Environmental Degradation Due to Unplanned Quarries for Engineering Purpose in the North-Western Part of Bangladesh

Mohammed Masum[1*], Md. Abu Sayem[1], Md. Sohel Rana[1]

[1]Geological Survey of Bangladesh, 153 Pioneer Road, Segunbagicha, Dhaka, Bangladesh

*(*Corresponding Author: masum613@yahoo.com)*

Abstract: The study area is in different parts of Pangram Upazila, Lalmonirhat district, in the northwestern part of Bangladesh, where many quarries were identified for engineering purposes. The studied areas encompass about 55 km along the banks of the Dharla and Saniazan rivers near the India-Bangladesh border. The main objective of the study was to delineate the environmental degradation due to unplanned gravel extraction in the study area. By collecting field data with the help of augers, field observation, digging, and GPS, I also collected information from the local statistical office. A major portion of the mapped area is occupied by the Tista Fan and covered by the floodplain deposits of the Holocene age. Tista alluvial fan deposits are generally composed of sand and stone (gravel) at various percentages, which are working as the main raw materials of construction throughout the country. The source of the gravel is exposed in the various overthrust sheets of the Darjeeling Himalaya of Nepal, Tibet, India, and Bhutan. Large amounts of stones (gravel) and sand were extracted unconditionally from the riverbed, riverbank, and surroundings by using the mechanical dredgers and excavators. The unplanned way of extraction is increasing the riverbank erosion and destroying the surrounding agricultural lands, landscapes, river navigation, and biodiversity. Sound and dust are created in the quarry areas due to unplanned use of dredgers and stone crushers, which is aggravating the environmental pollution. Many kinds of environmental pollution might be faced in the surveyed as well as surrounding areas of Lalmonirhat district due to this unplanned extraction/quarry. Environmental degradation might be enhancing the negative impact of the climatic conditions of the country. Stones (gravel) and sand are part of mineral resources and are needed for construction or engineering purposes around the country. Sand and stone should be extracted for engineering purposes in an environmentally planned way so that agricultural lands, biodiversity, landscapes, and other negative environmental issues are protected, which must be reduced to prevent future environmental degradation of the country.

Keywords: ***Quarry, Gravel, Sand, Environment.***

Introduction

The study area is one of the large extraction points of sand and stone (gravel) in Bangladesh, which has developed the alluvial fans found along the foot of the Meghalaya plateau (Meetei et al., 2007). Sand and stone are major raw materials used for engineering purposes in the construction industry around the world. Due to rapid industrialization, urbanization, and associated development, the demand for sand and gravel has risen, especially in developing countries. It has been reported that these sand and stone (gravel) are quarried in an unplanned way, and due to these activities, the area is facing environmental degradation. Huge amounts of gravel and sand were extracted at different places in the study area (northwestern part of Bangladesh) with the dredging machine locally known as the Boma Machine for its extreme noise. Due to the decline in channel gradient and decrease in velocity, the streams leave their canyons, causing the deposition of sand and stone (gravel) sediments, which formed a fan-shaped Tista. Every monsoon season, it carries millions of tons of sand and stone (gravel) in the downstream part within the fan. The unplanned use of dredgers/Boma machines and stone crushers is destroying the landscape and polluting the environment in the surrounding area of these quarries. The sand and stone are also valuable construction materials and are used for engineering purposes throughout the country. A field survey to investigate the real scenario of these quarries which covering the areas of Rahmanpur, Rasulgonj, Mirzarcoart area of the Saniazan river (tributary of Tista river) bank and Islampur, Srirampur, Ufarmara, Azizpur, Dhabolsuti, Bangkanda The main objective of the research was the real scenario of the quarries' dominant areas due to unplanned gravel extraction in the northwestern region of Bangladesh. To assess the extent and types of environmental degradation caused by unplanned quarrying for engineering purposes. This could include identifying which environmental components are most affected (soil, water, air, vegetation, biodiversity, etc.). To evaluate the overall socio-economic impacts of unplanned quarry operations on local communities and propose some recommendations to mitigate environmental degradation from quarrying while balancing the engineering.

Materials and Methods

A GPS device is utilized to map the locations of quarries. Soil sampling kits (auger, soil bags, a measuring tape, and a camera for photo documentation. GIS/remote sensing tools are used to collectively enhance the accuracy and efficiency of environmental assessments. By integrating data from various sources, researchers can gain a comprehensive understanding of the ecological impact of quarrying activities. Official

records of quarry leases, geological information and local meteorological data. Identified unplanned/unregulated quarry sites in the region via field reconnaissance, satellite imagery, and local knowledge. In addition, select control/reference sites (areas with little or no quarrying) for comparison. Compute the change in areas (loss of vegetation, increase in barren/quarry land). Survey vegetation covers close to quarry sites to assess species richness and density. Assess impact on aquatic ecology, like fish counts in rivers. Measure riverbank changes over time using old maps/satellite images etc.

Results and Discussions

Several quarries—Islampur, Srirampur/Azizpur, Rahmanpur/Mirzarcot, Ufarmara, Dhabolsuti/Bangkanda, Sohagpur, and Dhabulguri—were surveyed during field investigations. All were found to use unplanned dredging methods. Large numbers of dredgers operated on both cultivated land and along the Dharla River's banks to extract gravel, stone, and sand. This unregulated quarrying has caused extensive environmental damage, including riverbank and riverbed erosion, loss of farmland, landscape degradation, and loss of natural beauty. Local biodiversity has also become increasingly vulnerable due to these unsustainable extraction practices.

Destroying landscape and natural beauty: The study area lost its landscape and natural beauty due to this unplanned gravel extraction where many big ditches/holes are formed, the landscape has become rugged.

Destroying agricultural land: In some areas, gravel was extracted from near the riverbank of agricultural land in an unplanned way where dredgers are used where the area has lost its normal phenomena of agricultural land.

Declining fish breeding: Due to unplanned quarries the area was destroying the normal phenomena of river or water body and declining the river navigation, which directly affects fish breeding. As a result, fish production of the area decreases day by day due to the unplanned quarries.

Biodiversity: Huge fumes and noise continuously fluctuate from gravel extracting machines and crushers near the river adjoining the quarries. As a result, the overall biodiversity is not well enough and continuously facing extremely vulnerable for the unplanned gravel extraction in the study area. Some conductive species for improving overall biodiversity of the area, which is declining day by day.

Destroying riverbank and bed: Huge riverbank erosion and river shifting observed in the study area due to these unplanned mechanical quarries. The Dharla and Saniazan rivers is facing very vanquishable due to these unplanned quarries. River erosion enhancing the quarry surrounding areas day by day which agitates environmental pollution.

Destroying Roads or Communication System: Due to over-extraction or unplanned extraction huge amount of gravel or stone loaded in the trucks or heavy vehicles and transported from quarry area to over the country. As a result, local roads carrying overloaded and destroying their general phenomena. The local roads converted into small dirty water storage and hampered general transportation system.

Sound and air pollution: Huge noise or unwanted sound was created by using such unplanned quarries (used lots of dredgers with very closely in a small place) in the study area.

All of these factors of environmental pollution might be insisting on the environmental degradation in the study area day by day, which may be agitating the negative impact on the climatic condition of the country.

Conclusions and Recommendations

Uncontrolled sand and gravel extraction in Patgram Upazila, Lalmonirhat—driven by stone crushers, Boma machines, and dredgers—has caused significant environmental damage. Only the Dhabulguri quarry uses manual, more controlled methods. To ensure sustainability, all mechanical operations and quarrying near riverbanks or farmland should be halted until a full environmental impact assessment is conducted. Extraction should be limited to designated riverbed zones and carried out using eco-friendly manual techniques.

Acknowledgement

The authors express their heartiest thanks to the locality and Upazila administration of Patgram Upazilla for their good assistance during the period of field investigation. The authors are thankful to Md. Harun-Or-Rashid, Upazila Nirbahi Officer (UNO) of Patgram Upazila, for his logistic support during the fieldwork and indebted to the Honorable Director General of the Geological Survey of Bangladesh for her kind permission to work in the field and valuable comments, advice, and directions during the surveyed time.

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