

Interlinking of Rivers: Concerns and Benefits

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Abstract—India is a diverse country not only in terms of culture and traditions but also in terms of geography, wherein some regions have an excess of river water and others face water scarcity. Being a monsoon country the rainfall is unsteady, unevenly distributed and hence drought in some parts and floods in other parts frequently occur. This problem of irregular distribution of water can be overcome to a greater extent by interlinking of rivers. Rivers have played a vital role in improvising our economy- a source of livelihood to many Indians and essential for both agricultural and industrial activities. River water has been the backbone of Indian agriculture. Therefore, there is a crucial need to manage this river water. This paper analyses the availability of water resources in different parts of India. The main objective of this paper is to promote sustainable development and management of the water resources and also to understand the challenges and prospects in 'Interlinking of Rivers' with reference to the 'Indian Rivers Inter-link Project'.

1. INTRODUCTION

The most important natural resource on the planet earth is water and rivers are the major sources of water. Water sustains all aspects of life such as domestic, agricultural, industrial, etc. It plays a major role in town planning because settlement always starts near a source of water. The foundation of both agriculture and town planning is being laid on water. Several agencies including United Nations and the World Bank have claimed that there will be a huge water crisis in the near future in developing countries like India [1]. According to a discussion paper by TERI, India sustains nearly 17 percent of the world's population but unfortunately, only four percent of water resources are available for such a highly populated nation [2]. With the rapid growth in population in India, the demand for water resources will increase alarmingly [Figure1]. United Nations agencies have also claimed that this scarcity of water will, in fact, accelerate in the near future thereby creating serious problems for mankind and the environment. The ground water level is also declining at the rate of 10 cm per year. Almost 75 per cent of surface water and groundwater resources are contaminated due to increasing discharge of wastewater into the water bodies [3]. This has also lead to drainage blocking which has resulted in riverine floods in the areas where river plane is occupied by buildings.

On the other hand, water scarcity has become the biggest problem of all times. The government is inadequate in dealing

with repetitive cycles of flood and drought occurring at the same time in different parts of the country. There is water scarcity in certain regions and water surplus in the other regions in our nation. There is an urgent need to adopt a highly efficient, effective and sustainable water program that can help us to use the available water resources in a judicious and effective way. The water from surplus rivers can be interlinked with the water scarce rivers so that there is a proper supply of water to fields, villages, towns and industries round the year without causing any harm to our environment.

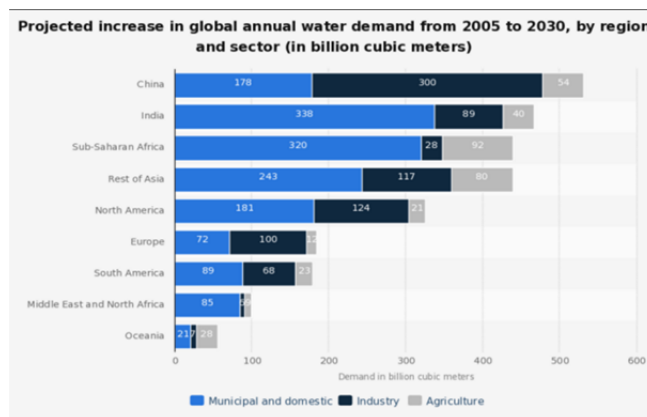


Fig. 1: Increase in global annual water demand from 2005 to 2030 [Source: Water Resource Group, Statista 2015]

The Indian Inter Link River Project (ILR) has been proposed as a solution by National Water Development Agency (NWDA) of India. This project involves diversion of the Ganges and the Brahmaputra – two of the major rivers of India. The estimated cost of this project is around US \$123 billion (as per 2002 data) which is the largest in the world [4]. The core objective of this paper is to understand the interlinking river project and to highlight the advantages and disadvantages of river interlinking keeping in mind the sustainable development.

2. LITERATURE REVIEW

Mankind has always tried to balance the water scenario by the diversion of streams or rivers. The idea of diverting water from the rivers in eastern India, which have surplus water into

the peninsular region where there is a very low level of precipitation further fortifies the idea of interlinking of rivers. Sir Arthur Cutton was the first one to propose the very idea of interlinking of rivers in India in the 19th century in order to link rivers in southern India for inland navigation. He was the key Fig. behind the restoration of Grand Anicut on the Cauvery [4]. The idea of interlinking was further revised by Dr. K.L Rao, an Indian engineer and a Padma Bhushan awardee who had served as the Member of Parliament for Vijayawada from 1962 to 1977 during the reign of Smt. Indira Gandhi. He was the Minister of Power and Irrigation then. During the mid of 1960s, he presented a proposal of a Link Canal for Ganga-Cauvery. His idea was based on the most genuine fact that some river basins in the country are 'water surplus', and some others are 'water deficit', and thereby he developed the draft to mitigate the problem of water scarcity in many parts of the country. He proposed to connect these rivers through a 'National Water Grid' [5]. Captain Dastur after few years also initiated the idea of a lateral Himalayan Canal from Ravi to the Brahmaputra, interconnected with peninsular India circumscribing peninsular rivers of India through Garland Canal. He proposed a reminiscent scheme known as Garland Canal scheme to divert Himalayan waters to the peninsular parts of the India through pipelines. However, the Garland Canal Scheme was found impracticable and imaginary by the National Commission for Integrated Water Resource Development Plan (NCIWRDP). Both the proposals were given by Dr. Rao and Captain Dastur were examined and were discarded before being executed due to their grandeur. These projects required a huge sum of money and power and time as well [6]. Interlinking was indeed a mirage in a resource deficient country like India. It was only during 1980 that the then Ministry of irrigation (now the Ministry of Water Resources) perceived another plan for National Perspective for Water Development and to make interlinking of a river- a reality National water development Agency was formulated in 1982. There is no doubt in the fact that NWDA has taken inspiration from Dr. Rao's ideology. It has analyzed surpluses and deficits river basins of India and explored the possibilities of storage, links, and transfers. NWDA has identified more than 30 river links, which would connect every major river in the Indian mainland. After several years, another interlinking project- Interlink River Project was approved but still in its nascent stage of execution. The Government of India was asked by the Supreme Court to complete all planning required to launch the project by 2006 and the project was supposed to be completed by 2016. So, the then Prime Minister, Vajpayee of the ruling NDA government constituted a high-powered, multi-disciplinary task force to begin with the execution of the River Interlink Project and Suresh Prabhu, the then member of cabinet was asked to lead the project. With the downfall of the NDA government, this idea of interlinking was also expected to fall [7]. At the same time, a lot of opposition has emerged from NGOs and other environmental groups. Critics have questioned the basic model and concept of water resources planning and management in

India. They have questioned the sustainability of construction of large-scale dams and canal networks because it has resulted in rehabilitation and thereby in protests. The new UPA government has witnessed a decline on this mega-project. On December'15, this project of interlinking got another hope of execution when Suresh Prabhu said in one of his interviews that the dream project of the former Prime Minister Atal Bihari Vajpayee, 'the interlinking of all rivers' is a priority in Prime Minister Narendra Modi's agenda and also the project will be considered for its execution as soon as possible by Union cabinet as it would be beneficial for the entire nation. The government sees this project for interlinking of rivers of India as a permanent solution to mitigate the negative impacts of drought and water shortages in some parts while water surplus and severe flooding in the other.

However, Inter-state river water disputes have resulted in demonstration of water politics. In case of inter basin water transfer (IBT), diversion of river water has also resulted in socio-economic issues leading to protests and disputes over water not only at national level but also at international level [8]. It is indeed said that the world war III will be the worst outcome of water scarcity and water disputes. Kerala has disturbed relation with Tamil Nadu over the latest Mullaperiyar dam battle. Tamil Nadu also has disturbed relation with Karnataka over the distribution and diversion of Cauvery waters. Similarly Punjab and Haryana have been the victims of the water disputes over Ravi-Beas waters [9]. There is no assurance that Himalayan Rivers will feed all the South Indian rivers because some of the Himalayan Rivers are also drought prone.

On the other hand we have witnessed successful completion of IBT projects which had initially posed problems and had resulted in side-effects. China has set an example in the same field by transferring 44.8 billion cubic meters of water from the Yellow River Basin in arid northern China to Yangtze River in southern China. In India also the diversion of the Periyar River in 1985 to supplement the waters of the Vaigai in Tamil Nadu, the linking of Krishna-Cuddapah and the Telegu Ganga canal that have diverted Krishna water to increase water supply to Chennai are recent case of IBT success. Around 9 km³ of water has been contributed to Ravi and Beas waters through the Indira Gandhi Nahar (IGN). The Sardar Sarovar Project has diverted Narmada waters successfully to the arid areas of North Gujarat, Saurashtra and Kutch, across seven river basins [9].

3. CASE STUDY

Lesotho Highlands Water Project (LHWP) is a well-known IBT project. This project is built and managed by Lesotho and South Africa and it depicts the work structure of IBT in the context of a developing country. It was proposed to divert water from economically poor yet water surplus country of Lesotho, to the prosperous yet water deficit country of South Africa. It transfers and diverts water from the upper reaches of

the Sengu Rivers to the Vaal River. The initial planning for the project began in the 1950s. Attempts to implement this project initially failed as the two countries could not reach an agreement. Further planning and feasibility studies were undertaken in the early 1980s taking both the parties into consideration and the treaty for the project was signed between the two Governments in 1986. Phase I of LWHP was completed in 2004 at a cost of approximately \$2 billion. Approximately 750 million m³ per annum is diverted through phase I completion. It has three storage dams in the upper reaches of the Sengu river system, transfer tunnels 110 km leading to the Vaal River through a hydropower station, 300-km of access roads and a number of and a number of enhancement measures related to environmental and social mitigation [10]. The treaty has allowed the management of the environment, sustaining existing livelihoods and compensation mechanisms for the rehabilitation. The phase 1a and 1b included environmental impact assessments and environmental action plans, which included resettlement and development, public health and natural environment and heritage components [11]. Thus, if planned and executed in a participatory manner, taking into account various stake holder groups, IBT projects can become 'the lifeblood of developing and extant human settlements.'

4. THE INDIAN INTERLINK PROJECT

One of the largest civil engineering projects that has been proposed jointly by the Supreme Court and the President of India. The aim of this project is to transfer the water from surplus river basins to the water scarce western and southern regions of India in order to mitigate the drought conditions prevailing in these regions and also to divert the surplus water in the eastern regions of India. Under this project, 30 links and some 3000 storages will connect 37 Himalayan and Peninsular rivers. The project has been proposed in order to fulfil the very idea of interlinking the water surplus Himalayan Rivers with water scares western and peninsular India. Detailed planning of this mega-project is being undertaken by National Water Development Agency (NWDA). This agency has been carrying out studies for water resources development based on the National Perspective Plan. This proposal of interlinking of rivers comprises of two components, namely Himalayan and Peninsular Component [figure2].

The Himalayan component will transfer almost 35 cubic km water, and the peninsular component will transfers around 140 Km³ water through a network of 14,900 km long canals (NWDA 2006). The Himalayan Component is being proposed with 16 river links. It has two sub-components-the first will transfer the surplus waters of the Ganga and Brahmaputra to the Mahanadi basin, then from Mahanadi to Godavari, Godavari to Krishna, Krishna to Pennar and Pennar to Cauvery basins. The second component will transfer surplus water from the eastern Ganga to the western parts of the Ganga, and then to Sabarmati river basins [12]. This transfer of surplus water has the potential (if executed) to mitigate the

floods in the eastern parts of Ganga basin, and to eradicate the water scarcity of the western parts of the basin.

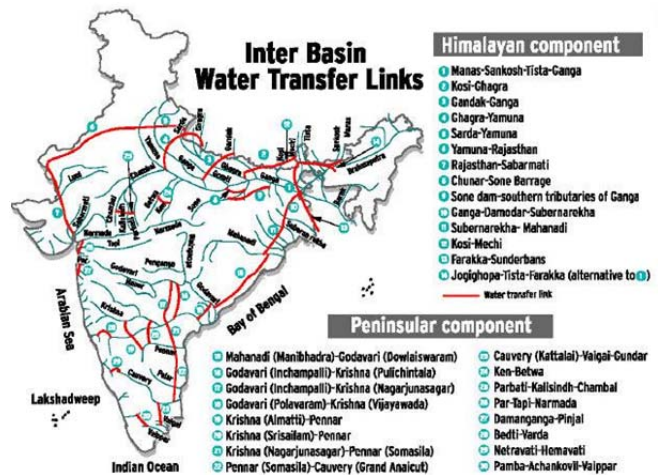


Fig. 2: Himalayan and Peninsular component of interlinking [Source: NWDA]

The biggest challenge for the Himalayan Component is the need several large dams in the neighboring countries- Bhutan and Nepal so as to store and transfer flood waters of the tributaries of the Ganga and Brahmaputra rivers. Large dams shall be constructed within India to store and transfer the surplus waters of Godavari and Mahanadi rivers.

The Peninsular component again has 16 major links and has four sub-components:

- Linking Mahanadi, Godavari, Krishna, Cauvery, Vaigai Rivers
- Linking west flowing rivers to south of Tapi and North of Mumbai
- Linking Ken & Betwa and Parbati Kalisindh & Chambal rivers and
- Diverting the flow of some west flowing rivers to the eastern region.

The total cost of the project is divided into three components: the estimated cost of Peninsular component is US\$ 23 billion; the estimated cost of Himalayan component is US\$ 41 billion; and the estimated cost of Hydroelectric component is US\$ 59 billion. It has been suggested by the experts that the project will cost around US \$ 123 billion. The total power generated in the peninsular component will be 34GW- 40GW and 30 GW in the Himalayan component [12].

4.1 Prospects of Interlinking

- One of the profess benefits of the interlinking of rivers is that it will provide drinking water to large areas in the country suffering from drought conditions every year. The will add to the domestic water supplies, including

sanitation, which should be the top most priority of our country, especially in the rural India where proper sanitation facilities are still not available [4]. Water scarce regions are expected to benefit most from ILR, having access to water for drinking and domestic purposes.

- It would increase irrigation by 25m ha through surface irrigation and 10m ha through ground water irrigation, in regions where water is scarce [1]. This would in turn add to increased crop production to meet the requirements of increasing population [Fig. 3], boost employment opportunity and amplify farm inputs
- Crops lost due to draught and flood conditions can be avoided. The damage due to flood conditions is expected to reduce by 35 percent [13]. Thus, this increase in crop production would increase food availability to millions in the country and would add to the annual average income of farmers.
- The water crisis situation persisting in the country could be mitigated if the ILR project is executed. The utilization of water surface resources would increase by 25 percent [14].
- With the execution of this project electricity problems can be reduced as hydro-electric power plants can be started, thus, strengthening the national grid.
- It will integrate the nation as one and would add waterline defense to the nation, through inland navigation thereby, enhancing security [1].

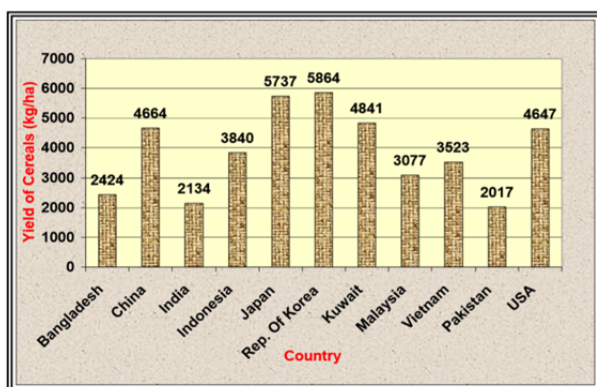


Fig. 3: Country wise yield of cereals (in Kg/Ha) [Source: Water and Related Statistics, Central Water Commission, 1998]

The ILR project, interlinks rivers to provide water to various regions of the country, but this is not the first attempt to integrate water features to reduce the water crisis situation in various parts of the country. Inter-basin water transfer (IBT) projects were first executed in India by integrating the Indus and Ganga basins during colonial irrigation. Later, various rivers were diverted and canals were made across many

regions in the country to successfully meet the water requirements of those regions.

4.2 Challenges Faced by Interlinking

Inter-linking river project has many challenges related to economic, political, ecological and social costs and is also time consuming.

- The rehabilitation of people would be on a massive scale which is an extremely difficult task, the inhabitants have cultural, traditional and ancestral ties with the region they live in and convincing them to migrate to any other region would be difficult. Moreover, the people need proper transportation facilities, infrastructure, employment, medical and educational facilities and convenience for their day to day activities as well, thus, convincing them to migrate would also add to the budget of the project.
- Political issues not only include the inland politics of the nation but also, international political issues, which involve neighboring countries Nepal and Bhutan, the Himalayan component is critically dependent on these countries as dams need to be constructed in their regions which might hinder the water supply to these countries. Bangladesh is primarily the one citing a problem as it is a downstream country. Bangladesh is thinking of taking the matter of the interlinking project up to the UN [15].
- Environmentalists are concerned with the ecological impact of the project as Indian National Water Development Agency are planning to create hundreds of reservoirs and more than 600 canals [1]. Shiva commented that the water flowing into the sea is an important link in the water cycle and is not waste. With this link severed, the ecological balance of land and seas, freshwater and sea water or ocean water, also gets disintegrated Shiva considered ILR violence to nature, he said, violence is not indigenous to the use of river waters for human needs and that it is a particular characteristic of gigantic river valley projects that they work against, and not with, the logic of the river [16]. Enormous amount of resources would be required in the ILR project. This may tend to lead to scarcity of some other resource.
- Certain scientists have doubted that the physical and chemical properties of sediment load may significantly change due the diversion of river. River formation and the shape of the delta formed at the river basin may also get altered [3].
- The project is time consuming and is estimated to be completed in about 50 years.
- The total cost of the project includes cost of infrastructure, cost of transportation of resources, cost of

resources, maintenance cost, physical position of dams, canals and tunnels, supply of electricity and cost of rehabilitation of the inhabitants (including all facilities and infrastructure). This in total adds up to be a very huge amount.

- Water related diseases, like Malaria and Filariasis, can spread through slow moving water in various parts of the nation.

5. CONCLUSION

A task force has been constituted by the Indian government to examine the project in depth at various points of issue in fields of science, politics, economics and social sciences, also including two stakeholders, one from water deficit state and the other from a water rich state. The issues that will be addressed include, guidance for norms of appraisal of individual projects including their economic viability, socio-economic impacts, environmental impacts, and preparation of rehabilitation plans; to develop procedures for unanimity amongst states; prioritize various projects; propose organizational structures for executing the project; consider financing modalities for the project; and look upon the international ramifications of the project. The targeted date for achieving the goal of the ILR project is 31st December, 2016 (Ministry of Water Resources 2002) [1].

With the rapid increase of demand for water and new technological advancements, the ILR project seems to act as a boon for the nation. It will not only meet the water requirements of millions people by providing water but would also reduce the problems people face in water scarce regions. The water supply would be from regions having surplus water in the rivers to regions where water is scarce, thus, equally and adequately fulfilling the needs of people across the nation.

It not only boosts the water supply in the country but also, increases the production of crops due to the increase in irrigation thereby, increasing incomes of the farmers. Till the construction phase of about 50 years it would provide employment to the unemployed.

Though ILR is beneficial it would have a crucial and alarming impact on the environment. Thus, it is essential to develop various methods in mitigating with the drawbacks of the project, also, the construction of dams, canals and tunnels should not be blindly done, the placement of these things should be done by keeping in mind the impact it would have ecologically on a certain region.

But still even if the project is executed the water supply problem in vast regions of the country would still be a point to ponder on as many areas of the country have vast deserts which do not contain rivers in the vicinity to which they could be linked, thus, providing water in scarce regions would still pose a challenge. Resource mobilization for such a large-scale

project would be difficult, also, the scale of the project may result in scarcity of some other resource within the nation.

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