

IMPACT ASSESSMENT OF WATER TRANSFER IN THE NATIONAL RIVER LINKING PLAN: A CASE STUDY OF PROPOSED SHARDA-YAMUNA LINK

SUMMARY of THESIS

**SUBMITTED TO
BABASAHEB BHIMRAO AMBEDKAR UNIVERSITY
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SUMMARY

Key findings of the research

The Case study of Proposed Sharda-Yamuna Link highlights the role of Large Scale Inter-Basin Water Transfer project in proper distribution of water and management of Flood and Drought problems in U.P and U.K states in India.

A National Perspective Plan was formed by Central Water Commission and Indian Ministry of Water Resources in 1980, under which about 30 “Inter- Basin Water Transfer Links” or “Interlinking of Rivers” proposed over 37 Indian rivers in respect of both Peninsular and Himalayan Rivers of the country. The interest shown by many researchers in the field of water resource management gave the concept of Large Scale Inter Basin Water Transfer projects in order to reduce the imbalances in the water availability between various regions by surplus water transfer from surplus regions to deficit regions.

Sharda-Yamuna Link (S-Y Link) is a Himalayan river development component and one of the proposed links of NPP in India. This link has been conceived for transferring estimated surplus water of approx 11,680 million cubic meters from Sharda River into Sharda-Yamuna link for use in water scarce areas of Rajasthan, Uttar Pradesh, Haryana and Gujarat. The S-Y link will fulfil the drinking, irrigation and industrial water requirements in acute water short and water scarce areas of western part of India. This link will also fulfil the other water requirements in its Enrouted areas through which the link crosses and surrounded Command areas. The canal alignment of the proposed Sharda-Yamuna link canal will passes through two states namely Uttarakhand and Uttar Pradesh in India. It will traverse though Champawat, Nainital,

Udham Singh Nagar and Haridwar districts in Uttarakhand, which are the Enrouted areas and Bijnor, Muzaffarnagar districts, which are the Command areas in Uttar Pradesh state.

The key objectives of the of the S-Y Link canal project were to study the Description, Environmental, Ecological and Social Impacts of the Proposed Sharda-Yamuna Link Project on its Enrouted and Command regions.

S-Y link canal project comprises of three main components namely construction of Pancheshwar dam, Poonagiri dam for hydro power production and S-Y canal development. The canal will be trapezoidal section with 55.0 m bed width and 7.8 m full supply depth. The total length of the S-Y link canal is 384 Km. The average elevation of link canal varies from 240 to 280 m above means sea level. The S-Y link canal will take water from the right bank of the proposed barrage of about 5 Km downstream of proposed Poornagiri dam and 6 Km of existing Tanakpur barrage near Tanakpur town of Champawat district of Uttarakhand and outfalls into Yamuna near upstream of connecting U.P and Haryana in Kairana village of Muzaffarnagar district of Uttar Pradesh state. The available water from river Sharda will first store in the reservoir created by proposed Pancheshwar dam. Then the release of surplus water from this reservoir after generating the power will again store at proposed Poornagiri dam. The location of Poornagiri dam is at 58 Km distance of Pancheshwar dam. The designed discharge at head and tail of S-Y link canal will be 757.32 Cumecs and 605.77 Cumecs respectively. The full supply depth and bed slope is 7.8 m respectively for its entire length. Out of remaining 11,629 Mm³ (Million cubic meters) of water available in river Yamuna, about 3054 Mm³ of water will be available for industrial and domestic use. The remaining 8575 Mm³ of water will be available for further diversion for providing

irrigation to 10.27 Lakh hac in the water scarce areas of western regions and for the industrial and domestic water supply in Enrouted areas of the S-Y link. Besides various small tributaries, the S-Y link canal will cross important major rivers Kosi, Ramganga and Ganga. Barrages on each of these crossings are proposed to be constructed as level crossing. About 89 road bridges, 8 railways bridges and 2 canal escapes are proposed at suitable location along the entire stretch of link canal. The direct benefited En-route Command area of 2, 94,500 ha. S-Y link canal will provide 2.94 lakh ha annual irrigation in the areas of Uttar Pradesh and Uttarakhand state utilizing 1758 Mm³ of water. The construction process work of the S-Y link canal is based on perfect construction and manpower planning. Many key types of machinery will be required for the construction work of Sharda-Yamuna link project along with good technical professionals. The duration is estimated for the construction work is approx 9 years.

Baseline Environmental Status is associated with the physical, biological components of environment. The Enrouted and Command areas of proposed S-Y Link are covered in U.P and U.K states. In view of **Physiography and Geology**, the entire S-Y link canal stretch including Enrouted and Command areas of U.P lies in Himalayan and Gangetic plane. U.P states lies in northern plane physiographic zone and U.K is situated in south part of Himalaya. Enrouted areas such as Champawat, Nainital, U.S. Nagar and Haridwar lies comes under greater Himalayan range and Command area U. S. Nagar is situated in Sivalik range of Himalaya region. The project site lies over sediments of Gangetic plain comprising sand, silt and clay with kankar in varied proportions. The S-Y link canal alignment passes through mainly bhabar and tarai plains from east to west and after that entire stretch up to regional distance 384 Km falls in

alluvial plain. There will be no change in geology pattern of the Enrouted and Command districts.

With respect to **Soil**, the Enrouted and Command areas of the S-Y link canal covers in U.P and U.K states, which lies in Gangetic region. In U.K mountain soils are also present due to hilly region. Due to presence of Ganga River, alluvial types of soil are present which flooded soil. The soils in this plain are developed from alluvium deposited due to presence of rivers Ganga and Yamuna. The soils are generally very deep, highly productive and cultivated for wheat, rice and sugarcane crops. Canal alignment mainly passes through soils of old alluvium plain followed by soils of tarai and bhabar plain which is flood plain. Soil in command area is fertile and suitable for growing the crops. The soil of U.K is less productive, after construction of S-Y link canal the productivity of the crops may increase due to increase in water availability. The soil will be very productive and fertile. Productivity of agriculture of U.P and U.K region may rise. But during construction work of the canal and barrages by cleaning of vegetation, soil erosion may increase, which is negative aspect of the link canal. Soils of bhabar region and ravine plains near rivers and rivulets present in some patches along the alignment may show excessively drainage properties, severe seepage and erosion vulnerability.

In case of **Agriculture**, the maximum occupation of U.P and U.K states is agriculture, which lies in Indo-Gangetic plain in which river Ganga flows with its tributaries. In addition to agriculture, U.P is an industrial area. The predominant cropping pattern all along the canal alignment is observed as paddy and wheat in U.S Nagar, Haridwar and Bijnor districts and sugarcane crop in Muzaffarnagar district. S-Y canal alignment in Champawat and Nainital districts mainly pass through forest with minimal

agriculture activity. U.K is an agricultural state due to presence of favourable climate, soil. Maximum population of the state is based on agriculture. The state is a good for the cultivation of wheat, rice, maize, bazra etc. S-Y Link will increase 2.94 lakh ha of agricultural area in Enrouted and Command areas of U.P and U.K. The total cultivated area of U.P and U.K will be 7, 84, 28,452.94 $\times 10^9$ Hectares. The S-Y Link canal will help in reducing the barren land by providing water. After the construction of the link canal, agriculture and other developmental activities may spread. Agriculture and irrigation will rise due to good water availability. The soil of the region is highly fertile and proposed link canal will increase the agriculture in U.P also. In U.P and U.K irrigation done by the canals and tube wells. The construction of the S-Y link canal may help in development of agricultural activities with proper availability of water such as the productivity of crops, intensity of crops, cropping pattern, more food grain production, agriculture labour, annual agriculture benefits and high yield varieties improved seeds.

In case of **Land use pattern** in U.P and U.K states, major crops grown are such as sugarcane, paddy, wheat etc. The entire stretch comes in Himalayan range which covers maximum forest area. The catchment area of Pancheshwar and Poornagiri dam covers in the reserve forest, protected forest, cultivated area and agricultural area. Due to construction work of the S-Y link canal there will be possibility of small change in land-use area in certain places. The land-use value will also rise by increasing tourist, agriculture, industries market places and settlements. Negative aspect of the link canal is that, it will require approx 256 Sq Km (25,699 ha) of agricultural area for the construction. Out of 384 Km length of S-Y canal alignment, 256.2 Km length of the canal covers agricultural land, 112 Km covers forest land and 15.8 Km length covers

settlement, river beds & other land use. Initial stretch of about 100 Km, S-Y link canal alignment is covers through the forest area and remaining 12 Km forest is in intermittent patches.

With reference to **Climate and Rainfall Status**, In Uttar Pradesh state, it has humid subtropical climate (warmer summers) and some areas are semi arid regions. In Uttarakhand state, it has mountainous and humid subtropical type of climate is present. Monsoon occurs from June to September month and in winter rain occurs occasionally. Rainfall shows high regional variation from east to west along canal alignment. According to recent annual rainfall status in India, based on Indian Meteorological Department, the average annual rainfall in U.P is (100-120 cm) and in U.K is (120-400 cm), which is more than other states. On the basis of current data, during monsoons and rainy season, U.P faced normal rainfall of about 66.9 mm in east and 65.6 mm in western part, while in U.K, 107.4 mm of rainfall occurs, which is normal. During winters, U.P faced from excess rainfall which is about 18.2 mm in western region and 16.8 mm in eastern part and in U.K about 52.1 mm of rainfall occurs which is normal. Both U.P and U.K states faced from excess rainfall which is (46.6 mm and 8.9 mm) in western U.P and 7.2 mm in eastern U.P. Due to variations in rainfall and climate western, central and north eastern regions in India faced with drought and flood. Several districts of Uttarakhand have faced heavy rainfall in last year's. On the basis of Indian Meteorological Department, last five years rainfall data shows that Enrouted and Command areas of the S-Y link canal in U.P and U.K faced excess rainfall during monsoon seasons. There will be no such impact of S-Y link on the climate and rainfall status of the Enrouted and Command areas. S-Y link will provide an equal distribution of

water in states U.P and U.K due to surplus water transfer. The link will help in maintaining the water balance and minimizing the risk of flood in U.P and U.K regions by proper distribution of water. Surplus amount of water during the monsoons will be available to the drought affected regions.

As we see the **Surface Hydrology** status of U.P and U.K, the states are fulfilled of major rivers and their tributaries such as river Ganga and Yamuna. All the Enrouted and Command areas of the S-Y link covered in Sharda, Ramganga, Yamuna and Ganga basin. S-Y link alignment including Enrouted and Command area falls mainly in Sharda, Ramganga and Yamuna sub-basins of Ganga basin and having well-drained properties. Among the perennial rivers Sharda, Kosi, Ramganga, Ganga and Yamuna are the main rivers coming across the proposed S-Y link alignment. All Command areas fall in Ganga-Ramganga region except Rampur, which is located in Kosi- Gola region. River Ganga, Ramganga a tributary of Ganga itself and their tributaries drain the major part of command areas belonging to Moradabad and J.P. Nagar district. Due to major rivers and their tributaries water balance is irregular. During monsoons the heavy flood situation arises. So, the S-Y Link canal will help in maintaining water balance and provide the surplus water to deficit regions also.

Statistics shows that **Ground Water** constitutes major source of irrigation in all project block along canal alignment as well as in its en-route command area. Over exploitation of ground water, has led to decline in water levels. Bareilly, Badaun, J.P. Nagar and Moradabad districts have ground water shortage. Water levels are observed at deep level (ranging 10 to 20 m below ground level) during pre and post monsoon period except at shallow level in tarai area during post-monsoon period. Rampur and U.S. Nagar being

located in tarai zone, show good potential for further ground water development. Condition in Muzaffanagar and Bijnor districts is not as much alarming as compared to other districts of command area. Proposed S-Y Link will help in maintaining the ground water level in Enrouted and Command areas. S-Y link canal can be a source of drinking water and irrigation. During summers, S-Y link canal will helpful for recharging ground water and increase the amount of water in canals. After recharging the ground water, the net annual ground water availability of Uttarakhand State will increase to 49,493.87 Mm³ from 2,100 Mm³ and in Uttarakhand State it may increase up to 49,493.87 Mm³ from 2,100 Mm³. Hence, overall canal alignment is passing through districts with good potential of ground water development area. In case of **Water Quality** of the study area, surface as well as ground water may slightly get deteriorated during the construction work of S-Y link. Some settlements also face from bad water quality along the canal cover.

The **Baseline Ecological Status** of the S-Y link canal describes the recent status of the ecosystem along the S-Y canal including study of flora, fauna, forest cover, wildlife, vegetation along the canal alignment, protected areas in Enrouted and Command areas of U.P and U.K states and Impact of proposed S-Y Link canal on forest and non-forest area of Enrouted districts and wildlife reserves. The S-Y link canal will cross through Himalayas and Gangetic plain of U.K and U.P states in India. Himalaya is the highest mountain in the world, which was formed about millions of years ago having extreme cold climate and rich in diversity of flora and fauna. Indo-Gangetic Plain is a northern plain. It is a plain of river Ganga, Brahmaputra and Indus and their tributaries. The plain was formed by mountainous streams. It is a plain of rivers flowing in the

regions. Climate of U.P and U.K states is very warmer in summers and some western parts are drought affected. Soils are very fertile, alluvial due to the plain of flowing major rivers and their tributaries. Vegetation in the plain varies due to variations in rainfall status. The Gangetic plain is a plain of large diversity of flora and fauna. U.K is rich in forest diversity. Dry temperate, grasslands and wet temperate types of forest are present. In U.P, tropical thorn and dry deciduous forest are present.

According to India State of Forest Report, U.K state has more forest cover (26.38 %) than in U.P (3.39 %) state. Among the Enrouted areas in U.K state of the S-Y link canal, Champawat (1187 Sq. Km) and Nainital (3074 Sq. Km) districts has both types open and dense forests. While in Haridwar (615 Sq. Km) district, it has more open forest area, Among the Command area U.S Nagar (5.46 Sq.Km) has more open forest area. Nainital district has more forest cover (3074 Sq. Km) among all the Enrouted and Command areas of U.K state. Among the Enrouted areas of S-Y link canal in U.P. state, Bijnor (417 Sq. Km) district has both open and dense forest area and Muzzafarnagar (41 Sq. Km) district has open forest area. While in Command areas Moradabad (26 Sq. Km), J.P. Nagar (86 Sq. Km), Bijnor (417 Sq. Km), Bareilly (44 Sq. Km) and Badaun (44 Sq. Km), have open forest area and Rampur district has both open and dense forest areas. Among all the Enrouted and Command districts in U.P state, Bijnor district has maximum forest (417 Sq. Km) cover. Different types of forest along the S-Y link canal (384 Km) are such as Sal, mixed forest etc. It is covered by more diversity of fauna. Various medical and aromatic plants are also present along the link. Proposed S-Y Link canal is likely to transverse about 112 Km through forest area, which is approx 1.9 % out of the total forest area of U.P and U.K state and about 0.3% of the geographical area will

be covered by the link canal out of the total (G.A) geographical area of U.P and U.K state. Approx (0.2 %) of the forest area may covered by the S-Y link out of the total forest area of U.P and U.P state. Due to the construction work of the link some forest area of about 112 Km may be covered, but after construction the link canal, the forest area in Enrouted and Command areas may rise due to the water availability. The proposed S-Y link will help in increasing more forest cover in U.P than U.K state. U.P has more non-forest area.

U.P state has one National Park (N.P) and 23 wildlife sanctuaries and U.K state has about 6 National Parks and 7 wildlife sanctuaries are present which is rich in diversity of flora and fauna. The proposed S-Y canal will not cross through any wildlife sanctuary and N.P, but the nearest N.P is Jim Corbett. It is situated approx 1 Km at a distance from the link canal, which is located at Kaunkhera village in Nainital district of U.K state. During the construction time, some disturbances may create, but after the construction of link canal diversity of flora and fauna may increase due to increase in water availability, there would be more migration, more habitation etc. The S-Y link will be more helpful endangered species for their survival. EIA is an effective tool for study of environmental impacts of any project activity. EIA techniques can help to protect the environment and mitigate the negative impacts.

With respect to the **Socio-Economic Status**, among the Enrouted and Command areas of the S-Y link canal Haridwar, Moradabad and Bijnor districts were visited during (October to November 2014) to know the Socio-Economic Status. Bijnor is both Enrouted and Command area. Five local sites of each Enrouted and Command districts were visited. The study on recent Socio- Economic conditions was done on the basis of

EIA Checklist Method and to know the Socio Economic Impacts of the S-Y link canal. The field survey was done with pre-prepared questionnaires and checklist. Interview was taken with discussion from several group of people include literates, illiterates, labours, employers youngsters etc. Certain environmental components were selected such as literacy rate and education, electrical availability or supply, water availability, water quality, agriculture, occupation and family income, important landmark, spoil generation, industry, climate, religious monument, flood status, drainage system and water collection, tourism, seepage and percolation (absorption of water), traffic, air quality, construction development, soil, fishery, public health status and medical facilities to know the possible environmental and socio economic impacts of S-Y Link canal on its Enrouted and Command areas.

In **Haridwar district**, the visited sites are Mayapur Chowki, Ranipur, Kankhal Area, Harkipauri and Kotwali Nagar. The literacy rate is medium; there will be no impact of the S-Y Link canal on literacy rate. Electrical and water availability may increase, Water quality may affected during the construction of the canal. Agriculture, industries, occupation, family income may rise during construction and after construction of the S-Y link canal. There are important landmarks in all the sites. Climate of the areas is dominating; there will be no significant impact of the link canal. Spoil generation, flood status and drainage system may be affected during the construction time. Sometimes in rainy season, flood comes in laksar area due to which water level rise in river Ganga. Tourism is maximum during the tourist season likely to increase and increase in quality of religious monuments, temples. Traffic, air quality seepage and percolation of water construction development may affected by the S-Y Link during the construction time.

Soil fertility and fishery production may rise due to increase in water availability. There will be no significant impact of S-Y link on public health status and medical facilities.

In **Moradabad district**, which is the command area, the visited sites are Station Road, Kath Road Hartala, Karula, Pital Nagar Bus Stand and Buddha Bazaar. No impact of the S-Y link canal on literacy rate of all the sites. Electrical availability is good in all the sites (above 20 hrs), water supply is medium, but sometimes sand present in ground water. There will be increase in water and electrical availability due to presence of link canal but water quality may decrease during the construction time. There is no agriculture in all the sites the link canal, but the agriculture may raise due to good water availability. Occupation and family income is average in all the sites depends on private sectors, business work; labour work, which may increase during the construction. Industrial sector is likely to increase the productivity due to increase in water availability. No impact will affect landmark, climate of the region. Traffic congestion, seepage, percolation of water, air quality, drainage system, flood and spoil generation may occur during the construction time of the S-Y link canal. Soil fertility, fishery production and tourism may increase after the S-Y Link canal construction.

In **Bijnor district**, the sites visited are Jatan, Sotiyan, Awas Vikas Colony, Ghasiawala Area and Barrage Colony. Literacy rate is average in all the sites. Water quantity, agriculture and electrical availability are very low in all the sites. S-Y link may increase the water, electrical availability and agriculture of the areas. Industries, occupation and family income may increase during and after the construction work. Water quality is medium in all the areas, sometimes sand comes in drinking water. Water quality, traffic, air quality, drainage system, spoils generation and construction

development may increase during the construction of the link canal. Soil quality, fishery production and tourism may rise after the construction of the link canal.

“Overall in the Enrouted and command areas, Enrouted areas will be more benefited by the construction of proposed Sharda-Yamuna link canal, as the alignment crosses the areas. Water availability, electrical availability, fishery, industries, tourism, soil, fertility, agriculture, occupation, family income and religious monuments are likely to increase during and after the construction phase of S-Y Link”.

Some adverse impacts may arise such as air quality, water quality, traffic, drainage, seepage, percolation of water, construction and development of the regions, but such adverse impacts occurs only during the construction work of S-Y Link, after the construction, there will be no significant impacts. On the basis of Socio-Economic survey, beneficial impacts of proposed S-Y link are found to be more than the adverse impacts on environment. The adverse impacts can be minimize during the construction time with a proper Environmental Management Plan.

It is necessary to know the expected adverse impacts of S-Y link project to mitigate the harmful Environmental, Ecological and Social impacts of the link canal on its Enrouted and Command areas. Impacts during the construction phase are of temporary nature and can be managed with better housekeeping and construction practices.