



## INTERLINKING OF RIVERS: NECESSITIES, BENEFITS AND CHALLENGES

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### ABSTRACT :

water is the most important natural renewable resource and is vital for all life on the earth .The well being and development of any society is dependent on the availability of water.

The interlinking of rivers is a major endeavor to create additional storage facilities and transfer water from water-surplus regions to more drought-prone areas through inter-basin transfers. In India rainfall is dependent on the south-west and north-east monsoons or on the shallow

cyclonic depressions and disturbances and on violent local storms which form regions where cool humid winds of the sea meet the dry winds from the land and occasionally reach cyclonic dimension. Hence some areas are affected by the droughts while other areas are affected by seasonal floods.

Interlinking of rivers involving inter basin water transfer has canals, tunnels or water lifts, for water to flow from one river basin to another and making use of excess water. An integrated approach becomes necessary when dealing with resources such as water, which transcend state boundaries and form lifelines for entire communities. River deltas and drainage areas suffer from disequilibrium in water supplies that may necessitate the transfer of water from surplus to deficit areas.

Some of the benefits due to interlinking of rivers are in the area of irrigation, flood prevention, hydropower generation, navigation etc., whereas the area of concerns are ecological issues, deforestation, aqua life, submergence of habitable or reserved lands, displacement of people, etc. This paper highlights the concept of inter-basin transfer of water, related issues and concerns of interlinking of rivers, economic and ecological benefits leading to sustainable development of region as well as adverse impacts due to inter-basin water transfer.

**KEYWORDS :** Interlinking of Rivers, Hydropower generation, Geographical distribution, Monsoon Period, Indian Rainfall.

### INTRODUCTON

India is a vast country in terms of natural resources and considered one of the mega-biodiversity countries in the world. The freshwater aquatic resources of the different river basins are unevenly distributed in space and time and the country is suffering from the increasing population and shortage of all kind of natural resources like water. To fulfill the water demand and mitigate flood and drought, Indian Government has been planning a huge scheme encompassing the Himalayas and most of India, by linking all major rivers through interlinking canals systems and building several dams. Though the concept of interlinking of rivers is novel and new in India, it had rather initiated long back in other countries of ancient civilization. This is considered as one of the options to remedy spatial mismatch in water availability and demand. To overcome those, National Water Development Agency



(NWDA) has taken up massive project and nearly 30 links have been proposed to interlink the major rivers.

India is one of the few countries in the world gifted with considerable water resources. Being a monsoon country, the land frequently witnesses' erratic rainfall causing considerable damage to social, economic, ecological and political fabric of the nation.

The spatial and temporal variations in the precipitation over India often lead to human sufferings through scarcity of drinking water, inundation of agricultural lands, failure of crops, etc. There is no doubt that the satisfaction of the domestic needs of water should be seen as a basic human right and should receive the highest priority in our water policy.

Further, protection of rainfed farm lands from variations in the climate, especially long spells of droughts, should be an equally important and high priority objective in India's water policy. The logic behind the interlinking project is based on the view that there is 'surplus' water in some river basins or sub-basins, which, if transferred to the other 'deficit' river basins, would provide a permanent solution to the problem of human sufferings from droughts and water scarcity. On the face of it, this is convincing enough logic for undertaking the project for interlinking of India's rivers

### INTERLINKING OF RIVERS PROJECT

The ILR Programme seeks to transfer water from surplus areas to deficit areas in the country. Some of the related developments in post-independence period are -1982: The National Water Development Agency (NWDA) was formed as an autonomous body to carry out the water balance and feasibility studies of the ILR. December 2002: A Task Force on Interlinking of Rivers was constituted under the Chairmanship of Suresh Prabhu. The Task Force submitted its report in April 2004.

Acting on its recommendations, a tri-partite Memorandum of Understanding (MoU) was signed between the Union Government, Madhya Pradesh and Uttar Pradesh for the execution of Ken-Betwa link project.

2012: The Supreme Court guided the Union Government to establish a specialists board to seek after the issue with state governments. However, it left the implementation of project on centre's discretion citing it to be the executive's purview.

April 2015: The Union Ministry of Water Resources, River Development and Ganga Rejuvenation has constituted the Task Force for Interlinking of Rivers to look into issues relating to Inter linking of Rivers (ILR).

March 2016: The Government of Andhra Pradesh dedicated the Pattiseema Lift Irrigation Project to people. The project seeks to link the two major rivers of the state – Godavari and Krishna – to benefit farmers of Krishna and Guntur districts.

December 2016: The National Board for Wildlife (NBWL) gave environmental clearance to the Ken-Betwa Inter-Linking of Rivers (ILR) project. This project is the first ever inter-state river linking project in India.

- Its vision is to ensure greater equity in the distribution of water by enhancing the availability of water in drought prone and rainfed areas.
- The ILR seeks to deliver 173 billion cubic meters of water through a 12,500 km of canal network to irrigate 34 million hectares.
- In 2005, National Water Development Agency (NWDA) has included the intra-state rivers linking as the third component.
- Up until now, NWDA has gotten 46 proposition of intra-state joins from 9 States viz. Maharashtra, Gujarat, Jharkhand, Orissa, Bihar, Rajasthan, Tamil Nadu, Karnataka and Chhattisgarh.
- The programme is divided into two components – HRC and PRC. The National Perspective Plan (NPP) prepared by Ministry of Water Resources identified 14 links under Himalayan Rivers Component (HRC) and 16 links under Peninsular Rivers Component (PRC) for inter basin transfer of water.

### HIMALAYAN COMPONENT

By 2015, fourteen between connections under thought for Himalayan segment are as per the following, with possibility examine status distinguished

- Ghaghara– Yamuna connect
- Sarada– Yamuna interface
- Yamuna– Rajasthan connect
- Rajasthan– Sabarmati interface
- Kosi– Ghaghara interface
- Kosi– Mechi connect
- Manas– Sankosh– Tista– Ganga connect
- Jogighopa– Tista– Farakka interface
- Ganga– Damodar– Subernarekha connect
- Subernarekha– Mahanadi interface
- Farakka– Sunderbans interface
- Gandak– Ganga interface
- Chunar– Sone Barrage interface
- Sone dam– Southern tributaries of Ganga interface

### **PENINSULAR COMPONENT**

This segment will inundate an extra 25 million hectares by surface waters, 10 million hectares by expanded utilization of ground waters and produce hydro control, aside from advantages of improved flood control and local navigation.[24]

The between connections under thought for Peninsular part are as per the following, with separate status of practicality thinks about

- Almatti– Pennar Link
- Inchampalli– Nagarjunasagar connect
- Mahanadi– Godavari Link
- Nagarjunasagar– Somasila Link
- Pamba– Anchankovil– Vaippar Link
- Par– Tapi– Narmada Link
- Parbati– Kalisindh– Chambal Link
- Polavaram– Vijaywada connect
- Somasila– Grand Anicut Link
- Srisaillam– Pennar interface
- Damanganga– Pinjal Link
- Kattalai– Vaigai– Gundar Link
- Ken– Betwa Link
- Netravati– Hemavati Link
- Bedti– Varada Link

### **AUDIT OF LITERATURE**

Linking waterways isn't new. It was Sir Arthur Cotton who had initially proposed the systems administration of waterways over a century prior, and Dr. K. L. Rao, the Minister of Power and Irrigation in the Cabinet of Smt. Indira Gandhi, restored this proposition in 1972. Both were no uncertainty famous architects. Cotton's prime concern was for inland navigational system and Dr. Rao's worry was for water system and power. (Shiva and Jalees, 2003) The then-Ministry of Irrigation (presently the Ministry of Water Resources) considered an arrangement for "National Perspectives for Water Development" in August 1980 (Ministry of Water Resources, 1980) This made ready for the foundation of the National Water Development Agency (NWDA) in 1982 to work out basinwise surpluses and deficiencies and investigate potential outcomes of capacity, connections and exchanges, has distinguished 30 waterway connections, which would interface each real stream in the Indian terrain, and has arranged a practicality give an account of six of these. The Supreme Court has solicited

the Government from India to finish all arranging required to dispatch the venture by 2006 and these undertakings of between bowl moves be finished in the following 10 years or somewhere in the vicinity. Shah and Raju (1986) examined the nature and example of the improvement of water showcases crosswise over areas of India considering the lift water system potential as a noteworthy basis. Indeed, even in the worldwide setting, supply sharing has involved enormous versus little, with issues over supply in Nepal, Bangladesh, and India. In issues of between bowl exchanges, such redirections do to be sure reason the liveliest concerns, regularly prompting challenges and obstruction in the trading locale, started by the natural significance of water forever and the economy (Verghese, 1990). On administration, Ramaswamy Iyer (2002, 2003) composes that the most unmistakable indication of water legislative issues has been in between State stream water question. The disagreement about the sharing of Cauvery waters has expected gigantic significance in the governmental issues of Tamil Nadu and Karnataka. So also, the disagreements regarding Ravi-Beas waters have involved Punjab and Haryana. Verghese (2003), one of its few victors outside the administration, proposes it ought to be seen as a 50-multi year venture. Verghese (2003) discovered ILR differently depicted as "alarmingly vainglorious", a "twisted vision", "extremely inept", an instance of putting the "truck before the steed", a "sub-mainland disaster", "a surge of gibberish", a "perilous daydream" or an instance of "hydrohubris". As per Iyer (2003) "It adds up to nothing not exactly the redrawing of the topography of the nation."

According to Bandyopadhyaya and Praveen (2003), the proposition professes to bundle an unsure and flawed thought as an attractive one. Rath (2003) considered the ILR a 'la-la-land' since he, in the same way as other others, is wary of the administration's ability to assemble the sort of investable assets ILR requests. Shukla and Asthana (2005) uncover the difficulties inborn in the administration's arrangement choice to interlink waterways as imagined by the bureaucratic organization of state control, a culture of logical ability, an apparent need to activate worldwide capital, and the resistance to such plans induced by the office of common society in an offer to inspect how extraordinary on-screen characters conceptualize the task through a digressive methodology. It is normal that the water request of nonfood grain yields will additionally quicken with changing utilization designs (Amarasinghe et al, 2007a; 2007b). Krueger et al (2007) feature that appropriately arranged water asset advancement and the executives can ease neediness, improve the personal satisfaction, and decrease provincial inconsistencies and to keep up the respectability of the normal Fig. 1. Source: Home Page of International Water Management Institute (IWMI) <http://nrlp.iwmi.org/>(according to 2012).

The new landing page of International Water Management Institute is [www.iwmi.cgiar.org](http://www.iwmi.cgiar.org) Geo-Eco-Marina 19/2013 139 Dharmendra Mehta, Naveen K. Mehta – Interlinking of Rivers in India: Issues and Challenges condition. Shah et al (2007) format seven reasons why returning to the stream connecting issue is a smart thought. Reddy (2008), in his most extensive survey of water evaluating as an interest the executives choice, presumes that the capacity of water estimating to impact water use in India is extremely obliged both by the nature and dimension of water rates just as by the absence of powerful institutional and specialized conditions. Shilp et al (2008) demonstrate that the current example of interstate virtual water exchange is fueling shortcomings in as of now water rare states and that instead of being directed by water gifts, virtual water streams are impacted by different factors, for example, „per capita net edited zone" and „access to verified markets".

IWMI-CPWF venture (2009) furnishes general society and strategy organizers with a fair investigation of the advantages and expenses of various segments of the National River Linking Project (NRLP).

## RESEARCH METHODOLOGY

Interlinking of Rivers is a fantasy venture and the street ahead is very testing. This was an examination directed based on optional information accessible from different sources alongside writing survey. In writing survey, look into data from 1986 to 2008 was gathered and contemplated. The auxiliary information was gathered from magazines, books, bury net, industry diaries and so forth. Writing survey has appeared earlier research work done around there. Noteworthy sources of info

were found in the topic with reference to interlinking waterways ventures. The effect on the earth has been examined.

### **NECESSITIES OF THE INTER LINKING RIVER PROJECT**

- Meteorological reasons: The average rainfall in India is about 4,000 billion cubic meters. However, most of it comes over a 4-month period – June through September.
- The spatial distribution of rainfall is also uneven which ranges from 12 cm in Rajasthan to more than 250 cm in Meghalaya.
- Besides, the Himalayan and Peninsular drainage systems vary considerably in terms of their flow volumes across season.
- While Himalayan Rivers are perennial in nature, flows in Peninsular Rivers are much dependent on rainfall.
- Coupled with the above factors, disturbances in the monsoon cycle due to the 'external' factors such as El Nino, La Nino and Climate Change made rainfall distribution inconsistent over the years leading to simultaneous occurrence of floods and droughts.
- This topographical and time change in accessibility of normal water versus the all year interest for water system, drinking, and modern water makes an interest supply hole.
- If interlinking of rivers is implemented by connecting through canals, then such uneven water flow in different river basins will get balanced.
- Moreover, around 65% of the flow in the rivers is untapped and goes to sea every year. Hence, it is necessary to interlink the rivers of the north with that of south.
- Food security: We need to produce around 450 million tonnes of food grains per annum to cater to the nutrition requirements of over 1.5 billion in 2050.

### **ADVANTAGES OF INTERLINKING OF RIVERS**

- Irrigation and flood prevention-The programme primarily solves this problem of simultaneous occurrence of floods and droughts in various As per an estimate, around 12% (40 million hectare) of land in India is prone to floods and around 68% of India's total area is prone to drought parts of the country. The interlinking of rivers programme is expected to create 35 million hectares irrigation facility in water-scarce western and peninsular regions. By linking of rivers, vast amount of land areas which will not otherwise be irrigated and are unusable for agriculture become fertile. For example, interlinking of Godavari and Krishna rivers in Andhra Pradesh will lead to better irrigation facilities in the Rayalseema, which is one of the most backward regions in the country.
- Generation of electricity-With new canals built, feasibility of new dams to generate hydroelectric power becomes a possibility. The construction of small, medium and large-scale dams is expected to generate 34000 MW of cumulative hydro power.
- Navigation-Newly created network of canals opens up new routes and ways and routes of water navigation, which is generally more efficient and cheaper compared to road transport. Using the resultant network of rivers, the untapped inland water navigation facilities will be utilised to provide affordable and clean freight and passenger transport infrastructure.
- The additional irrigation facilities will ensure achieving the government's goal of doubling farm income by 2022 through enhanced production and productivity.
- The ILR will give boost to allied sectors of the agriculture like fisheries leading to gains in employment, export earnings and social and economic infrastructure development.
- The successful completion of the programme will ease pressure on ground water resources and lead to sustainable development of water-deficit areas.
- The ILR will address development needs of backward regions and inter-state and intra-state social and economic disparities will be ameliorated to a great extent.
- The ILR will prevent flow of fresh river water into sea and increase India's utilizable surface water by 25%.

### **ISSUES AND CHALLENGES**

Though the interlinking of river programme is the most ambitious anti-poverty measure ever conceptualised by the Indian Government, it has attracted a lot of criticism due to a wide range of social, political, economic and environmental costs associated with it. Some of them are -

- As per an estimate, the project needs an investment to the tune of Rs 11 lakh crore (9% of Gross National Income) over a period of ten years. This huge investment can't be met by the government without cutting on social sector spending and increase in taxes.
- Further, the Union Government and State Governments will be in a tussle over expenditure share threatening federal polity.
- The recent disagreement between the NITI Aayog and the Union Ministry of Water Resources over the share of Madhya Pradesh in the execution of Rs 10000 crore Ken-Betwa river linkage project better illustrate this situation.
- The feasibility of the project has not been studied in detail, nor have its economic, social and ecological implications. Majorly, there is no social impact assessment done on the displaced people.
- There is a disagreement within the expert community over deciding the "surplus" and "deficit" criteria.
- Another major issue vis-a-vis river linking is that water is a state subject. States that have surplus water are not ready to forego their water resources due to political and administrative reasons.
- The Himalayan Rivers are cross-border in nature. The Ganga, Brahmaputra and Indus river systems of Himalayas belong to China, Nepal, India, Pakistan, Bhutan and Bangladesh. Hence, any changes made by India to these natural river courses will be met with stiff resistance from the neighbouring countries.
- There are uncertainty and unknowns about operations, how much water will be shifted and when, whether this may cause water logging, salinisation and the resulting desertification in the command areas of these projects. Different researchers have asked whether there are different advances to address the cycle of dry seasons and flood ruins, with less vulnerabilities about potential natural and biological effect.
- Water stockpiling and dispersed stores are probably going to uproot individuals - a recovery procedure that has pulled in worry of sociologists and political gatherings. Further, the between connection would make a way for oceanic biological systems to move starting with one waterway then onto the next, which thus may influence the vocations of individuals who depend on fishery as their pay. As respects to the effect on fish and amphibian biodiversity, there could be certain just as negative effects.
- India has a developing populace, and extensive ruined rustic populace that depends on storm inundated horticulture. Climate un assurances, and potential environmental change prompted climate volatilities, raise worries of social solidness and effect of floods and dry spells on provincial destitution. The number of inhabitants in India is required to become further at a decelerating pace and balance out around 1.5 billion by 2050,. This will build interest for dependable wellsprings of sustenance and improved horticulture yields - the two of which, guarantees India's National Council of Applied Economic Research, require altogether improve water system arrange than the ebb and flow state. The normal precipitation in India is around 4,000 billion cubic meter, of which yearly surface water stream in India is evaluated at 1,869 billion cubic meter As of 2007, about 60% of this potential was acknowledged through water system or common stream of Indian waterways, lakes and selection of siphons to pull ground water for water system. 80% of the water India gets through its yearly rains and surface water stream, occurs over a multi month time frame - June through September. This spatial and time fluctuation in accessibility of common water versus all year interest for water system, drinking and modern water makes an interest supply hole, that just exacerbates with India's rising populace. Defenders guarantee the solutions to India's water issue is to save the bottomless rainstorm water abundance, store it in repositories, and utilize this water in zones which have periodic insufficient precipitation, or are known to be dry spell inclined or in those seasons of the year when water supplies turn out to be rare.

## WAY FORWARD

Water is the essence of life. It is something that cannot be created by man. Therefore, the management of available water resources is essential to meet the demands of growing population. Towards this endeavour, the government has initiated the ILR Programme.

For its timely implementation, the following aspects should be taken care of –

- As pointed out by the Draft National Water Framework Bill, 2016, equity component of access to water should be given prime importance while choosing the beneficiaries of the programme.
- There is a considerable disagreement between the states on the ILR. While Tamil Nadu is in its favour, Assam, Kerala and Sikkim may oppose it due to the loss of water resources.
- Hence, it is the responsibility of the Union Government to build consensus on the programme in order to avoid strains in federal relations. For this, the Parliament is the most appropriate platform.
- Principles of surplus should be laid down instead of legal definition of surplus which has different perspective among stakeholders and environmentalists.
- Necessary legal framework should be prepared in the form of MoUs and agreements to ensure cooperation of neighbouring countries that have sovereign rights over the Himalayan river waters.

## CONCLUSION

Effective usage of this undertaking to a great extent lingers upon auspicious arrival of water from the surplus bowl to the shortfall bowl. The Government of India has established a team to analyze the venture, involved specialists from science, building, financial aspects, and sociologies and including as official partners one part from a water shortage state and one part from a water surplus state. It will address the accompanying wide issues: give direction to standards of examination of individual ventures versus their monetary feasibility, financial effects, natural effects, and arrangement of resettlement plans; build up an instrument for rapid accord among states; organize distinctive undertakings; propose hierarchical structures for executing the task; think about subsidizing modalities for the venture; and consider the international ramifications of the project.

As discussed, the water availability in the country is plenty but it is unevenly distributed and hence the water scarcity problem exists in some parts of the country. Successful examples of inter linking are Indira Gandhi canal and Narmada canal. The Indira Gandhi Nahar or Rajasthan Canal is one of the most gigantic projects in the world aiming to dedesertify and transform desert waste land into agriculturally productive area. The project objectives include drought proofing, providing drinking water, improvement of environment, afforestation, employment, rehabilitation, development and projection of animal wealth and increasing agricultural produce. The Narmada Link Canal To fulfill the water requirement of 71% of water scarce area needs to divert excess water from surplus basins of South and Central Gujarat. The Sardar Sarovar Project carries Narmada waters across these surplus basins to the arid areas of North Gujarat, Saurashtra and Kutch. The Inter Basin Transfer of water from Narmada main canal to eleven rivers of Gujarat viz. Heran, Orsang, Karad, Mahi, Saidak, Mohar, Watrak, Sabarmati, Khari, Rupen and Banas is planned to fill about 700 village tanks and ponds by water of Narmada.

The solution for implementing the ILR project is centralization of all the rivers and to form a National authority consisting of expertise from various fields like policy makers, scientists, hydrologists, engineers, economists, NGOs, environmentalists, GIS experts, farmers from various regions of country. The canals can be substituted with lined tunnels which may reduce water losses due to infiltration. Also the covering top of canals with solar panels will reduce evaporation losses and can generate electricity which will have benefit-cost ILR projects. Also the zero land acquisition cost by interlinking of river basins by tunnels can be envisaged. Thus the two crucial components of infrastructure i.e. water and power can be conserved and generated respectively. Also the crushing of basalt or dolerite rocks bored from tunneling can be used as construction material in form of coarse and fine aggregates which is becoming scarce a scarce commodity in India. The study by use of GIS with hydrological tools and geological study for availability of construction material, proper planning of conservation of environment, study of climate change, contribution of NGOs, justified decisions of policy makers, proper understanding among intrastate river controversies, strategic cost management by analyzing the

financial model by analysts, can help to prepare reliable detailed project reports and execution of the ILR projects.

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