

Sand Extraction and Its Impact on the Livelihood of Rural People of Bangladesh: Evidence from Brahmaputra River

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Abstract: The demand for sand has risen dramatically as a result of rising urbanization and industrialization. Sand becomes a scarce resource. In Asia, sand demand is described as "non-linear." For example, China used more sand to produce concrete in 2011 and 2013 than the United States did in the whole twentieth century. The government delegated sand extraction to private parties. Sand grabbers take sand in a variety of unlawful and unexpected ways since it is considered a successful industry. Illegal sand extraction has negative consequences for the riverine ecology and people's livelihoods. Most newspaper articles focus on the negative effects of unlawful and sand mining in underdeveloped nations like Bangladesh, where a large number of people rely on river-based economies to meet their fundamental necessities. Academics have mostly disregarded the social aspects of sand extraction. In this regard, the purpose of this paper was to investigate the effects of sand extraction on the lifestyle of people living along riverbanks and chars. Primary data was obtained from Chilmari (Sub-district), Kurigram, where the Brahmaputra River has an impact on people's lives in various ways, in order to achieve the research's goals. Using primary and secondary data, it can be concluded that unlawful and unplanned sand extraction contributed significantly to the destruction of the river-based ecology and environment. Individuals, communities, and states lost human, natural, social, and physical capital (property) as a result of degraded ecosystems and environments. Finally, it had an impact on the life of Bangladesh's riparian people.

Keywords: sand extraction, livelihood, common properties, river-based ecosystem, environmental pollutions

I. INTRODUCTION

Sand extraction, often known as sand mining, is a major mining component around the world. Sand extraction is a contentious topic. Sand extraction has often been observed to have both beneficial and bad aspects. According to Filho et al (2021), the majority of researchers believe that the negative effects of sand extraction exceed the good effects of sand extraction. Table 1 shows the harmful effects of sand mining on the ecosystem. Contribution to poverty reduction, economic growth, and creation of new habitats for plants and animals, and formation of new reservoirs are all positive aspects of sand mining (Prothom Alo, 23 January, 2018). To lessen the negative effects of sand extraction, it is frequently recommended that stakeholders avoid 'indiscriminate sand mining' (Padmalal & Maya, 2014).

Sand is an important component in construction and development operations. Because of a variety of variables including economic expansion, government legislation, and societal expectations, the usage of sand in development activities has expanded. Sand is utilized in a variety of industrial processes in addition to construction (Filho et al, 2021). In Asia, sand demand is described as "non-linear." For example, China used more sand to produce concrete in 2011 and 2013 than the United States did in the whole twentieth century (UNEP-GEAS, 2014). India is another large sand-consuming country. In the building industry, sand is referred to be the "second most commonly used raw material." The need for sand is steadily increasing. For example, India's real estate market is expected to grow by 30% over the next decade. Aside from that, the demand for sand will rise as additional roads, dams, bridges, and individual houses are built (Moudgil, 2017). Relying on the reports of newspapers and comments of concerned stakeholders, it can be noted that a similar situation has been observed in Bangladesh. This country is implementing huge construction-related development activities and the demand of sand has been increased manifold. The demand of sand might increase in future (Khan, 2022).

Despite having increased demand of sand, lives and livelihood of people of developing countries have been disrupted because of illegal and unplanned sand extraction. But, studies rarely focus on the impact of sand extraction on the livelihood of the people of developing countries. The literature review section indicated that sand mining brought several negative impacts on the natural environment, including river ecosystem and economy. Most of the related studies are biased to explore the impact of sand mining on environment (for more details please refer to section 2). The details of human-nature interaction considering the sand extraction as a case have not been explored. In this connection, an academic effort is needed to explore the relationship between sand extraction and livelihood of the concerned geographical location. Apart from this, to our best knowledge, there is no accessible research on 'sand extraction' and its impact on the lives and livelihood in Bangladesh. However, the context of this country has been chosen for some specific reasons. The reasons are: (i) Bangladesh is known as 'nodimatrik' (riparian country) country (Hasan, Shahriar & Jim, 2019), and lives

and livelihoods of Bangladesh are directly and indirectly linked to river. (ii) Around 90% rivers are victims of illegal sand extraction. (iii) State of environmental governance is not well capable to tackle the indiscriminate sand mining & (iv) Sand mining induced environmental cost may bring bad impact on the lives and livelihoods of common people of the concerned geographic connection. Because of the above noted factors, the study would like to explore that to what extent sand extraction influence the lives and livelihood of the people of Bangladesh who lives on the banks of the river of the *Brahmaputra* and its chars.

II. LITERATURE REVIEW

A non-systematic literature review identified a good number of critical issues. Firstly, our literature survey considers the geographical focus of the sand extraction-related studies. It uncovers very few studies that based on the primary data rarely consider the context of Asia even though most of the sand of the world is used in this region. Few reviews consider the global context. Most of the related studies are focused on the Global North. A review article (Koehnken *et.al*, 2019) noted the geographical focus of sand related studies as, “*Most papers focused on the river systems in Europe (23) and North America (16)*” (Koehnken *et.al*, 2019: 354). Recently Filho *et.al* (2021) conducted another systematic review. The geographical focus of the study showed that the Asian countries, mostly the developing countries remained unexplored. In this connection, an effort that will uncover sand related dynamics of the Global South is needed. Secondly, the literature review of this writing uncovered the focus of the studies. It has been found that the impact of sand extraction on environment is explored widely. More specifically, the studies identified how and to what extent sand extraction impacted on environment, inland biodiversity and rivers, coastal and inland erosion climate and economy (Pascal, 2014). Most of the research examined the social impact focusing on the economic perspective. Other social issues remained as unexplored. Only, Bendixen *et.al* (2021) explored the relationship between the sand extraction and its impact on the selected indicators of Sustainable Development Goals (SDGs). The scholarship, mostly, relied on theoretical arguments. It lacks empirical evidence. However, regulation and management of sand mining or extraction are critical. Mostly, policies, social norms and values determine the features of human-river interaction. Thus, during the management of regulation and management of sand mining features of human-nature interaction must be considered with special attention.

Like other social perspectives of the environment, human-nature interaction has remained ignored by the academia (Soga and Gaston, 2020). Most of the sand related studies ignore several significant issues of sand extraction or mining, such as human-nature interaction. Considering the core understanding of human-nature interaction, it can be argued that if human interacts with nature negatively, human beings

will suffer differently. Degraded nature influences the lives and livelihood of the selected geographical location or adjacent area. Thus, the impact of sand extraction on the lives and livelihood must be explored if we would like to draw a clear picture of human-river interaction.

As it has been noted earlier that the demand for sand has been increased manifold in developing countries, a similar situation has been observed in Bangladesh. Relying on newspaper reports, it can be noted that both legal and illegal sand extraction has now become a reality. Even though huge sand extraction is observed in Bangladesh, academic explanation of sand extraction and its impact on lives and livelihoods remain an untouched issue. However, several articles deal with water pollution and river pollution; these studies do not explore the impact of sand extraction on livelihood of riparian people of Bangladesh (Hasan, Shahriar & Jim, 2019; Uddin & Jeong, 2021). In this connection, this research has been conducted considering the context of Bangladesh.

III. METHODS

Bangladesh is considered as a case because a large number of rivers passed through this country. The lives and livelihood of common people are very much influenced by the rivers and river based resources. Among the rivers, the *Brahmaputra* is known as the longest river of this country. For selecting the study location Chimary Upazila (Sub-district), of Kurigram district is selected as study location. The *Brahmaputra*, one of the biggest rivers of Bangladesh intersected the sub-district. Apart from this, the sub-district is popularly known for being the home of a number of water bodies. The most significant water bodies of this sub-district are: Chaslar Beel, Udnar Beel, Magurar Beel, Shouldhukrir Beel, Pedi Theorar Beel, and Horinnar Bandha Beel (Banglapedia, 2020). For collecting primary data this paper relied on qualitative data collection techniques such as, ‘focus group discussion’ (FGD) and ‘key informant interviews’ (KII). To support primary data, this writing collected information from published and unpublished documents. One pre-formulated guideline has been used to collect data from local people, mostly, those who live in *chars* (river island) and river banks. A total of 30 respondents (including male and female) were included in this research. Ten (10) key informants, such as local government representatives, journalists, member of political parties, and environmental activists were interviewed to supplement the FGD data. For collecting and accumulating primary data, this research follows three steps. Firstly, researchers conducted FGDs with the primary stakeholders who are directly influenced by sand extraction. Secondly, KIIs were conducted. Thirdly, the authors conducted interviews and FGDs in Bengali language, and the data were translated into English.

IV. THEORIES

The diversity, complexity, and extensiveness of human-nature interaction are wider than what we imagine. In this

connection, Soga and Gaston (2020) rightly noted this interaction as complex and multi-dimensional. According to them, “[...] *human–nature interaction occurs when a person is present in the same physical space as nature or directly perceives a stimulus from nature*” (Soga & Gaston, 2020:1). This definition considered only the physical interaction between human and nature. Since the definition does not include the indirect aspect of human-nature interaction, then this research searched for another definition of human-nature interaction which views human nature interaction from a broader perspective, including social system perspective. Relying on the understanding of Martin (2001), Lill & Gräber (2006) defines Human Environmental Interactions as “*interactions between the human social system and (the “rest” of) the ecosystem*”. This definition refers that the

‘human social system’ interacts with nature. The river-based ecosystem is very much significant both for the environment and livelihoods of the people of Bangladesh because the country is popularly known as a riparian country. The theory section of the writing would like to explore a theoretical framework to explore the relationship between ‘sand extraction’ and its impacts on the livelihood of this country.

Relying on a literature review Filho *et al.* (2021) offered a framework to unveil the relationship among sand extraction, environmental effect, and social & economic impact. Relying on the offered framework of Filho *et al.* (2021) this section would like to prepare a customised framework of river-people interaction in Bangladesh. The following figure describes the impact of sand extraction on environment and society.

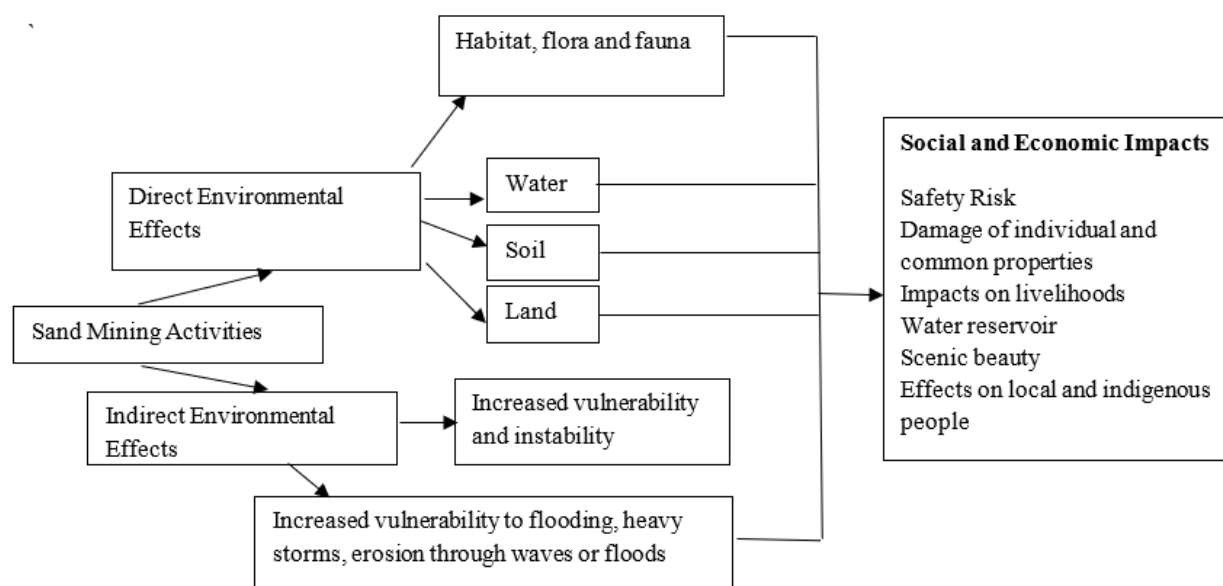


Figure-1: Impacts of Sand Extraction on the lives and livelihoods (Adopted and revised from, Filho *et al.*, 2021: 11).

As per Filho *et al.* (2021), sand extraction brings direct and indirect environmental effects. The model theoretically may divide the environmental effect of sand extraction directly and indirectly. In reality, it is hard to make a clear distinction between the direct and indirect effects of sand extraction. To avoid this complexity, Filho *et al.* (2021) tried to show the linkages between indirect and direct environmental effects of sand extraction. It makes the model complex. However, the model attempted to explore the impact of sand extraction from social and economic perspectives. Apart from this, this model makes a connection between economic and social impacts. In reality, it is hard to make a clear distinction between social and economic impacts. Since this study would like to capture the experiences of local people, it relied on a simplified framework. Mostly, it explores three broad issues: (i) Environmental and morphological aspects (ii) property and livelihood-related impacts, and (iii) common properties and societal impacts.

V. SAND EXTRACTION: GLOBAL AND BANGLADESH CONTEXT

Bangladesh is the land of around 700 big and small rivers (The Daily Samakal, February 8, 2018). River-based ecosystem and economy are hampered by different kinds of river pollution (Uddin & Jeong, 2021). Sand extraction is one of the human activities that hamper the river-based ecosystem of this country in different ways. It is not easy to find out the real picture of sand mining and extraction in Bangladesh since there is no nationwide survey on sand extraction. Riverine, a non-government organization working on the rivers of Bangladesh identified that sand has been extracted from 80 percent rivers of Bangladesh. The report was based on the news or reports of local and national newspapers of Bangladesh. This estimation may not present the actual scenario of sand extraction in this country because it only relied on the published reports of newspapers and newspaper reports do not always capture all the sand extraction-related

news. Thus, the actual scenario of sand extraction is much higher than the reported news. Very repeated news related to sand extraction from river come out in daily newspapers. For instance, we searched sand extraction-related news in the online version of the daily newspaper Prothom Alo. This newspaper has been chosen because it is popularly known as the most popular Bangla newspaper in this country. This research searched the website of the newspaper using the Bengali word “Balu” (including inverted comma). From 1st January 2020 to 31 December 2021 total of 940 newspaper reports were found (Newspaper Analysis by the Authors, 2022). All sand extractions are not illegal. The table-2 presents the portfolio of legal sand extraction in Bangladesh:

VI.RESULTS

6.1 Morphodynamic Changes and Environmental Issues

A good number of newspaper articles and a limited number of academic articles articulated that the rivers of Bangladesh experienced physical, geomorphic, and structural changes (Islam et al., 2021; Rahman, et. al, 2021). Islam *et al.*, (2021: 181) describes the situation as, “[...] vertical and horizontal changes over six months in the selected segment of the Padma River valley have been triggered by mining activities”. The human interaction (such as sand mining) is regarded as one of the critical responsible factors for bringing faster “morphodynamic change” in a river than any kind of natural process, such as erosion and sedimentation. Morpho-dynamic changes have, also, been found in the *Brahmaputra*, and the *Meghna* (Rahman, *et al.*, 2021). This study attempted to explore the people’s perception regarding the changes of physical, geomorphic and structural changes of river and sediments. Data presented in table-1 presents people’s perception regarding changes in river-based ecosystem because of sand extraction.

Table 1: Physical, geomorphic, and structural change in river and sediments

Indicators	People’s Perception (FGD Findings)
Habitat, Flora, and Fauna	People do not get enough fish and other habitants, <i>shamuk</i> (Oyster), <i>jhinuk</i> (Snail) and river based plants and birds.
Water	The colour of the water has changed. Local people experienced prolonged monsoon and unexpected floods.
Soil/ Land	People experienced river bank erosion and changes in the fertility of land.
Air	Air pollution is found because of sand components and carbon dioxide emission because of fuel used in draggers and transports.
Sound Pollution	Draggers are used to extract sand, and transports are used to transfer sand from one place to another place. Draggers and transportation produce sound.

[Source: Field Data (FGD), 2022]

The notable environmental damage due to sand mining is negative changes in local flora and fauna. Damage of flora and fauna brought negative consequences on the lives of fishes and other fresh water-based habitants. (Prothom Alo, January 23, 2018).

As per the opinion of the common people of Bangladesh, they found a change in the water quality of the selected rivers. They, also, found the mixing of sand with water and water was found as unworthy of drinking for human beings and animals (FGD, 2022). The Department of Environment (DoE) of Bangladesh assessed the quality of the water of the selected rivers of Bangladesh and published it as “River Water Quality Report 2015”. As per the report, sand/earth filling is considered as one of the factors that played a significant role to bring the negative effect on the quality of river water (River Water Quality Report, 2015: 44).

Sand mining badly affected the river bed and banks of the rivers. In this connection, very often newspapers of Bangladesh published titled, “River erosion, sand extraction go hand in hand (The Daily Prothom Alo, February 14, 2021).” The country is popularly known as one of the vulnerable countries of the world where people faced different kinds of challenges because of river bank erosion. Its climatic conditions and geographical position invite river bank erosions. It has been estimated earlier that every year about 10,000 hectares of flood plain land were destroyed by riverbank erosions in this country (Cited in, Hasan, 2018: 216)

Draggers and transports used for sand extraction and transfer of sand from one place to another place worked as a source of air pollution. Apart from this, sand components mix with air and play a critical role in degrading the air quality of Bangladesh. According to DoE, 20 causes are responsible for air pollution in this country. ‘Commercial extraction and collection of sand’ are noted as significant factors of air pollution in Bangladesh (Cited in, Nafiz, 2021). Like air pollution, sand extraction and transportation produce sound pollution for the people and river-based habitants. Extracted sand is, also, used in grabbing the wetlands of urban areas of Bangladesh.

6.2 Livelihood and Sand Extraction from River

The above-noted sections retrieved that sand extraction from rivers brought diverse negative impacts on the river ecosystem and environment. The government allows sand extraction from rivers ignoring the environmental concern because it brings revenue. It contributes to poverty alleviation, economic growth, the creation of new habitats for plants and animals and the creation of new reservoirs. For instance, the income of government of Bangladesh from this sector has been around 63 cores BDT in the financial year 2018-19 (The Daily Jagonews24, February, 8, 2020). The following table presents the recent revenue generation from sand extraction.

Table-2: Legal sand extraction in Bangladesh

Year	Number of Sand Mine	Legally Allocated Sand Mines
2016-2017	765	434
2017-2018	706	381
2018-2019	550	308

[Source: The Daily Jagonews24, 8 February, 2020, <https://www.jagonews24.com/opinion/article/557798>]

Sand extraction indeed brought some positive impacts on livelihood. It has been identified by different studies that the negative impact of sand extraction on livelihood outweighs the benefit of sand extraction.

6.3 River Bank Erosion and Related Issues

Sand extraction is closely linked to riverbank erosion. A female respondent who lives on the bank of the river describes riverbank erosion in her locality. He described as,

“It is known to me that sand extraction from the river is harmful to both river and us. Because of the [...] sand extraction dwellers of river banks and chars of the river are affected badly. [...] make people homeless, landless and jobless. My neighbors lost their house, land, cattle and other resources with in a blink of an eye. Our men cannot catch fish in the river because there is no fish where dredgers are used (FGD, February 2022)”.

The aforementioned perception depicted that due to the sand extraction from rivers people experienced riverbank erosion. Riverbank erosion related literature identified that (Das et. al, 2014) extraction of sand from rivers “makes the flow oblique” (p.8). However, it acted as a cause of riverbank erosion, and it, also, played a significant role in filling the river bed with mud. Thus, it can be noted that sand extraction influenced riverbank erosion. Riverbank erosions are noted as one of the root causes of vulnerability of riverine people. A research identified that because of riverbank erosion more than 65% of people of a village experienced more than 4 times displacement in their lifetime (Chatterjee & Mistri, 2013, Cited in, Das et.al, 2014:22). The study, moreover, added that three types of impacts have been found on lives and livelihood because of riverbank erosion. The impacts are: social impact (homelessness, migration, and identity crisis), economic impact (loss of productive land, risk of poverty), and other impact (improper care of health, lack of educational attainment, criminal activities) (Das et.al, 2014:22).

6.4 Reduction of Farmland and Its Effect on Food Production

Illegal sand lifting poses a serious threat to farmlands. A headline of an internationally recognized newspaper can be presented as a piece of evidence. The newspaper highlighted the issue by publishing a headline as “Illegal sand lifting poses threat to farmlands¹”. The readers of newspapers of Bangladesh read that kind of newspaper regularly. A study cited that about 9,000 hectares of homestead and farming land are destroyed every year as a result of riverbank erosion (Barua, Molla& Rahman, 2019: 36).

The reduction of farmland, directly and indirectly, impacted livelihood, social status and food security. However, sand mining influenced the food security system badly in three ways. Firstly, illegal and unplanned sand extraction destroyed

the farmland and it reduced food production Secondly, it plays a critical role in running the total ecosystem of rivers that influences the production of fish and other water based plants and animals which are the food of human being and domestic animal (FGD, February, 2022).

6.5 Human Health Risk

Sand extraction generates direct and indirect human health risks. Degradation of water quality directly influences the health condition of people whose livelihoods are linked to rivers. Very often, sand mining-related activities take the lives of labors and common people. People of Bangladesh very often read that news in local and national newspapers. However, the laborers who are engaged in sand extraction and transportation they very often affected by air pollution and sound pollution-related diseases. Local people are, also, the victim of air, water and sound pollution (FGD, February 2022). Moreover, sand extraction directly influences the livelihood of common people and the changes in livelihood negatively influenced the health of common people.

6.6 Changing Occupation

A good number of people of river banks and chars are directly dependent on the river-based economy for their livelihoods. Sand extraction induced the destruction of the river-based economy and pushed people to change their professions. One of the male respondents describe the situation as,

“[...] my two family members were involved in fishing at the river. Last few years, they were not getting enough fish from the river. The money that they were getting from selling the small amount of fish was not enough to meet the basic needs of our family members. Around two years, we passed the days by reducing our basic consumption, such as rice. We hoped that the situation will change and we will get enough fish. But, [...] became hopeless, and now, do not go to the river. They are, now, working as agriculture laborers” (FGD, February, 2022).

6.7 Migration

The livelihood of a good share of the total population of the study area relied on river based activities. Because of the degradation of the ecosystem of the river, the river became less resourceful, and river-based livelihood is hindered largely. The previous section noted that the people who were involved in fishing moved to local agriculture related activities. FGD findings uncovered that the agricultural sector of the study area cannot accommodate all labors. Thus, they migrated to the big cities and the capital of Bangladesh. However, sand extraction induced riverbank erosion is another reason that makes people bound to take migration related decisions. Another research disclosed that riverbank erosion pushed 2, 00,000 people in a year to take migration-related decisions in Bangladesh (Barua, Molla & Rahman, 2019: 36).

¹ <https://www.thedailystar.net/country/news/illegal-sand-lifting-poses-threat-farmlands-1988801>

6.8 Conflict

Sand mining generates different types of conflict. Since illegal sand mining is considered as a big business and there is little regulation to tackle sand mining. To grab sand, local groups are engaged in conflicts with themselves. Apart from this, local people who are most affected by sand extraction raise their voices. Sometimes, it has been found that the people who raised their voices received threats. However, the sand grabbers assaulted them physically (FGD, February 2022). A newspaper reported that from 2017 to 2021, 9 people were killed and about 400 were injured because of the sand-extraction related conflicts in an adjacent area of the *Jamuna* river (Khan, 2022).

6.9 Damage of Common Properties

Illegal and unplanned sand extractions bring insurmountable challenges in managing the common properties or state-owned properties. Such as, sand extraction brought negative impacts on bridges, culverts, dams or embankments, playgrounds and educational² institutions (The Daily Star). The relevant news comes out in the national and local newspapers. For instance, a newspaper described the sand extraction induced common property damage as “300 Cox’s Bazar establishments at risk as dam collapse causes river erosion: Unplanned and illegal sand extraction by a syndicate, including the local UP chairman, caused the collapse (The Business Standard, 7 August 2021). While conducting field visits for this study, it has been uncovered that sand collection and dumping use common properties. In this regard,

“They [sand collectors] used open spaces, such as a playground, embankment, and schools. Our children do not get playground, we do not get enough space to use during the harvest of agricultural products (FGD, February 2022)”.

6.10 Destruction of Local Road

A good number of local people identified that transpiration of sands using big and heavy trucks destroyed the rural roads. According to one of the respondents of the selected Upazila, *“Rural roads are collapsing and becoming impassable as trucks transport soil and sand over day and night. We, the local people, are the worst sufferers of the illegal sand mining” (KII, January 2022).*

6.11 River Based Transportation

Local people of the Chilmari sub-district identified that river-based transports are hampered by sand extraction. In this regard, a farmer of the local area noted that before starting sand extraction in their locality an engine-driven boat was passing through their locality. At this moment, they are not getting the boat the sand extraction team occupied the ways of the boat. Because of the lack of water-based transport, local

people used road transport which is costly and time-consuming (FGD, February 2022).

6.12 Destroy of Scenic Beauty and Tourism

Different researchers noted that sand extraction badly impacted the scenic beauty of the rivers and riverbanks. The respondents of the study who lives in riverbanks or chars noted that sand extraction destroy scenic beauty. The destroying scenic beauty of the river hampered the local tourism and enjoying leisure time of local people. In this connection, one of the boat men describes the changing in scenic beauty. According to him,

“[...] a few years back many people came to our area to see the river, bird and local fish market. Now we do not see enough fish and because of sound pollution birds do not come to our area. However, our men and women do not get the opportunity to enjoy their leisure time because of sound and crowdedness” (FGD, February, 2021).

VII. DISCUSSION

The introductory section of this writing identified that sand is one of the significant minerals of the world and it has a good connection with river-based ecosystem. The demand for sands in construction has been increased in developing countries. Raising demand for sand played a key role in making the sand as a valuable product. Since it is a valuable product, a group of people would like to make their profit from unplanned and illegal sand mining. Though more unplanned and illegal sand mining is observed in developing countries like Bangladesh, rare academic investigations have been found in the developing context. Few studies have considered the sand extraction from the perspective of social perspective. The social perspective of sand mining, mostly the impact on lives and livelihood remained as unexplored. In this connection, this article took an attempt to explore the impact of sand mining considering the context of Bangladesh where a share of people relied on rivers for their livelihood.

This writing uncovers the following theoretical and practical issues:

- Firstly, sand extraction brings insurmountable challenges for natural resource management. The lack of proper natural resource management negatively influences the river-based ecosystem, more specifically and environmental pollution in general.
- Secondly, a good number of people in Bangladesh rely on river-based economy to lead their lives. Degraded river ecosystem and environmental pollution impact on the livelihood of the people who live on river banks and *chars*. Because of the unplanned and illegal sand extraction people encounter river-bank erosions. Riverbank erosions are linked to destroying homeland, farmland, and displacement or migration. However, the degradation

² <https://www.thedailystar.net/news/country/sand-lifting-puts-bridges-risk-1622050>

of riverbank ecosystem makes the river less resourceful. Scarcities of lack of resources make the people jobless and they take decisions to change their river-based professions.

- Thirdly, sand extraction impacts on human health and nutrition. Sand extraction machines and sand-carrying vehicles are responsible for sound, water, and air pollution. These pollutions impacted human health. However, the degradation of river-based resources, such as fish and plants is responsible to reduce the nutritional status of local people.
- Last but not least, sand extraction played a role in destroying the common and state-owned properties, such as dams, playgrounds, bridges, roads, scenic beauty of rivers etc.

VIII. CONCLUSION

As an economically growing country, sand extraction in Bangladesh is increasing at a significant rate. Sand is essential for industrialization and the construction of new infrastructure. This rate will increase further in the future considering the growing population. This is a matter of global concern, not just in Bangladesh. According to the United Nations, another 2.5 billion people will be urban dwellers by 2050. As a result, the demand for sand will also increase as the demand for infrastructure and new construction increases. Above noted findings retrieved that sand extraction is responsible for environmental degradation, including the destruction of the river ecosystem. This degradation brings negative effects on rivers and the riverine economy and livelihood. Therefore, in order to protect the natural environment and livelihood security, necessary measures have to be taken. More specifically, the regulatory government is critical to stopping illegal sand extraction.

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