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Modification of Panzan Left Canal by Analysis of River Interlinking

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Abstract - Inter-Linking of River is a water conservation method to reduce the irregular distribution of water and for providing solution to minimize floods and droughts in India. The rivers in semi –arid drought – prone tahsils are life-line of livelihood. The rivers play a vital role in the lives of the drought – prone tahsils people. Proper management of river water is the need of the hour. Indian agriculture largely depends upon Monsoon which is always uncertain in nature. Damage to crops due to drought and pitiable drainage facility could be managed. Depleting and decreasing status of water resources may be one of the most critical resource issues of the 21st century.

However, it summarizes the findings of the Strategic Analysis of this Project. Considering the future demands, conservation and management of water resources are very essential.

Keywords – Interlinking of river, Indian agriculture, semi –arid drought – prone tahsils, Geographic Information System.

I. INTRODUCTION

Due to uneven distribution of rainfall and water bodies throughout India, there are problems of water scarcity in certain parts of the country and floods in other. The nation at present spends about Rs. 150 billion per annum on drought relief and another Rs. 300 billion per annum on flood relief (Kalyanaraman, 2004). The increase in population and urbanization and urbanization necessitates growth in the agricultural and industrial sectors which demand for more fresh water. When surface water is the non-available mode the alternative is to depend on ground water.

To solve these problems, the Government of India has come up with a plan of interlinking 37 major rivers of India to distribute water equally amongst all the states. The River Interlinking Project (RIP) has two components - the Himalayan and the Peninsular.

The core objectives of the paper are to understand the historical background of Interlinking River Projects and to discuss issues and challenges pertaining to Interlinking River Projects. The idea of drawing water from the rivers in eastern India, which have larger runoff, in comparison to certain places in the peninsular region, where the precipitation levels are much lower, can be seen as an extension of that practice idea.

Fig.1 Barren land due to lack of water

The above figure shows the drought situation in the area the agricultural land has fully dried and this shows the necessity of water in the area.

A characteristic of the monsoon climate is variability of rainfall from year to year. India has an average of one in five below-normal rainfall years. India is basically an agricultural country, and all its resources depend on agricultural output. In India, 55% of agricultural output is from irrigated lands.

At this point interlinking of Indian rivers will open new avenues for developing new supplies. But we are at cross roads, creating new supplies when we face problem leads to bad management of resources. So, there is also a need to develop strong policies for efficient use of water resources.

Moreover, average farm incomes have increased from 80-100%as a result of irrigation, while yields have doubled compared with those achieved under the former rain-fed conditions. Water will no longer be cheap and plentiful. It will be scarce, expensive to develop and maintain and valuable in use.

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II. STUDY AREA

Tapi enters in the district at RL220 m. and leaves it at about 150 MSL. It is a main drainage and all of its tributaries and sub-tributaries draining finally into it. On the right bank it receives 29 tributaries and on left bank it receives 11 tributaries, draining directly into it. The mountain front is almost a geological fault running parallel to Satpuda and Tapi river followed by a highly previous Bazda zone on left of Tapi it receives three major tributaries like Bori, Girna and Waghur. Girna dam is placed at RL400 at south west corner of district having its own distribution system as shown in the plate it is to be connected to every ridge and reservoir of the district on the left side by constructing CanaIs, tunnels etc. It is planned so that canal running parallel to Ajanta hills at almost mountain front. It will flow from West to East and on north - south ridge. Some part of these canals will have zero gradient wherever required to have flow in both the directions to divert surplus water from to deficient zones. So Bori river, ridge between Girna & Bori, Girna river, a ridge between Girna and Waghur, Waghur river and ridge between Waghur and Bhogawati will be well covered and will boost ecology, flora and fauna of the area. The total area is almost a drought prone area, a rain shadow area also and having scanty rainfall pattern.

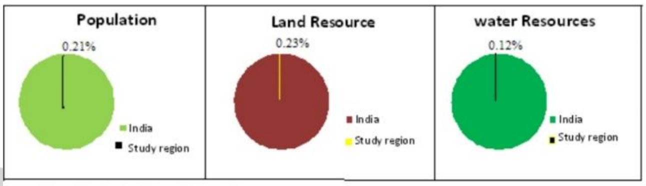
Jalgaon District is located in the north-west region of the state of Maharashtra. It is bounded by Satpuda mountain ranges in the north, Ajanta Mountain ranges in the south. Jalgaon is rich in volcanic soil which is well suited for cotton production. It is a major business centre for gold, pulses, cotton and bananas. Languages spoken are Marathi, Ahirani, Hindi, and English. Jalgaon District receives an average rainfall of about 690· mm and the temperature varies from 10-48 degree Celsius. Jalgaon is one of the 35-odd districts in the western Indian state of Maharashtra. The district hosts a population of about 4 million in an area of about 11,700 sq km.

Fig.2 Aerial view of Jalgaon region

The fig 2 shows the aerial view of the area in this figure we can see the agricultural area and barren area. By this we come to now in which area water is required.

III. METHODOLOGY

The Girna Major project is situated on the border of the two districts - Nasik and Jalgaon. In 2005, Nasik district obtained the high range of rains and the Girna dam was full till the middle of July 2005. During that period, 64,000 cusecs water was released in the Girna River from the Tapi River in the interest of flood management and finally it was released into the Arabian Sea. For regular irrigation purposes, the Girna project has Paznan left bank canal which flows towards Jalgaon district. During that period, 64,000 cusecs water was released in the Girna River from the Tapi River in the interest of flood management and finally it was released into the Arabian Sea. For regular irrigation purposes, the Girna project has Paznan left bank canal which flows towards Jalgaon district.



Source: Census Handbook of Jalgaon district, 2011

Fig.3 Pie chart of land resource, population, water resources

The above pie chart shows us per capita land, water and population availability in the study region. By this we come to know the necessity of water.

Providing water for drinking as well as irrigation purposes in the drought-hit areas of Jalgaon district by using diverted excess overflowing water, by adopting the "River Linking Technique" The less than adequate rainfall in the seven tehsils was likely to create drought-like conditions.

The excess flood waters in the Paznan left bank canal were diverted. Then, the canal was breached at 31st km and water was diverted into a local nalas. It flows and joins the Bori.

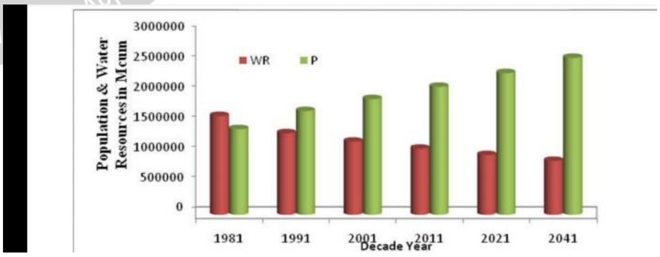


Fig.4 Bar chart of population and water resources

In fig.4 we can see year wise increase in population and use of water resources. It also shows the increasing water demand infront of increasing population.

River by traveling a distance of 6 km by power of gravity .The Bori River flows 35 km towards the easter reaches the Bori dam situated in the Jalgaon district. In this way, water traveled 68 km. The capacity of the Bori dam is 1,400 M.c.ft.

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Fig.5 current water supply through canal

From the above fig we come to know that the water supply is not as required to the people. As river girna river is receiving water from many rivers the access water should be used to transferred to required destination. While having ground level study of the area we came to know the following scenario.

Calculations:

For old method the dimensions of canal are as follows:

Breadth of canal: 12 m

Depth of canal: 3 m

Water flow speed:10 km/hr

To find the volume of water we need to find the length of the water flowing through the canal in 30 minutes at the speed of 10 km/h.

Let us find the volume of the water by using the formula;

volume = l × b × h, where l, b, and h are the length, breadth, and height.

Length of the water flowing through the canal in 1 hour (60 minutes) = 10 km

Length of the water flowing through the canal in 30 minutes = 10 km/2 = 5 km

L = 5 × 1000 m = 5000 m

V=l x b x h=5000 x 12 x 3=180000 m3 =180000/101.94

=1765.74 cusecs

For new method the dimensions of canal are as follows:

Breadth of canal: 15 m

Depth of canal: 4 m

Water flow speed:10 km/hr

To find the volume of water we need to find the length of the water flowing through the canal in 30 minutes at the speed of 10 km/h.

Let us find the volume of the water by using the formula;

volume = l × b × h, where l, b, and h are the length, breadth, and height.

Length of the water flowing through the canal in 1 hour (60 minutes) = 10 km

Length of the water flowing through the canal in 30 minutes = 10 km/2 = 5 km

L = 5 × 1000 m = 5000 m

V=l x b x h=5000 x 15 x 4=300000 m3 =300000/101.94

=2942.9 cusecs

The old canal system had many disadvantages such as:

- The leakage problem in canal system
- Lesser amount of water transferred through the canal system
- The amount of water transferred is 1765 cusecs only

To overcome this situation when we modify the old system we get the following results.

Modified Method of Interlinking:

- The old leakage problem would be solved
- More amount of water would be transmitted through the canal system
- The amount transferred would be 2942 cusecs

As the land required land is already present there so no additional cost of land would be required. There are only few changes need to be done in old system so that the current requirement of people is fulfilled. We also have to see the current and future requirements and design the new system accordingly. So the new system would fulfill the desired requirements. While having study of the area we also tried to study the elevation of land at different point so the canal should not have any problem .

We need to calculate the requirement and increase the size accordingly. The old problems should be overcomed.

In this we also use QGis software to see the area increased in water supply .by this software we are able to see the shapefile of the area of region and the 3-D terrain area of river attributes. this software shows the pictorial representation of area.

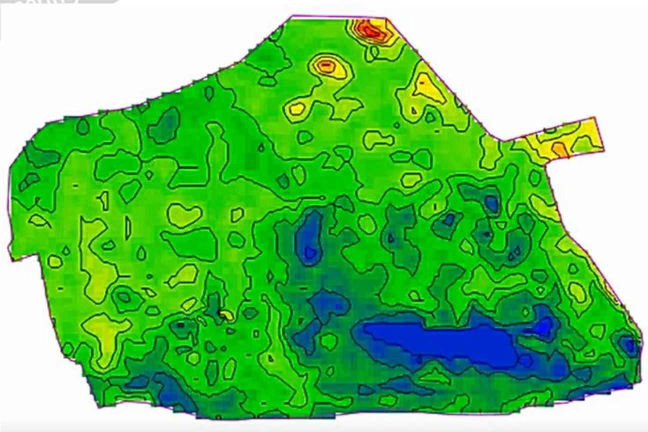

Fig.6 Terrain diagram of study area

From above fig we can see the terrain diagram of the study area .in this we can also get the information about the different elevation at different levels or at places in the figure. In this software we can get exact elevation height at particular level.

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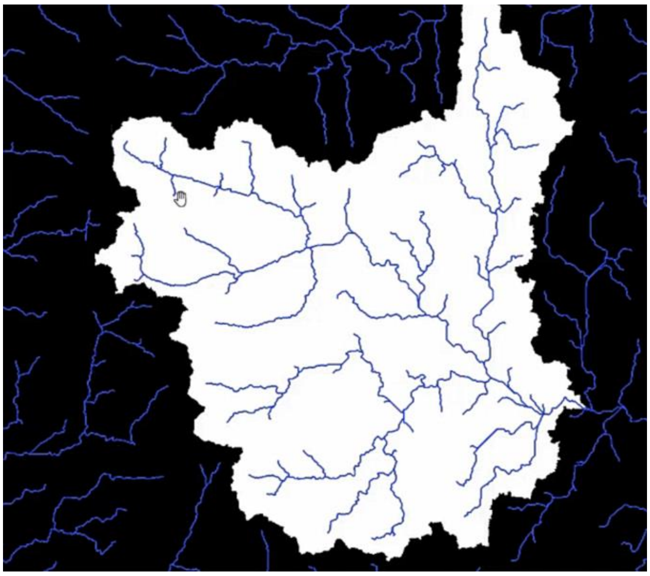

FIG.7 Catchment area and river attributes

This fig tells us the catchment area and the river attributes after the rainfall. The lines outside the white area also represent the catchment area.

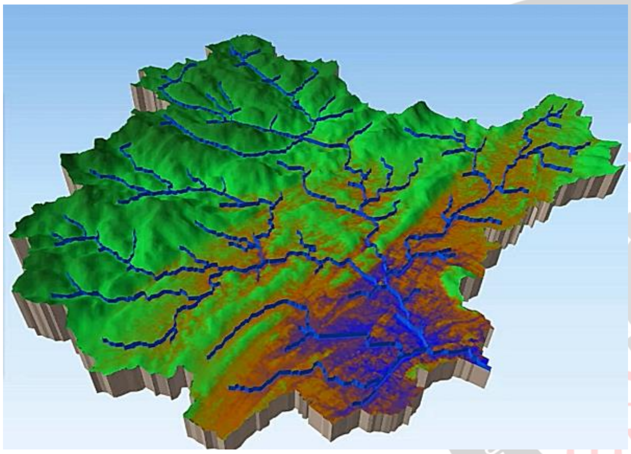

FIG.8 Increased water supply by new method

In this figure we see the increased water distribution after increased size of canal. the area gets increased and the more area gets the benefit of it and don't suffer from drought condition.

India needs infrastructure for logistics and movement of freight. Using connected rivers as navigation is a cleaner, low carbon footprint form of transport infrastructure, particularly for ores and food grains.

Once proper increment in size of canal is done then the gradually size of reservoir is increased then there is increase in supply of water area then before. As the larger parts get supplied by water then the water problem in that area gets solved and instead of barrel land the land gets irrigated.

As the increase in population increases needs of food and water so proper water management should be done. India is second largest in terms of population so the proper management is necessary and proper utilization is also necessary.

IV. RESULTS AND DISCUSSION

From the selected area for the project, we have found out the problems the people used to face in that region and also the acute shortage of water people faces in summer season. This problem is faced by people every time so there should be proper use of excess water in other regions.

Table 1. Proposed River Linking Projects in the study region and volume of water diverted

Sr. No.	River Link	Volume of water to be diverted (Mcum)	Cost (Lakh Rs.)
	Girna dam to Girna, other River, canals,projects, k.t. weirs,bandaras and tanks		
1	Girna and Bori River	20.843	222.242
2	Girna Mhaswa and Bhokarbari Project	19.521	202.121
3	Girna –Anjani Rivers	18.114	156.234
4	Girna and Tittur Rivers	14.358	101.271
5	Girna and Pimpri bandara	13.142	119.231
6	Panzan left bank canal - Girna River	19.118	200.147
7	Girna and Kajgaon bandara	5.269	82.856
8	Aad Nadi - Patna and Kodgaon bandara	9.4	25.25
9	Aad Nadi - Dongri River and Tittur River	7.235	12.148
	Total diverted water in Mcum.	127.000	1,121.500

The table shows that the amount of excess water that can be diverted and the cost that would be required for it. As it is very useful for other area were there is shortage of water then with the help of following data we come to know the from which area or region the excess water should be transferred. It also helps the excess unwanted water in that region to get rid off to other area.

In this while visiting the site we came to know about the actual problem that is the old canal size should be increased as the sufficient space is available so no need of new placed will be required. In old system the transfer of water was to less and were having few leakage issue which would also lead to less transfer of water

The old dimensions of canal:

Breadth of canal: 12 m

Depth of canal: 3 m

Water flow speed:10 km/hr

Volume(output): 180000 m3.

The new dimensions of canal:

Breadth of canal: 15 m

Depth of canal: 4 m

Water flow speed:10 km/hr

Volume(output): 300000 m3.

The old canal was made on the consideration that it would be sufficient but due to increase in people in the locality it was not sufficient. So, we have proposed to increase the size of canal which would solve problem. As the excess water would be transferred through the increased size of canal then the capacity of reservoir would also be increased once the

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amount of flow increases the area of water supply also increases.

V. CONCLUSION

Interlinking of rivers have many benefits. India receives plenty of rainfall, but most of this rainwater is going into drains. If we capture all these rainwaters, India will not face water scarcity in the coming years. By interlinking of rivers, the water shortage problem can be solved.

While having ground level survey we came to know that old canal size of canal was not sufficient for supply of water according to requirement of people. It also has leakage problems. Only 1765 cusecs water was able to pass through. The Jalgaon region had 15 villages surrounding it and the old canal system was not sufficient for it. Volume(output): 180000 m3 was the water discharge in old method.

In the new system the leakage problem would be solved. The size of canal would be increased. The water transfer would be 2942 cusecs Volume(output): 300000 m3 was the water discharge in new method. By this we understand the necessity of increase of canal size. As only the construction cost is to be required as the cost of land is already saved due to available land.

If water transferred from water abundant rivers to water deficit areas, there would be adequate supply for everyone in every part of the country. The excess water in a river is utilized to recharge the ground water bodies and dry wells in its command areas.

By this come to know that interlinking is important and the excess water instead of wasting it we can utilize it in good way. By the software we can also see the terrain , different elevation and 3-d view of the region ,also the attributes of rivers .On visiting the site personally we came to know that the size of canal should be increased which would lead to sufficient supply of water.

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