2) Water development projects are normally undertaken by a State besides a few interstate projects by interstate agencies. If in a State particular basin is rich in water resources while an adjoining basin is poor the State may like to transfer the water of the rich basin in its own basin which is not so rich.
3) Systematic numerical data for declaring surplus and deficit basin are lacking.
4) Percapita water availability in various river basins is not available. Actual stream flow data for major rivers and their tributaries is non-existent. Rainfall data is not accurately recorded. No systematic attempts have been taken estimating surface run off.
5) Large-scale superimposition of vast infrastructure comprising dams, barrages and canals will create radical changes on physiography of the country affecting the environment.
6) Construction of dams in seismotectonically active Himalayan region will cause tectonic imbalance, which may result in earthquake. Moreover, reservoir induced seismicity may develop due to construction of big reservoirs.
7) Change in hydrology of river flows coupled with introduction of link channels and distribution systems will have significant impact on environment. This project will have significant negative role on wildlife habitat and result in loss of valuable biological diversity in protected areas. Interiinking rivers can have very serious impact on territoriai distribution system of fishes of India and can show serious negative impact on its biological cycle due to changes in established hydrological and limnological profile. Any major changes in natural riverine climate are likely to affect forest vegetation. Humidity in atmosphere will be increased.
8) Chances of leakage and seepage loss in long transfer through canal system will affect geohydrological setting of the tract.
9) Rise in Ground water level will result in concentration of salt residue over surface, which will render the land unfit for cultivation. Development of waterlogging situation will also deteriorate soil conditions and may convert large tract of fertile lands into a nonusable one.
10) Sedimentation in the bed of the reservoir reduces the available storage capacity.
11) From the economic point of view, valuable mineral deposits should not be allowed to be put out of use through submergence or any other cause.
12) Most of the link channels are likely to be aligned across direction of run-off which follows the general slope of country. So, serious drainage

congestion is bound to happen in upstream side of channel banks in spite of construction of cross drainage works.

13) Quality of water will be changed. Alkaline water from northern India will be joined with slightly acidic water of southern part, which may affect life habitat.

Conclusions

In view of water crisis looming large and considering the economics of water in coming years, concept of interbasin transfer cannot be neglected. Desirability and viability of the proposal should be properly clarified before implementation. An extensive multidisciplinary study is essential before formulation of engineering design. Proper environmental impact assessment seems to be required. Considering the fact that the dimension of impact will be extremely large, a well-informed and cautious approach is called for. In all fairness, the detailed plan should be made public and national debate should be initiated involving persons from all disciplines including Engineers, Geologists, Geographers, Environmentalists, Agronomists, Soil Scientists, Sociologists, Anthropologists and Financial Analysts. Moreover, it may be judicious to attempt similar smaller projects within the basin to fulfil the needs of basin in an integrated and holistic approach before taking up the mega project of Rs. 560000 crore.

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