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Research study

Impacts of Makhi-Farsh Link Canal on the hydrology & drainage of Thar - a community perspective

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Impacts of Makhi-Farsh Link Canal on the hydrology and drainage of Thar - a community perspective

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List of Abbreviations

1. Concrete Channel (CC)
2. China Pakistan Economic Corridor (CPEC)
3. Focus Group Discussion (FGD)
4. Geological Survey of Pakistan (GSP)
5. Key Informant Interview (KII)
6. Sindh Engro Coal Mining Company (SECMC)
7. Left Bank Outfall Drain (LBOD)
8. Private Power and Infrastructure Board (PPIB)
9. British Overseas Development Agency (ODA)
10. Sindh Arid Zone Development Authority (SAZDA)

Executive Summary

Ten years ago, the government of Sindh proposed to construct Makhi-Farash Link Canal in order to supply water to Thar coal power plants for electricity generation. The proposed Link Canal was to draw water from Farash-Makhi Canal at a place called Farash Mori in Sanghar district. Farash Mori is the point where Farash-Makhi Canal draws water from its two sources; Chotiari Dam and Nara Canal. Though Farash Makhi Canal is itself a distributary of Nara Canal but it has its own seven distributaries namely Thar Wah, Dhoronaro Shaakh, Sufi Shaakh, Sirari Shaakh, Heeral Shaakh, Disti, and Dhoro Puran.

This report tries to undertake an impact analysis of the proposed Link Canal by explaining its relationships with other water bodies of the study area, as listed above. It also tries to set the context of the proposed Link Canal project or water supply scheme by describing it in the backdrop of water scarcity in parts of the districts under study. The other aspect of this study relates with the adverse impacts these interactions might have on the communities living along and around the project area.

Local communities, based on their past experiences of engaging with governments on different projects of water supply, have repeatedly expressed their apprehensions regarding the proposed Link Canal project which is still under way despite many protest demonstrations by local residents and by those from the project area. This report, mainly based on Focused Group Discussions and Key Informant Interviews held in ten villages of two districts Umerkot and Tharparkar, confirms these apprehensions held by local residents.

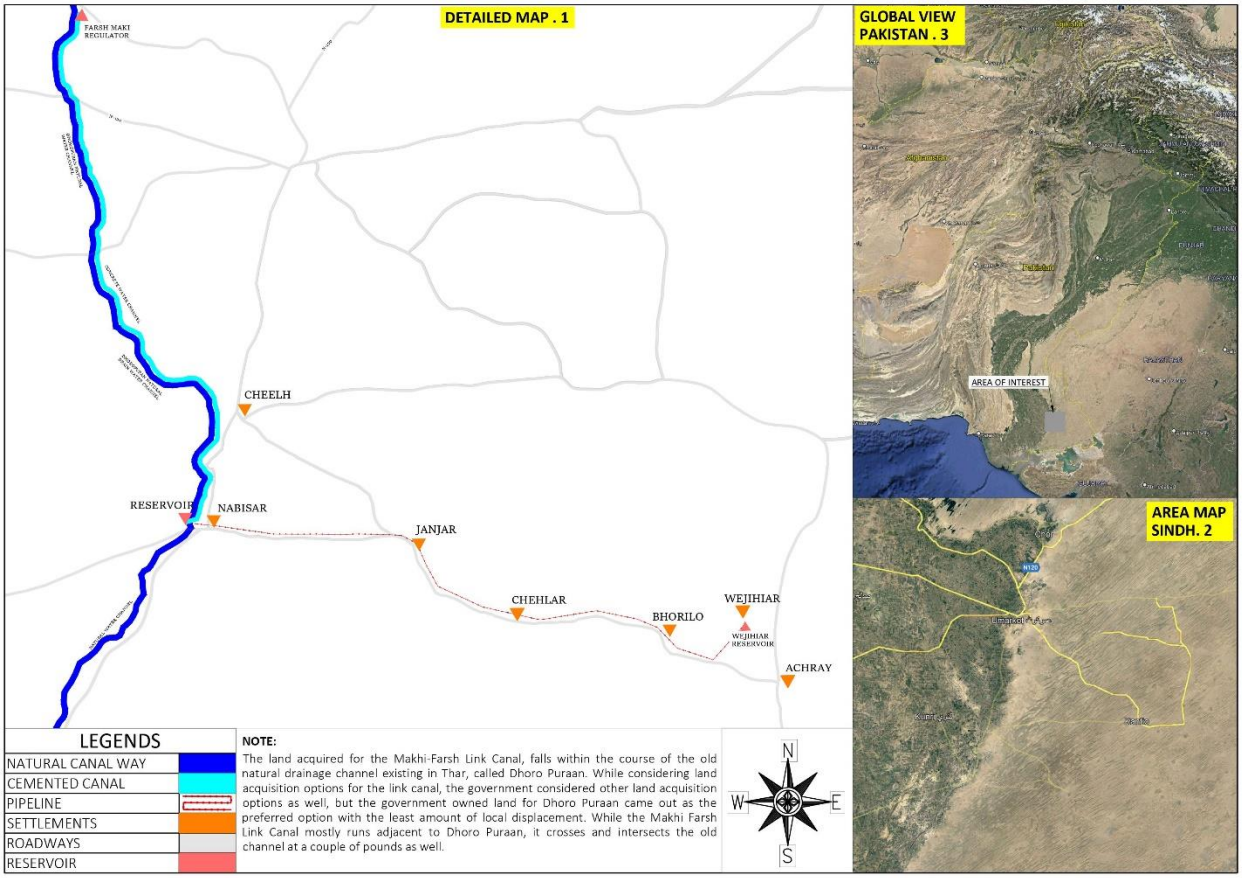
Introduction of Makhi-Farsh Link Canal Project

The federal government approved the Makhi-Farash Link Canal, irrigation and water supply scheme, worth Rs27 billion, during a meeting of the Executive Committee of the National Economic Council held in Islamabad in May, 2011. The decision was made after the Sindh government persuaded the federal government to approve the scheme because it was necessary to provide water to the Thar coal fields. According to the Sindh government, without it, it would not be possible for the government to generate electricity from coal.

One decade down the road, Thari people are reported to have questioned the benefits of the government's planned water schemes to Thar coal blocks. According to a news report published in The News on October 11, 2021, these schemes neither take communities' land rights into account nor pay heed to the environmental impacts.

The report says that the residents from Nabisar to Vejhiar villages also claimed that the government did not compensate them when it took away their grazing fields and blocked their access pathways to other villages and graveyards when it built dams for transferring water of the Left Bank Outfall Drain (LBOD) to Thar coal site. It has been learnt that the idea to divert water

from Makhi-Farash to the coal site came after the government found LBOD water too saline for the required purpose.



Makhi-Farsh Link Canal is a freshwater supply scheme being implemented by the government of Sindh which proposes to provide 200 cusecs of freshwater to Thar Coalfields via a 70-kilometer-long Concrete Channel (CC). This CC/Link Canal/Makhi Farash Link Canal starts from Farsh Mori, a water regulator, at Makhi Farsh Canal near Dhoronaro in district Umerkot and ends at Nabisar and from there it is further stretched to Vejhiar through 60-kilometer pipeline in district Tharparkar.

In order to provide freshwater to coal power plants new dams are being built in both Nabisar and Vejhiar. According to the field visits by our team, two dams at Nabisar have already been built while the work on the second dam in Vejhiar is still under progress. Once completed the Makhi-Farash Link Canal Project proposes:

- Intake of 90 Cusec (during the emergency period) and for normal operation 53 cusecs of water during summer months and 50 cusecs of water during winter months from Concrete Channel delivering water from Makhi-Farsh Canal.
- 70-km long CC will carry 200 cusec freshwater from Farash Complex at Makhi-Farash Canal near Dhoronaro to Nabisar.

- Build a reservoir to store 45 days of water (5.71 million m³ Capacity) at Nabisar.
- Treatment of Water to make it suitable as per the requirements of the Government of Sindh.
- Build Pumping Station and 60.50 km Pipeline to transfer water from Nabisar to Vejihar.
- Build Reservoir for 30 Days Storage (3.52 million m³ Capacity) at Vejhiar.

1.1 Water scarcity

The Tharparkar region of Sindh is home to nearly 1.65 million humans and four million livestock. It is spread over 22,000 square kilometers in the southeast of the province and geographically it is divided into eight sub-regions i.e. Khaerr, Parkar, Kanthho, Samroti, Wango, Wat, Mehranno and Dhatt.

According to a research article titled The Thar Desert and its Antiquity written by R. P. Dhir and A. K. Singhvi, some 2,000 years ago, Tharparkar was not a desert, it was rather an area of fertile lands as a giant river ran through it. Some historians believe that the river disappeared and after that the region evolved into sand dunes and rocks. The region became a desert area and it no longer had water resources.

Therefore, most of the inhabitants of this region depend on groundwater and rainwater because there is no freshwater canal or river that could fulfill water needs of the population in that region. There are mostly dug wells in many villages that are often 300 to 500 feet deep and provide brackish water to the inhabitants. In many places, people make handmade tanks to store rainwater but this also depends on the amount of the rain that falls. The annual rainfall in Tharparkar is between 260 and 280 mm. More than 90 percent population of this water-deprived region has to walk miles for a pitcher of water on a daily basis.

1.2 Coal power plants

Thar, the land of water scarcity, has coal deposits in abundance. It has 175 billion tonnes of lignite coal deposits. These coal reservoirs are further divided into 13 blocks and different companies are engaged on these blocks for electricity generation from coal. In 2014, under the China Pakistan Economic Corridor (CPEC) the work on the very first block, Thar Coal Block – II, was kicked off by Sindh Engro Coal Mining Company (SECMC). The power plants on Thar Coal Project sites require a sizeable amount of water and for this purpose the provincial government of Sindh has decided to provide canal water to these plant sites through Makhi-Farsh Link Canal.
According to a document titled Pakistan Coal Power Generation Potential published by Private Power and Infrastructure Board (PPIB) in June 2004, the first indication of the presence of coal beneath the sands of the Thar Desert was reported while drilling water wells by the British Overseas Development Agency (ODA) in coordination with the Sindh Arid Zone Development Authority (SAZDA), in 1991.

It says that the Thar coalfield, with a resource potential of 175.5 million tonnes of coal, covers an area of 9000 sq. km. in the Tharparkar Desert. The mineable coal reserves are estimated to be 1,620 million tonnes. The coal-bearing area is covered by stable sand dunes.

According to the policy document, the presence of coal deposits in Pakistan was known before independence, but its economic value was highlighted in 1980 when large reserves of coal were discovered in the Lakhra and Sonda areas of Sindh Province.

The discovery of another huge coal deposit of 175.5 billion tonnes in an area of 10,000 sq. km in Tharparkar district of Sindh provided a quantum increase in the coal resources of Pakistan. After this discovery, Pakistan is now the 6th richest nation of the world in respect of coal resources. Interestingly, Pakistan did not appear even on the list of coal-rich countries before the discovery of Thar Coal.

1.3 Identification of the project area and the villages that will be affected along the project route

Makhi-Farash Link Canal Project can be divided into two parts for better understanding of the project area and the villages situated along its route that are likely to be affected in one way or the other.

First, five villages of the district Umerkot. Half of these villages are situated around Dhoronaro and the other half are located along Farash Mori to Nabisar route where water reservoirs are being built. The villages include; Nabisar, Allah Bachayo Mallah, Cheel Band, Haji Ismail Mehar, and Rana Waah. All these villages fall within the area of the project and are equally vulnerable to project activities.

Second, five villages from Nabisar to Vejhiar in district Tharparkar. The villages of district Tharparkar that lie along the project route are Jhanjhiar, Peeho Bheel, Dallan Jo Tarr, Vejihar and Accharay Jo Tarr. All of these five villages are situated across 60-kilometer long route and are equally vulnerable because of the activities of this water supply project. For more details about the potential impact and its consequences on 10 villages identified above please see the tables below.

Table 1:

S.no	Village	District	Likely Impact
1	Nabisar	Umerkot	• Agricultural lands will be destroyed due to seepage. • Shortage of water for agriculture purposes will occur.

			• Can be affected severly if flooding occurs in Dhoro Puran.
2	Allah Bachayo Malah	Umerkot	• Shortage of water for agriculture purposes will occur. • Fish farming will be adversly affected. • Can have adverse affects if flooding occurs in Dhoro Puran.
3	Cheel Band	Umerkot	• Shortage of water for agriculture purposes will occur. • Can have adverse affects if flooding occurs in Dhoro Puran.
4	Haji Ismail Mehr	Umerkot	• Shortage of water for agriculture purposes will occur. • Can have adverse affects if flooding occurs in Dhoro Puran.
5	Rana Waah	Umerkot	• Shortage of water for agriculture purposes will occur. • Can be affected severly if flooding occurs in Dhoro Puran.
6	Jhanjiar	Tharparkar	• Grazing fields for the livestock will be occupied in implemenation phase of the project. • Locals will no longer be able to carry out rainfed harvesting in the surroundings of this village.
7	Peeho Bheel	Tharparkar	• Grazing fields for the livestock will be occupied in implemenation phase of the project. • Locals will no longer be able to carry out rainfed harvesting in the surroundings of this village.
8	Dallon Jo Tar	Tharparkar	• Grazing fields for the livestock will be occupied in implemenation phase of the project. • Locals will no longer be able to carry out rainfed harvesting in the surroundings of this village.

9	Vajhair	Tharparkar	• Grazing fields for the livestock will be occupied in implemenation phase of the project. • Locals will no longer be able to carry out rainfed harvesting in the surroundings of this village. • Flooding in water reserviors can bring devistation in the village and resultantly physical displacement can also happen.
10	Acchray Jo Tarr	Tharparkar	• Grazing fields for the livestock will be occupied in implemenation phase of the project. • Locals will no longer be able to carry out rainfed harvesting in the surroundings of this village.

Table 2:

S. no	Village	Houses	Population	Main Castes	Languages	Health Facility	Facilities	Public Amenities	Water Facility	Graveyard
1	Nabisar	3500	20000	Kohli Bheel Chandio Meghwar	Sindhi/ Dhatki	Govt. Dispensary	8 schools 02 Mosques	Electricity	Water Filtration Plant Tube Wells, Water Supply Scheme	02
2	Allah Bachayo Mallah	100	550	Mallah Sand Kolhi	Sindhi / Dhatki	Nil	School, Mosque	Electricity	Nara Canal Water, Tube Wells	01
3	Cheel Band	750	5500	Kohli Dars Syed	Sindhi/ Dhatki	Govt. Dispensary	Mosque	Electricity	Water Filteration Plant Tube Well	01
4	Haji Ismail Mehar	70	600	Mehar Chanihia Kolhi	Sindhi	Animal Husbandry		Electricity	Nara Canal Water	01
5	Rana Waah	150	8500	Kolhi	Sindhi/ Dhatki	Nil	School, Mosque Mandir	Nil	Nara Canal Water, Tube Well	01
6	Janjhiar	800	5000	Thakur, Meghwar Bajir And Mahraj	Sindhi/ Dhatki	Nil	Primary Schools For Boys & Girls, 01 Mandir	Electricity	RO Plant Dug well	01
7	Peeho Bheel	150	8500	Bheel Kolhi	Sindhi/ Dhatki	Nil	01 Primary School	Nil	Nil	01
8	Dallon Jo Tar	800	4900	Bheel Thakur Kolhi	Sindhi/ Dhatki	Nil	Primary School	Nil	2 RO Plants & Dug well	01
9	Vajhair	190	12500	Thakur Bheel	Sindhi / Dhatki	Hospital	Primary Schools, Middle, Schools Boys And Girls, 01 Mandir, 01 Mosque	Electricity	Dug Well, RO Plant and Hand Pumps	01

1.4 Description of project area's surface water resources

Description and mapping of project area's hydrology, surface water resources, natural drainage (Dhoro Puraan), and other water bodies based on site visits to the project area:

We held Focused Group Discussions (FGDs) in order to map the project area's hydrology, surface water resources, and natural drainage (Dhoro Puran), and other water bodies. The FGDs were conducted in 10 villages of two districts i.e. Umerkot and Tharparkar. All of these 10 villages, five villages from each district, fall in the project area. There is a strong possibility that these villages could have far reaching impacts on their socio-economic lives and face environmental hazards due to their proximity with the project route.

The villages of district Umerkot which include Nabisar, Allah Bachayo Mallah, Cheel Band, Haji Ismail Mehar, and Rana Waah lie in the canal command area and get canal water from Makhi-Farsh Canal. These villages are situated close to the banks of natural drainage via Dhoro Puran, so there is a possibility that in future when the canal water is supplied to the Thar coalfields the overflowing of Dhoro Puran may cause flooding in the villages mentioned above.

Because the concrete channel has been built in the body of Dhoro Puran or in other words the thickness of Dhoro Puran has been cut short and that will impede the natural flow of this drain because the flood or rain water will now have less than half of the space than it previously had allowing a free flow. Now, in case of water level increase in Dhoro Puran it is likely to overflow and inundate nearby villages within minutes.

Most recently in 2010-11, a mega flooding caused by Dhoro Puran has been recorded. All these five villages of district Umerkot where we conducted FGDs were severely affected due to that flooding and people had to shift to other areas along with their livestock. They returned back to their villages after six months. There is no official information available but the people say that flooding had brought a massive devastation in their region.

The villages of district Tharparkar that lie along the project route are Jhanjhiar, Peeho Bheel, Dallan Jo Tarr, Vejhiar and Acharay Jo Tarr. These villages don't have surface water resources so like other villages of the Thar these villages also depend on rainwater and brackish groundwater. Locals of these villages store rainwater for all purposes and sometimes when there is no rain in Thar they use underground water for the same purposes. These villages are situated far away from Dhoro Puran so there is no fear of any flooding due to disturbance in the flow of Dhoro Puran.

One major apprehension among villagers living in Thar is that their guacher (grazing land) area will be occupied by the government due to this project. Secondly, the rain-fed agriculture practiced by locals will be affected as the lands they use to cultivate during rains will also come under project route.

Description of the dependency of project area's residents on these water resources- Mapping of villages which are dependent on the flows of Makhi-Farash Canal for the sustenance of agricultural practices and livelihoods:

Agriculture is the main source of survival for more than 90 percent people in the villages that lie along the Makhi-Farash Canal command area which is also the tail end of Nara Canal as this is the point where Makhi-Farash Canal draws water from Nara Canal. Chotiari dam is the other source of water for Makhi-Farash Canal.

Almost all of these villages are associated with agriculture sector. For their cultivation, they depend on Makhi-Farash Canal water and there has already been a shortage of canal water in these villages due to insufficient water in the tail end i.e. Makhi-Farash Canal which is the only source of surface water for their agricultural lands.

The communities of district Umerkot utilize these surface water bodies for drinking and other domestic purposes. There are a few freshwater fish farms in this area which also use Nara Canal water. The Mallah community of village Haji Allah Bachayo Mallah is associated with fish farming business and they have two fish farms. A rough estimate is that there are around 20 small and big fish farms in the area.

During the FGDs and KIIs, almost every villager raised the question that how the Sindh government will manage to ensure the supply of water to their agricultural lands after completion of this Link Canal. Most of the people in the villages, where FGDs were conducted in district Umerkot are farmers and they have been associated with agriculture practice since centuries so they are well aware of the impacts this government-proposed Link Canal could have on their lives, lands, and livestock in the days to come.

As mentioned above, Makhi-Farash Canal gets water from two sources; Nara Canal and Chotiari Dam and these villages get water from Makhi-Farsh Canal and in case a new Link Canal is taken out the supply of water will be reduced in other canals and it would clearly cause reduction in irrigation supplies. Secondly, since they are fully dependent on the flows of Makhi-Farash Canal for the sustenance of agricultural practices and livelihoods and in case a new canal with the capacity of 200 cusecs is constructed from the Makhi Farsh Canal, the already low water flows will be reduced further in these villages.

The villages located in Thar where FGDs were conducted lie far from the canal command area so there are no perennial surface water resources available in those villages other than natural, seasonal storage tanks (Tarai in Sindhi) which can store rainwater only for some months after rains. The residents in Thar's villages that lie along the project area use underground brackish water for everyday use and for that purpose they have very deep dug wells, often 300 to 500 feet deep. In some densely populated villages like Vejhiar and Jhanjhiar people fetch water from Reverse Osmosis Plants installed by the government and use that source of water for drinking and other domestic purposes. As no supply of canal water is directly available in any part of the

Thar Desert, the residents of the villages that lie along the project area carry out rain-fed harvesting which can also be adversely affected by this water supply scheme.

Legal aspects related to water issues in Thar

2.1 Provincial, National and International laws applicable to water issues in Thar:

According to National Water Policy's section 17.1, "All citizens of Pakistan have the right of equal and affordable access to clean drinking water." There are other water rights, customary as well as those with legal standing, applicable to Thar. There are certain legal rights of people facing displacement due to Thar water projects and water allocation to Thar Coal Power Plants.

Dr. Mark Chernaik, from Environmental Law Alliance Worldwide, in an evaluation of the Environmental Impact Assessment (EIA) for the proposed supply of water from Nabisar to Vajhair, highlighted some flaws in the EIA of the proposed supply of water scheme. The review was done for Client Earth and is based on sound analysis.

It says that the EIA lacks necessary quantitative predictions about the long term quality of water in the proposed reservoirs at Vajhair and Nabisar, which would salinize after years of exposure to severe arid environments. The EIA, according to the evaluation study, also lacks necessary quantitative predictions about the impact of the project on local water resources. The EIA lacks necessary information about the description of the project. It also says that the EIA lacks necessary quantitative predictions about the impact to air quality of the proposed 7 MW powerhouse at Vajhair.

2.2 Synthesis of legal violations that could result from the construction of the Makhi-Farash Link Canal Scheme

Omissions in EIA studies carried out for the Makhi-Farash Link Canal when it comes to impacts on surface water resources and drainage patterns

It is estimated that the annual evapotranspiration in the Thar Desert is more than 1.8 meters. That is, each exposed water body in the Thar Desert has the capacity to lose at least 1.8 meters of water from its surface as it gains in rainfall. If the proposed Reservoir at Vajhair has a surface area of 205 acres (equivalent to 830,000 square meters), then annual evapotranspiration of more than 1.8 meters implies.

Dhoro Puran has been used as a natural drainage route for flood water for decades which tails at Shakoor lake in Rann of Kutchh but since a concrete lined water channel has been constructed in the bed of Dhoro Puran which will surely disturb the natural flow of the drain (Dhoro Puran) and resultantly there will be no alternative waterway left for the government to send floodwater

downstream during flooding days. This is a serious threat to local communities living along the route of the proposed water supply scheme and in EIA this threat has not been entertained.

The five villages i.e. Nabisar, Cheelband, Rana Waah, Haji Ismail Mehar, and Allah Bachayo Mallah where FGDs were conducted with the villagers have little access to Nara Canal Water. The local farmers are hardly able to carry out the cultivation practices and in case the 200 cusecs of water from this already water scarce irrigation system is cut down it will adversely impact their surface water resources and agricultural practices.

2.3 Legal violations related to projected withdrawal of excess water from surface water bodies by coal power plants than what is lawfully allotted to them

If 200 to 300 cusecs of water is taken out from the Farash-Makhi Canal, this will reduce the capacity of other seven tail end water distributary canals and due to that marginalized farmers will have to face a terrible scarcity of canal water. In villages like Abdul Qadus Sand which is situated very close to the proposed project start-up site (Farash Mori) has water scarcity and if more water is taken out from the canal the agricultural lands and livestock of people could die.

A KII with Mr. Ghulam Mustafa Sharifani, sub engineer Makhi Farsh Division, succinctly sums up the situation. According to Mr. Sharifani, the approved capacity of Makhi Farsh Division Canal is 1,200 cusecs but it is already running short of 600 cusecs of its actual capacity. So it would clearly be a violation if excessive water from an already water scarce canal allocation system is drawn to water power plants that actually are located at the distance of around 150 kilometers away in another district.

There are several legal violations resulting from the construction of Thar water supply schemes. One of the major concerns is that EIA does not take into consideration the fact that the proponents of the project have started construction even before the approval of EIA.

Implications of Farash-Makhi Link Canal construction and damming at Nabisar/Vejhair on the hydrology of Thar (Based on community interactions and the perspective of locals)

3.1 Impact Assessment of surface water diversions

Impacts related to land acquisition and displacement as result of water supply schemes

The mapping of the project area and FGDs conducted in 10 villages of both districts i.e. Umerkot and Tharparkar confirm that no human displacement will occur as a result of this water supply scheme because not even a single village falls in the line of water supply route. If livelihood disruption is counted as displacement, then yes there will be displacement. Gauchers (grazing land) of people in Thar's five villages will be occupied by the government due to this project's activities. Gauchers are important because they provide fodder to the livestock of Thari people.

But in village Vajhair where damming is being done by the government, there is a fear among the people, around 150 households, that they will be displaced after the construction of a second dam in their village, which is being constructed very close to their huts. The water level in this second dam will be high from the households that lie along the sand dunes so there exists a possibility of flooding if the water level in the dam crosses its limits and consequently, the possibility of displacement.

The KII with Mr. Khalid Dahar, who is Executive Engineer in Sindh government's Irrigation Department, suggests that the outdated Land Acquisition Act-1894 of the British government is still in place in Thar and it will be made applicable if any such matter related to land acquisition arises in coming days due to this water supply scheme. He also said that the *gaucher* area (grazing grounds) around many villages in Thar are not public property and it belongs to the government so such lands in some villages might be used by the project authorities but the villagers will be taken into confidence and they will be provided with alternate *gaucher* (grazing land) by the government.

3.2 Impacts on water resource availability in Makhi-Farash Canal command area due to excessive water withdrawals for Nabisar.

Water availability in the Makhi-Farash Canal command area will be adversely affected as a result of the withdrawal of excessive water for Nabisar through the Farsh-Makhi Link Canal. According to the KII conducted with Mr. Ghulam Mustafa Sharifani, who works as a sub engineer at Farsh Makhi Division of Sindh Irrigation Department, the capacity of Farsh Makhi Canal is 1200 cusecs but at present it has decreased to 600 cusecs only which means there is already a shortfall of water in the canal water supply system. In case a link canal is withdrawn from it, the already water scarce canal could cause further damage to water resource availability in the area.

There are already seven water canals/minors/distributary canals namely; Thar Wah, Dhoronaro Shaakh, Sufi Shaakh, Sirari Shaakh, Heeral Shaakh, Disti, and Dhoro Puran. These get water from Makhi Farsh Division and hardly any of them provide water to the tail end growers of this area and if a new canal is taken out from this water division it will make rest of the canals of the region without water which will severely hit agricultural lands of poor farmers of the region.

There is a water allocation system for all seven canals/minors of Makhi Farsh Division. According to that system three canals i.e. Thar Wah, Dhoronaro Shaakh, and Sufi Shaakh receive water twice a month (after every 15 days), three other canals/minors i.e. Sarari Shaakh, Heeral Shaakh, and Disti receive water for 15 days in a month while the remaining one Dhoro Puran is opened only during heavy rains or floods. But, currently this water allocation schedule has been changed due to the shortage of water in the canal water system. According to the new schedule three canals i.e. Thar Wah, Dhoronaro Shaakh, and Sufi Shaakh receive water for only seven days a month. The other three canals i.e. Sarari Shaakh, Heeral Shaakh and Disti also receive water for only seven days a month, and for the remaining 15 days the supply of water to the Makhi-Farash Canal remains closed.

3.3 Impacts of reservoir building at Nabisar and Vejihair on the communities practicing flood irrigation

Vejhair, where reservoir is being built under Makhi-Farsh Link Canal Project, is located in district Tharparkar and the villages around this village have no access to canal water. The communities cultivate their lands on rainwater only. There has never been any concept of flood irrigation practice among the Thari growers that means the construction of dams in Vejhair doesn't impact them much. The locals have small pieces of lands around their typical straw huts (*chaunra*s in Sindhi) which are cultivated on rainwater every year and if it doesn't rain in Thar they don't cultivate those lands and consequently the land remains barren throughout the year.

In villages that lie in Makhi-Farash Canal command area and around the proposed project route, the flood irrigation practice is not a common kind of cultivating activity, because they can get canal water for agriculture purpose every now and then. But in a vast area, locally named as 'Mehrano', that starts from Nabisar (where damming has been done) and ends at Naukot, communities have been doing flood irrigation because they face acute shortage of water in their area. They only get water for cultivation when heavy rains causes Dhoro Puran to flow till its tail end. They store that water and use it gradually for their crops throughout the season.

Building a reservoir at Nabisar will block the water that has previously been used by the people living and cultivating lands in Mehrano region of Thar. Moreover, such a project can also lead to food insecurity as there would be no other source of income left for the locals.

3.4 Impact of proposed water schemes on agriculture

Agriculture is the main source of income for the communities living along the proposed water supply scheme in district Umerkot. In the villages where FGDs were conducted more than 90 percent of the people in those villages directly depend on agriculture and they have some serious reservations regarding the Makhi-Farsh Link Canal Project as they believe that the project will devastate them.

All these villages that lie between Makhi-Farsh Mori and Nabisar where damming is being done receive canal water but not on regular basis. In some villages where FGDs were conducted people were talking about water allocation system which provides water once in a month. So in this water scarce situation who will guarantee that they, people living in villages that depend on Makhi-Farash Canal water in district Umerkot, will continue to receive the same amount of canal water or not.

In the case of villages that lie in Thar the situation is different as they do not receive canal water. The people in Thar's villages where FGDs were conducted do seasonal, rain-fed agriculture. They grow different crops during the months from June to September but that depends on the amount of rainfall in the area.

3.5 Socio-economic impacts on the communities of the region

Dam and reservoir building in these areas has already generated significant concerns regarding ecological impacts as well as immediate and long-term socio-economic consequences for local communities of farmers, fishermen, and herders. Habitats of unique fauna and flora suffered from substantial losses and became fragmented. Excessive storage at Nabisar dams has submerged and destroyed the riverine forest and a similar impact has been observed on rangelands that resulted in the loss of biodiversity and fodder. A riverine forest is located along the Dhoro Puran between Cheelband to Nabisar area of Kunri tehsil, district Umerkot. These forests can be seen growing along Dhoro Puran.

The increased water level in the reservoir has not only inundated the fertile land but also caused excessive water seepage to western and southern areas and subsequently adjoining agricultural lands became waterlogged, salinized, and barren. Participants of FGDs also highlighted that the fish stocks of the reservoir were slowly depleting due to unsustainable and overfishing practices.

It was claimed that the reservoir at Nabisar at its full capacity would irrigate 60,700 hectares of land for winter cropping but it is never filled to its full capacity due to the unavailability of water. It is estimated by local growers that increased levels of water will destroy about 30,000 hectares of cultivable land in and around the reservoir. Considering other factors of rangelands destruction, fish depletion, deforestation, and biodiversity loss, one can envisage that the economic losses from this development are much higher than its benefits.

Conclusion and recommendations

Even if we do a simple cost-benefit analysis we can safely say that the cost clearly outweighs benefits. The conclusion will be hard to digest for the government entities busy in implementing an unproductive project of providing canal water to coal power plants under the Thar Coal Project. A large number of people living in both districts, Umerkot and Thar, will have to pay a heavy price due to this water supply scheme. Thousands of acres of agricultural land will become barren and salinized. There will be a threat to indigenous bird and fish species for whom local water bodies and trees have been safest habitats for centuries but when the deforestation and water scarcity caused by the proposed water supply scheme will come into play everything in the region will be affected.

Agriculture is a prime source of income for the people in villages situated along the project area in district Umerkot. These people totally depend on Makhi-Farash Canal water which is provided to them through different minors/shaakhs/canals and for a long-time many villages particularly which are located at the tail end area of such canals and bordering with Thar are facing severe water scarcity. If more water is drawn from the same division, it will increase further water scarcity in the villages.

During FGDs, villagers of Nabisar also expressed their concerns about seepage and erosion and other issues that might occur in the agricultural land in the vicinity of the dam area. Another fear among the communities regarding the construction of a dam at Nabisar is that the people living in village Vejhair of district Tharparkar fear flooding where damming will be done. But the Thar is a rain-fed agricultural area so there will be no such issue to the lands but flooding in a dam can create miseries for the local people. Keeping in view the annual rainfall in Thar it looks impossible that Vejhair reservoir gets overflowed due to heavy rains but if it happens then it would affect the local population of around 150 households that dwell in village Vejhair.

It is a known fact that the Nara Canal is already providing less water to Farsh-Makhi Division than its required capacity and if the same water is further distributed to another canal how will people survive who are already on the horns of dilemma due to water shortage? If the water does not reach the agriculture lands it would turn barren and the fodder for livestock in these villages would decrease too. The government also has no plans to compensate people who might be displaced or those who might find their lands adversely affected by seepage or erosion as a result of this project.

The route of this proposed link canal from Makhi-Farsh Mori to Nabisar is the same as the natural route of an outfall drain namely Dhoro Puran which kicks off from Farsh Mori in district Umerkot and ends at Shakoor Lake in Rann of Kutchh. Apparently it looks cost-effective from the point of view of the government but they fail to justify the route of rainwater in case the area receives heavy rains. There are many such flaws in this water supply scheme that make it inefficient and ineffective to be implemented. But the government seems hell bent on providing water to Thar coal power plants at any cost and by any means.

The issues related to the water supply scheme can be explored further through discussions with people who are likely to get adversely affected due to this project. The government should conduct public hearings in all these villages to note down fears of masses related to changes in their life styles, environment, and water dependency. A compensation model should also be designed for the people who are going to lose their houses or lands. Most importantly the government should also disclose publicly whether the proposed canal will be allowed to provide water to thirsty people of Thar in future or not.