

Original Research

Received 20 May 2026

Revised 26 June 2026

Accepted 14 July 2026

Natural Resources for Human
Health 2026, Vol. 6(7s): 1128–1136

KEYWORDS:

Mineral, Mining, Revenue,
Stakeholders, Illegal, Political
Ecology and Floods.

Geo-Political Analysis of Illegal Sand Mining and its Impact on Human Health and Livelihood Sustainability in Bhikhna Thori, Bihar

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ABSTRACT: Sand plays a unique role in infrastructure development and generates employment opportunities and revenue for the government and other stakeholders. It is considered wealth in the backward regions of Bihar because the state lacks mineral resources; hence, sand has become an important part of the economy for local people living in the foothills or on the riverbanks. Illegal and uncontrolled sand mining in riverbeds in the Tarai is now cited as the major cause of flood havoc in the study area and of revenue losses for the Bihar government. This paper examines the political ecology of illegal sand mining, the role of money and muscle, the role of local administration, and its adverse impact on the ecology. The study found that the administration must control and eliminate illegal mining to protect the ecology and minimise havoc like frequent floods.

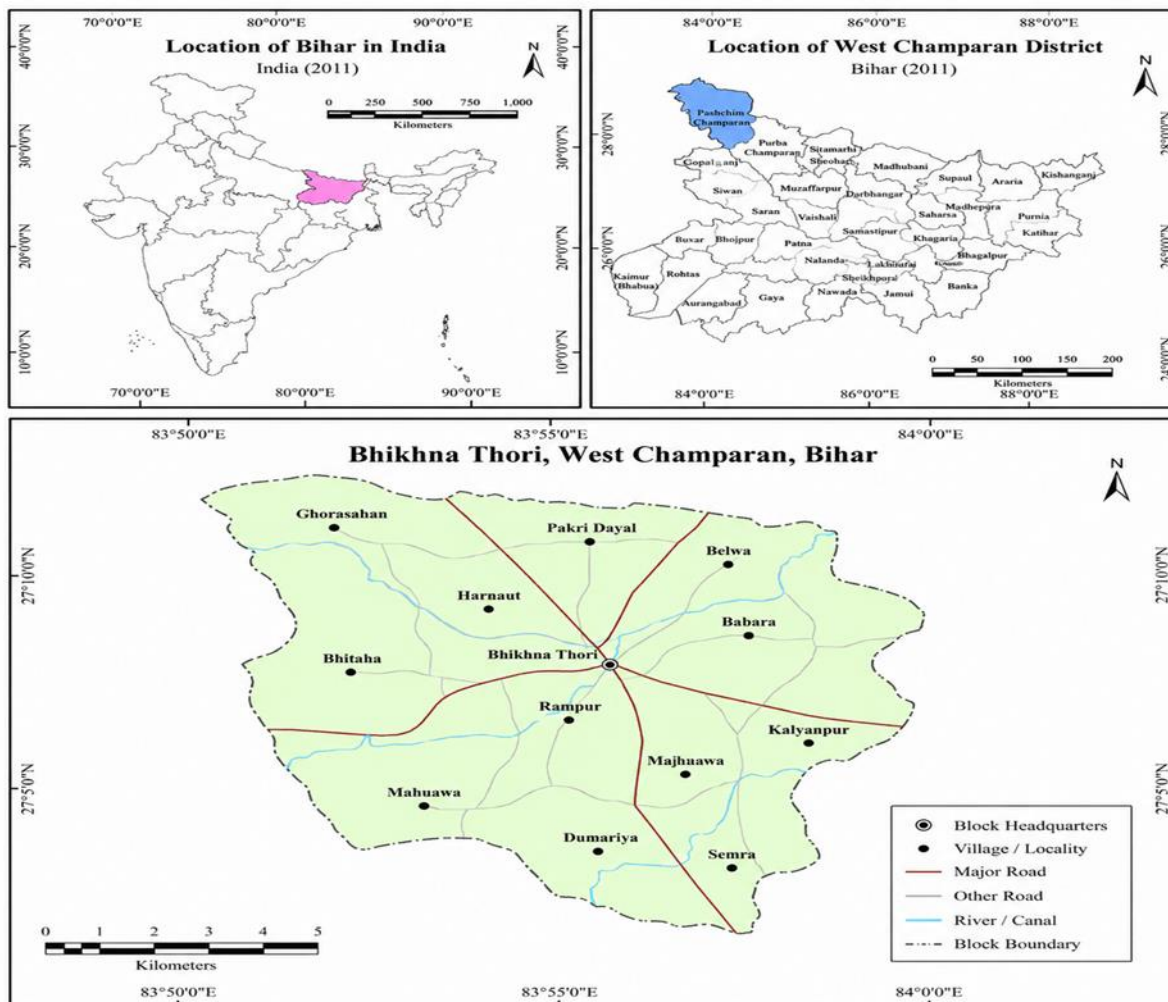
INTRODUCTION

An economically valuable resource found in river channels and flood plains, sand is a naturally occurring granular substance made of finely broken rock and mineral particles. It is also a major source of silica for producing sodium silicate, a chemical compound used in the construction industry to make both ordinary and optical glass. Sand mining has been a human activity from the beginning of time. Prospecting for ore bodies, evaluating a prospective mine's profit potential, extracting the needed resources, and restoring the land when the mine closes are all part of contemporary mining operations. Illegal sand mining is defined under section 3(e) of the Mines and Mineral Development and Regulation Act, 1957 (MMDR Act), which means the mining of sand from the riverbeds without a license or permit. In the study area, it is done by mining more sand than the authorised amount. There were over 27,000 cases of illegal mining of minor minerals (mostly sand) in the country during 2024–2025. This has resulted in riverbank erosion, increased flooding, and a severe threat to biodiversity. Local environmentalists and NGOs have now raised public awareness and called for a ban on this kind of illegal river sand mining. The sand is extracted in the study area from the riverside, formed millions of years ago, and is now the stage where river sand may no longer be available. It is already losing biodiversity, and sand extraction will further destroy it. To end river sand mining, the state government should ban it in the next few years and encourage the use of manufactured sand.

STUDY AREA

Bhikhna Thori is one of the most attractive destinations in Bihar, situated at 27°20'N latitude and 84°37'E longitude (adjacent to the Indo-Nepal border), in the foothills of the Himalayas in the Govardhana region of the Valmiki Nagar Tiger Reserve Area in West Champaran district. It is a frontier settlement in Nepal's Parsa district, with Thori Rural Municipality on the other side. It is well-known for a historic railway line that was abandoned in 2015. In the pre-British era, Bhikhna Thori was the sole road connecting India and Nepal, making it historically significant. The village is claimed to have gotten its name from Buddhist monks known locally as "Bhikhshu" or "Bhikkhu," who used Bhikhna Thori as a stopover while travelling from Tibet to India via Nepal. This place exemplifies the social harmony and economic interdependence of both countries. Bhikhna Thori is home

to the Tharus (the most populous tribe in Bihar), along with animals, resources and dense forest. This region is dominated by vast low-lying denudational plains intersected by numerous streams originating from the Himalayan ranges.



Source: Prepared by the authors

RESEARCH METHODOLOGY

The research process links the raw data and the final analysis. The "Local People Perspective Approach" concept is used alongside a questionnaire containing open- and closed-ended questions to capture the local population's viewpoint as a key data source. A judgmental random selection technique was used to select a total of 54 respondents, with around 15 respondents from each village chosen for the interview. The villages were sampled to get reliable data, considering the intensity and spatial distribution of floods as well as the size of the communities in terms of both area and population.

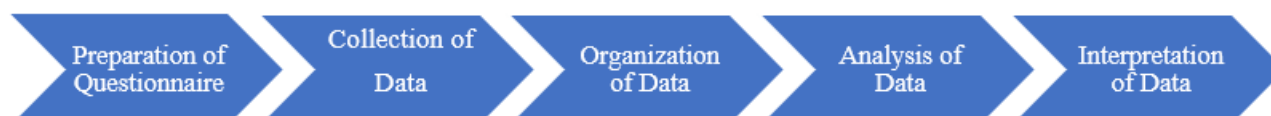


Figure 1.1: Data Processing, Prepared by the Author

This study is based on a survey of three ghats in this region: Manpur, Sithi, and Manguraha. A convenience random sampling method was adopted to conduct the survey. The study considered the opinions of tractor drivers, Munsies, and contractors. This research used an interview- and questionnaire-based survey among the various people involved. Simple statistics were used

in MS Excel to analyse the data. The research area's rainfall distribution was explained using straightforward statistics. Straightforward graphing techniques were used to explain the various aspects affecting the socioeconomic characteristics of the study area and how the exploitation of traditional water resources impacts them.

RESULTS AND DISCUSSION

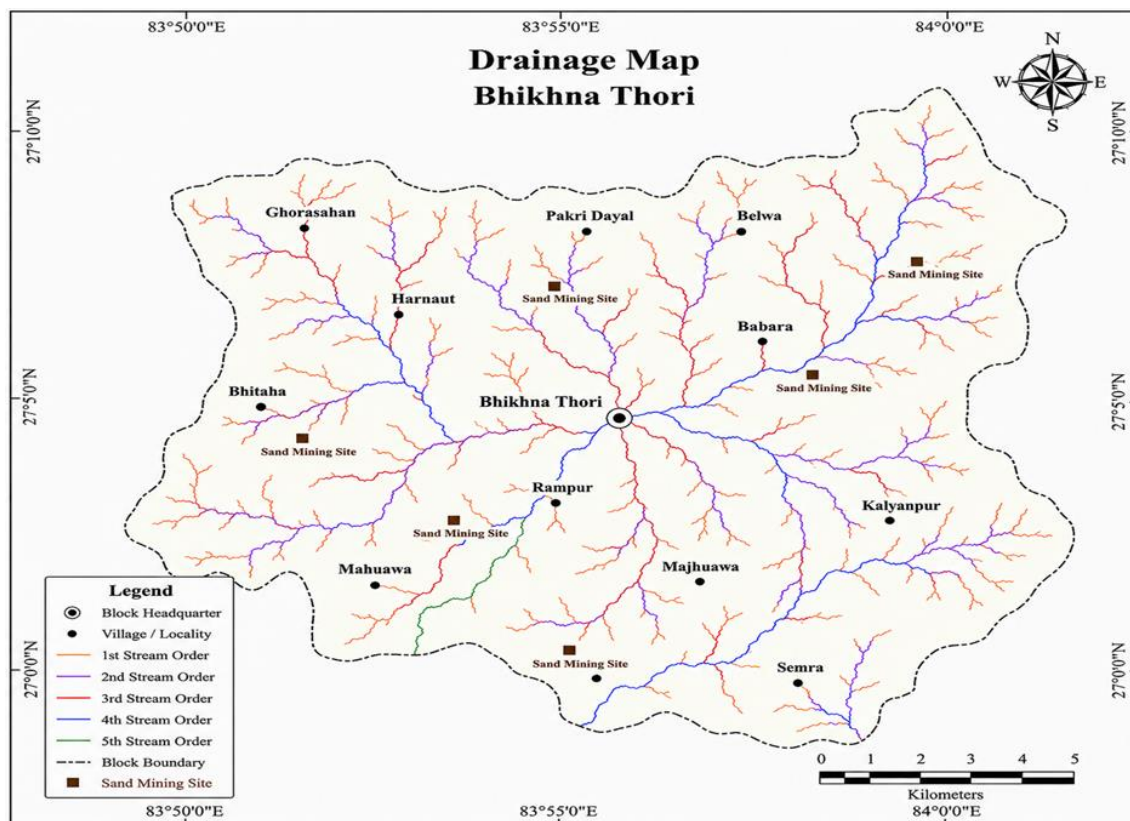
The district has suffered large-scale forest denudation. Forests are confined to the northern tract, particularly the Sumeshwar and Dun ranges. Many trees found in this region are Sal, Sisu, Tun, the red cotton tree, and Khair. In the moist lands of the Terai, clumps of bamboo, sabai grass, and narkat, etc., are found in the district. Since this region is situated in the foothills of the Himalayas, it is home to several small regional rivers; sediments carried by them are considered gold in this region because the river water carries boulders and stones with the sand in ample amounts (most of the rivers of North Bihar only carry sand as sediment), so it became more precious and prone to mining. River sand mining is common because habitation concentrates along rivers, and mining locations are preferred near markets or along transportation routes to reduce transportation costs. River sand mining can damage private and public properties as well as aquatic habitats. River. The area is exposed to soil erosion, occasional floods, and mild to moderate droughts. Some parts of the district remain waterlogged year-round. Common landscape features include oxbow lakes, back swamps, floodplains, and chaur land, which forms the wet area occurring mostly in the southern part of this region.

The small hills of Bikhna Thori are composed mainly of loose sandstones and limestones and are the origin of many small regional rivers and Nalas. They carry ample amounts of high-quality sand and stone as sediment, and when they enter the Tarai region, their basins widen, and the sediments are exposed; this creates a golden opportunity for contractors to mine without control. This exposure also reduces mining costs and time. Because of its proximity to the source, the sand granules are quite large, making them ideal as building material. The sand mined here contains many boulders, which cost much more than other sands. In the whole Tirhut Division, only this region produces such fine-quality sand. So, the demand for this quality of sand is quite high. After the implementation of the National Forest Policy (2006), the forest department prohibited rock mining in this region; hence, the need for boulders increased sand mining in the river basins of Gandak, Pandai, Maniyari, and Sikrahana.

HISTORICAL BACKGROUND

Since the time of the Ramayana, this region of Champaran has been known for its cultural heritage. In the dense forests of Valmiki Nagar Tiger Reserve Area, the sons of Ram and Sita were born in the Ashram of Maharshi Valmiki. The freedom struggle of Mahatma Gandhi also started there in 1916. After independence, this region saw the darkest era from 1947 to 2005. A state highway from Patna to Bikhna Thori (*a border village of India and Nepal*) and the Pakka houses built under the Indira Awas Yojna brought a new dimension of development to the district, increasing demand for building materials. After 2005, Nitish Kumar regularised the panchayat elections and gave special financial powers to Gram Pradhans, and the government gave preference to road construction. As a result, demand for building materials increased. As a result, the people involved in mining became rich. After 2006, the government started regular and partial bidding for the mines, but rapid infrastructure growth in the area created a need for more sand and boulders.

This boosted illegal mining. Over the previous 7-8 years, this illegal mining became much more organised and turned into a syndicate involving money, muscle, and administration.



NUMBER OF LEASES

There are three major ghats in this region, along with 33 small ghats along the river sides of Gandak, Sikrahana, and Pandai, where illegal mining is prominent. Manpur sand ghat, with the highest area in this region, has an output of more than 1000 tractors of sand per day because of the good quality of sand and boulders.

Table 1.1 Prominent Sand Ghats of Study Area

Name of The Sand Ghat	River	Area (hectares)
Manpur Sand Ghat	Masan	4.5
Sithi Sand Ghat	Sikrahna	2.4
Manguraha Sand Ghat	Pandai	1.87

(Source: Geological Survey of Bihar, 2025)

According to a shareholder and munshi, these Ghats have ample fine sand and boulders due to their nearness to their origin, so demand for sand from these ghats is highest in this region. Sithi and Manguraha have less developed transportation, so demand from these ghats is low; also, the sand from Manguraha contains few boulders, so demand is quite low.

Table 1.2: Amount of Mining from Major Ghats

Name of Sand Ghat	Number of Tractors Loaded Per Day
Manpur	1000-1200
Sithi	700-800
Manguraha	200-300

(Source: Primary Data, 2025)

IMPORTANT CLAUSES AND SYSTEM OF MINING IN STUDY AREA

The state government started regular online bidding for sand mines after 2006, as per the instructions of the Honourable Patna High Court, which brought transparency to this mining system. New Bihar Minor Mineral Rules 2018 proposed some clauses of a quarrying permit or a mining lease, which state that no mineral concession or lease shall be granted in respect of any land within 50 meters of any village, bridge, national highway, or reservoir except with the prior approval of the State Government; no quarrying shall be permitted within 46 (forty-six) meters distance from Flood control embankments. The quarrying shall be restricted up to a depth of 1.80m within 46 (forty-six) meters to 61(sixty-one) meters distance from the said embankments. It shall be further restricted up to a depth of 2.40 meters within 61 (sixty-one) meters to 91 (ninety-one) meters distance from the aforesaid embankments.

Table 1.3 Revenue Received by Government in the Last Three Years

Year	Revenue (In Lakh Rs.)
2022-2023	1162.66
2023-2024	1711.92
2024-2025	1836.73
Total	4711.31

(Source: Ministry of Mines, Government of Bihar, 2025)

The table above shows the revenue generated by the government from this district, and Manpur sand ghat contributes the most revenue because of the high demand for sand. As per the Ministry of Environment, the lease should be closed in the rainy season (in July, August, September, and October) so before that closing period, they mine the sand as much as they can, in this race they ignore the norms provided by the government even in this rainy season they illegally mine the sand with the involvement of local authorities, which creates havoc for the villages near which are in the radius of the flood area.

Market

Due to its superb quality, the sand extracted from here is considered gold; the sand of all three ghats is being sold to Gunaha, Narkatiyagunj, and Ram Nagar blocks, in which there are more than 250 villages. Nowadays, each chawk, aka the village marketplace, has shops that sell construction materials. They have their tractors and have their agents at each of the ghats, which provide the amount of sand you need at the construction sites. They have a multi-tier system that can provide any amount of sand, whether the lease is open or closed. In the rainy season, when the lease is closed, their illegal system is activated, and they use different routes or money power to meet demand, which boosts this illegal syndicate.

Breach of Clauses in this Area

Most notified ghats in the Bhikhna Thori region do not require clearances from the Ministry of Environment, and this is the system's main drawback. As a result, private contractors can mine as much as they want and expand the area as they want. This region falls under the Tiger Reserve Area, but forest officials have little say because of a clash with the local administration. The district administration only regulates the mine; i.e., they have the authority only to shut it down or open it. Sand is considered gold here; anywhere or in any amount they find it in or near the river basin, they start to dig it.

The contractors here do not care for any environmental norms or ethics. With the opening of the lease, they mine whatever amount they want (they mine more than 500 tractors per day, but the permission is only for 200 tractors from major and 150 from minor mines). As per the instructions of the authorities, mining should be done within 46 meters of the flood control embankments, but it is ignored completely, and the limit of mining is 3 meters deep from the earth's surface; this is completely ignored with the help of highly mechanized JCB machines they dig 8 to 10 meters at many places in the river basin which is causing of floods in this area. It is instructed that agricultural lands should not be used for mining, but in this area, one can get boulders up to three to four meters, so they also mine agricultural lands to maximise profit.

Why is it illegal?

The hills of the Bhikhna Thori region are the place of origin for several small rivers. So, the sediments it carries consist of boulders along with sand (because of its proximity to the origin). This is unique to this region because most sand mines in Bihar consist only of sand. So, the sediment it carries is considered Gold. Since they are notified as sand ghats, the government collects revenue only for sand; however, the sand mined in this region contains ample boulders and is sold at four to five times the price of normal sand, yet the government receives very little revenue.

Table 1.4 Cost of the Sand

Rate Per Tractor	Loading
800	Sand (Revenue given to the Government)
2200	Being sold to customers
4000	Sand (when the lease is closed)
4500-5500	Sand with Boulders
Up to 10000	Sand with Boulders (when Lease is Closed)

(Source- Primary Data)

As per the Ministry of Environment, the lease should be closed during the rainy season (July, August, September, and October), so before that closing period, they mine as much sand as they can; in this race, they ignore the norms provided by the government. Even in the rainy season, they illegally mine sand with the involvement of local authorities, causing havoc for villages near the flood area.

Who and How It Is Operating?

The Munsies, aka Ghat Managers, manage the ghats, including all financial matters; manage local people and administration; and earn maximum profit for their owners. This syndicate works on three levels; at each level, they try to make more and more profit, and this is the main reason behind this illegal syndicate. The government has limited the quantity of sand to be mined per day, but twice that amount is being mined. Most of the ghats have a good quantity of boulders, so they are under more threat because they give more profit.

The government has made the norm that only 50 CFT of sand can be loaded on a trailer. Still, the loading is more than 65 CFT most of the time, which earns extra money for them, but when the administration seizes the tractor for breaking the norms like overloading, mining during the closure of the lease period, mining from an unnotified area, tractors older than ten years and tractors without a GPS. The cuts, or commissions, are regularly sent to the authorities so that, in case of tractor seizures or any catfight, they can resolve it. Illegal mining is mostly done in the ghats, which are in the interior and less under surveillance, so they use agricultural land as a path for tractors, destroying hectares of land. The leases are closed in the rainy season to prevent the embankments from flooding and to prevent nearby villages from flooding, but they use the jungles to create routes and smuggle sand.

Role of Money and Muscle

This region is one of the most backward areas of Bihar, so the reach of the fourth pillar of democracy is very ineffective. The people involved in it interfere in most of the aspects of the livelihood of the people of this area which is why the media has the least interference in this matter usually they print of tractor seize only which has not any logic at all they never print the name of the contractor or the lease owner, because they get the equally cut (in the last three months there were only 31 tractors seized for illegal activity, according to the prominent newspapers like Hindustan and Dainik Jagran. Since most of these ghats are in interior areas, they do not have permanent roads, so contractors use agricultural fields as roads for their tractors, which destroys the land and its productivity, and sand and debris from the tractors make the fields unproductive for years. They threaten farmers into allowing tractors to pass through their fields. NGOs and other organisations working in this area do not intervene for fear of retaliation. After the floods of 2017, local people and tribes lost their livelihood options, and the district lost

infrastructure and other property worth 300 crores; then they started to raise their voice against this syndicate. But soon after the death of a local journalist in suspicious conditions, no further news came.

Impact of Illegal Sand Mining on Rivers

Instream mining lowers the stream bottom, which may lead to bank erosion. Excessive instream sand mining threatens bridges, river banks, and nearby structures. Sand mining also affects the adjoining groundwater system and how local people use the river. Instream sand mining destroys aquatic and riparian habitats through large changes in channel morphology.

Impacts include bed degradation, bed coarsening, lowered water tables near the streambed, and channel instability. These physical impacts degrade riparian and aquatic biota and may undermine bridges and other structures; continued extraction may also degrade the entire streambed to the depth of excavation. In the case of Bikhna Thori, the main essential rivers of this area, Gandak, Pandai, and Sikrahana, are facing serious threats due to this frequent illegal sand mining. Rivers are facing extensive damage to their embankments in Sikta, Mainatad, and Gaunaha; as a result, frequent floods were common in this region in the previous decade, and the number of people affected by floods is increasing year by year. In the major flood of 2017, approx. 250 people died in this area alone, and the financial losses were 300 crores; the main reason behind these floods was illegal sand ghats, which distort the river embankments.

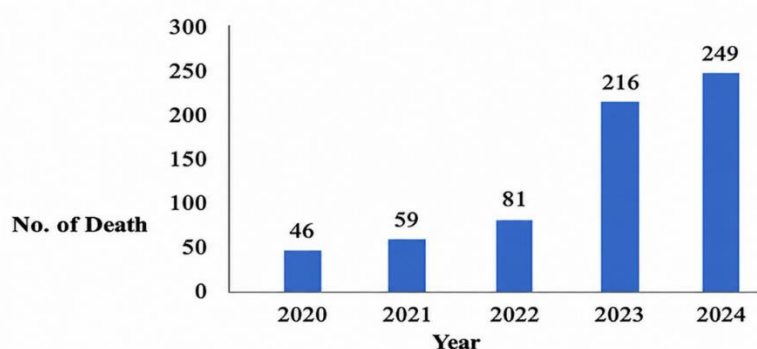


Figure: 2 No. of Deaths due to Floods.

Source: Office of District Magistrate, 2025

Impact of Illegal Mining on Forests

Faunal populations decrease when vegetation is completely removed, and the soil profile is destroyed, destroying habitat above and below ground, as well as within the aquatic ecosystem. Increased car traffic from sand mining has a detrimental effect on the environment. Access roads may affect the surrounding environment when they cross riparian areas. Beyond the immediate mine sites, stream mining can have further expensive consequences.

Every year, rich timber resources, wildlife habitats in riparian areas, and many hectares of lush streamside forest are destroyed. Degraded stream ecosystems diminish fisheries production, biodiversity, and recreational potential. Severely damaged waterways may reduce land and aesthetic values. In the Bikhna Thori region, illegal sand mining has adversely affected the forests near the sand ghats. After originating in the mountains (Lower Shivaliks), the region's main rivers flow through the dense forests of the Valmiki Nagar Tiger Reserve Area, which is rich in tree species, and the forest receives less administrative surveillance on rainy days. When the district administration orders a stop to mining on notified ghats on rainy days, sand smugglers develop new routes through forests to mine sand from unnotified areas. As a result, flora and fauna in this region, along with the forest ecosystem, are adversely affected, and during the rainy season it becomes difficult for the administration to monitor them. Along with sand, they usually smuggle timber, and these disturbances have increased attacks by wild animals on villagers in recent years. So, strings of electronic cameras and drone bases have been installed in the Valmiki Nagar Tiger Reserve Area to monitor suspicious vehicles.

Impact of Sand Mining on Local Agriculture

The economy of the West Champaran district is based on agriculture. It has the highest number of Tharu tribes, mainly concentrated in the Bhikhna Thori region. Due to its proximity to the foothills of the Himalayas, the land is very fertile. Because of the Tarai region, ample rock is found 3 to 5 meters below the earth's surface, which creates ideal conditions for sand and boulder mafias. After 2007, the Government of Bihar completely banned rock mining in this area because of the hard implications of the National Forest Policies. Bhikhna Thori falls under the Valmiki Nagar Tiger Reserve Area, and the UPA Government allocated a large amount of money to this area under the Indira Aawas Yojna for tribal housing. This created a shortage of boulders and stones for house building, and it was the main reason behind the rise of Sand and stone mafias; they started several illegal stone crushers. As demand for boulders grew, they started digging up more and more cultivable land. Even the local Tharu tribe was involved; they started digging up their agricultural lands, on which they had depended for decades. This illegal construction industry boomed after this because crushing the stones also yields sand and boulders. The hectares of land became pits in this region. Previously, sugarcane fields were used to create barriers to protect against frequent floods, but without them, the large floods in 2016 and 2017 occurred, causing a huge loss of life and economic damage. After efforts from local NGOs and the government, people are slowly reducing these practices.

Impact on Health

This paper shows that a riverbed retains water in summer by acting as a sponge. Many rivers in this region are already on the point of permanently drying up due to unsustainable and illegal sand mining. The Pandai and other rivers have large pits and ditches from mechanised, excessive riverbed excavation for sand; as a result, aquatic habitats are endangered, the rivers' natural flow is disrupted, and the nearby water table drops due to over-extraction. This can create serious drinking-water problems, and during these times, the villages surrounding these areas can become ghost areas. Women from the Tharu tribe are more likely to lose their livelihoods because economic marginalisation limits income diversification. Women's limited access to employment opportunities reduces recovery chances after flood-related displacement, and their duty to collect water for household use increases their burden under water scarcity. Extreme poverty is reflected in child work in the sand mining industry, and children are involved in sand extraction to support households that have lost income due to a smaller adult population. According to a report by SANDRP, the children working in sand extraction are exposed to heavy machinery, silica dust, and forced labour. Over the 16 months from December 2022 to March 2024, India recorded several incidents and violent acts linked to sand mining. 418 people died, and 438 were injured nationwide as a result of sand mining-related causes.



Figure 1. Conceptual Framework for Assessing the Effects of Sand Mining on Human Health
(Source: Compiled by the researcher)

CONCLUSION

River basins are considered the main source of sand. Sand from river basins is obtained through mining. The price of sand depends upon the presence of boulders in it; if it has more boulders, its price would be higher. To make more profit from sand mining, private contractors to whom the lease is allotted have started breaking government regulations, which is the main cause of frequent floods and environmental degradation in this region. Illegal sand mining threatens local people, forests, and agricultural lands. Soon, it will cause havoc in this region. Breaches of rules and regulations, and uncontrolled mining to maximise profit, have become a curse for this region. Frequent floods are very common in this region. For boulders, farmers and sand mafias have started digging on cultivable land, which will lead to land degradation. So, proper steps and improvements in the system should be taken to conserve the most beautiful location of North Bihar along with the Valmiki Nagar Tiger Reserve Area.

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