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Review Article

RE-DESIGNING GEOGRAPHY THROUGH INTER-LINKING OF RIVERS: A FEASIBILITY STUDY

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Abstract: The long debated and beautifully fantasized mega project inter-basin linkages have prefigured the solutions of water shortage problem. But such plan has tremendous ecological and social ramifications for the country like India. This article brings out the sense about the feasibility and practicability of such project by exploring its geographical and social consequences. It suggests measures to conserve and augment water resources that are less damaging to the environment.
Key words: River basin, river-linking, diversion, ecology, water recharging.

Two years back the Telegraph published news 'Aral Sea one of the planet's worst environmental disasters' that highlighted the fact that it has shrunk by 90 percent. Those who take interest in such news will be well aware that Aral Sea, formerly the world's fourth largest inland sea, has receded and split into four lakes which are further shrinking at faster rate. Reason for such a disaster was the diversion of rivers Amur and Syr Darya during 1960. Water from these two rivers which used to feed the Sea was diverted through irrigation canals. This is a very good example of result of men's brutality and his attitude of disrespect towards the nature for the sake of development. There are many such examples that give a grounding us to not to tamper the cycle of nature and if it is done so the results may be seen in the form of natural, social, ecological or political disasters. The study carried out by Glantz (2007) revealed the impact of increasing stream flow diversion on ecological and societal wellbeing that lead to major national catastrophes in a very short period. Many studies have shown the impact of water/river diversion on the ecosystem, society, economy and hydrogeology. Micklin (1977) pointed out that water diversion from river Volga has substantially affected the fish production of the Caspian Sea and the economy of Russia and Iran. Apart from the economic impacts the hydrogeological bearings were more severe.

When water falls on the earth in the form of precipitation or water melts down from the glaciers, some percolates and gets accumulated underground which forms aquifers. These aquifers are charged when conductivity is appropriate between surface

and subsurface layer of the earth. In the nature, river and aquifer are complementary to each other. The streams do not only receive water from rainfall or from glacial melt but also from aquifers. If the aquifer goes dry the stream will also dry up. On the other hand the aquifers receive water not only through the percolation of rainfall water but also through seepage of the river or stream. In this way these aquifers whether local or regional are inseparable part of the river system. These aquifers are sometimes called 'water tables' though a water table is actually just the top margin of an aquifer. The river takes a long time to form its course and the entire river bed and so as the aquifer which is the source of underground water that supports human being. The crisis has already started due to depleting level of water table due to over exploitation of underground water. The simulation result obtained by Fleecenstein et al. (2006) shows that the river aquifer systems in the Cosumnes basins are strongly influenced by river seepage, which is sensitive to aquifer heterogeneity. The results also show that most river recharge to the regional aquifer occur in only a few localized areas where the riverbed and underlying aquifer are most conductive.

If we divert the river water or change the direction of its streams to connect it with other river system we are actually tampering a big natural system. Environmentalists are already questioning the ecological cost of such disturbances which has arisen due to construction of large dams. Rehabilitation of displaced population is another serious matter that has to be tackled at all the phases. If we see the hydrological data of India we find that there is a huge gap between natural runoff and the utilizable surface water potential because enormous quantity of water goes wasted so it's essential to harness the water in some storage site like dam to cope with the problem of water scarcity. But what about the mega project that aims to interlink the great Himalayan Rivers with the Rivers of peninsular plateau of India. Such a project is definitely not a child play; government will and must look into its complete scientific, ecological and social aspects and the possible ramification of such an ambitious project in a meticulous and comprehensive way.

Idea of linking Indian rivers (Himalayan Garland Scheme), mooted by a military engineer named Dr. DJ Dastoor, died down in its conceptual stage due to speculated huge cost and involvement of Nepal. He wanted to take surplus water from Assam and Nepal to Gujarat. Later on K L Rao proposed the idea of interlinking Ganga with Cauvery in 1972; taking surplus water from river Ganga to the water deficit area

of river Cauvery during flood. The idea seemed fantastic as it was highly promising for the water scarce regions and debate on the feasibility and cost-benefit of such project continued and is still going on but never commended respect among the environmentalists. During flood, huge amount of water spills over the river basin in a short time period and diversion of such a great quantity is a daunting task. Will the diversion of water solve the problem of flood completely? What if the other rivers also get flooded during the same season because in maximum cases most of the rivers of north India are in spate during SW monsoon season? Further, what if the demand of water is raised during drought season by the people of one area from another? How the government will resolve such social issues and recover the cost of environmental damage?

People usually blame that India is procrastinating river inter linking project while world has already moved with the scheme of inter basin linkages. China has already started transferring water from Yangtze River to the Yellow river of dry plain of North China. But the question is if China has marched ahead should India also? If we compare the condition of India and China in terms of water resource availability China is three times bigger than India where annual rainfall (648 mm) is less as compared to India (1170 mm), natural runoff is high (2812 billion m^3) but there is a little difference between utilizable surface water potential of both the countries (India- 690 Cubic km and China-751 cubic km). Two countries are not alike in any respect and so as the policies and plans. We should try to find a solution rather following the track of China or any other country. In India there are two prominent tracts (drought-prone) with few scattered pockets, one is the desert and semi-desert region in west and second is the rain shadow regions on the east of the Western Ghats. In India more than 80 per cent of the annual runoff in rivers occurs during the monsoon months of June-September. Due to this runoff, most of the water not only flows unutilized to the sea, but also causes immense flood losses. Water should be diverted in the areas which are drought prone to solve the problem of water shortage and not as a means to control flood.

There are many grounds which deny the feasibility of such projects. Topography is one barricade between two rivers. Two river catchments are separated by water divides so linking of two channels or rivers depends on two possibilities; one is tunneling between two basins so that water can be channelized from one river to

another and second is to lift and store water at different elevation, in both the conditions there will be huge loss to ecology.

Transfer of water through inter linking will threat the coastal areas also as the freshwater discharge near the coast prevent the salinity transgression and sediments deposited at the mouth of the river helps managing the wetland ecosystem. If water is diverted in pre or post flood season also the freshwater discharge will get affected and so as the sediment supply which will be detrimental to the coastal ecosystem. Islam et al. (2008) in their study focused on the trailing mangrove wetland ecosystem function in the Ganga-Brahamaputra delta due to shortage of freshwater discharge caused by construction of Farakka barrage. It concludes that upstream freshwater supply is necessary for the protection of the mangrove wetland ecosystems in the Sundarban.

Another cause of concern which put question mark on the feasibility of such project is the changing and erratic weather pattern of India due to the effect of climate change. In 2006 Barmer was deluged with 750 mm of rainfall in seven days that was five times higher than the district's average annual rainfall. While on the other hand humid area of Assam has been experiencing prolonged dry spells and rising temperature. Due to global warming, WWF indicates that, the Gangotri glacier, the source of the Ganga, India's holiest river, is retreating 75 feet a year. In recent times, the western parts of the Indo-Gangetic plains suffer from severe droughts, each drought more intense and long lasting than the previous ones. The changing weather pattern will reverse the scene entirely therefore consideration of changing weather pattern is very crucial before starting construction of 5, 60,000 crore infrastructure. Today we have more water than our demand (680 BCM) but tomorrow we will face scarcity (demand of water is likely to reach 1000BCM by 2050) of it due to combined effect of various factors so we should be ready to tackle future challenges also.

Flood is the result of several factors like rainfall amount and intensity, configuration of the catchment area, nature of surface and sub-surface material, land use/cover and others. Construction of river defenses as levees, bunds, reservoirs, and weirs are not the all time measures to prevent rivers from overflowing their banks. Effective flood forecasting and warning and transmission of hydrological data, watershed management are some of the measures to prevent hazard like condition. Management of different land uses/covers is essential because rapid urbanization process is concretizing vast area making surface unable to allow water to infiltrate and

percolate. Few rivers like Kosi, Ganga and Brahmaputra seem impossible to control by any man made efforts and cause heavy devastation during flood so precise flood plain zonation of these rivers is essential which should be followed by the imposition of strict rules of the government disallowing people to settle in those risky areas. It's better to let the river flow during flood, and relocate people temporarily, because it enriches the soils that sustain agriculture of north Bihar. Laying down network of canals is may help solving the problem of flood as well as scarcity of water. Bihar has huge irrigation potential but only 42 percent potential has been created.

Exploration of cheap and healthier substitutes to augment ground water resource is important. Expansion of water harvesting structure is all time best alternatives. It is cost effective, resuscitates local ground water level, local wells last longer and the benefits are instantaneous and manifold. In many States the water harvesting structures have failed due to poor site selection and corrupt practices. Transparency in the methodology of organizations and selection of proper site will solve the problem. In India Percolation tank cost 20 to 30 thousand rupees which last for 20-30 years. Check Dam, Nala bunding are costly structures but well effective in ground water recharging if constructed on most suitable site. Domestic roof top rainwater harvesting system can also be adopted especially in the urban areas which require investment of 15 to 20 thousand rupees (but vary depending on the capacity of the storage tank). Government should frame water policy in such a way that can create balance between water consumed and recharged. It is always better to put the adoption of water-saving and conserving measures ahead of the water transshipment.

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