Issues and Remedial Measures in River Sand Mining - A Case Study Related to Artisanal River Sand Mining in Mahaweli River in Mahiyangana Area, Sri Lanka

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Abstract

The demand for river sand for construction purposes has increased significantly in Sri Lanka in recent years, particularly due to the tsunami disaster that occurred in December 2004 and post war period after 2009. This high demand led to a major increase in sand mining in many areas. The current demand for sand for building construction within the country is approximately 7- 7.5 million cubic metres per year. Mahaweli river, the longest river in Sri Lanka is acting as major source of river sand supply for construction industry in the country. Certain areas along the river have become dominant sand mining sites in Mahaweli river. Among that river sand mining sites, Mahiayangana area has been very famous for river sand for a long period. In Mahiayangana area, river sand mining is extensively engaged industry and created major income earning source for thousands of rural folks living nearby. This industry has been creating new socio-economic situation in the area as this has been beneficial to many people in the area. This paper discusses present issues related to artisanal river sand mining in Mahaweli river- Mahiayangana area and remedial measures already adopted and proposals to ensure sustainable way of mining to minimize detrimental environmental affects to the ecosystem of river and the river banks.

Keywords: Coarse aggregates, Green sand ferry, Ecological, Extraction, Floodplain, Pebbles.

1 Introduction

The use of sand as a construction material in Sri Lanka dates back to the ancient history. The "stupas"and "dagaba"`are the great buildings of ancient Sri Lankan history where sand seen to be one of the main construction materials used for constructing such huge structures. So starting from that era, river sand has played a pivotal role in construction industry. It is interesting to mention that specially during "Seethawaka" and "Kandyan" eras, certain areas were named as "Rajawella" and "Ruwanwella" because of such areas became very famous for extracting river sand which were highly suitable for various construction purposes at that time. For any construction, still river sand is the first choice out of other various sands such as washed sea

sand and artificially manufactured sand by quarry operations. Due to that reason, river sand mining has been undertaken across Sri Lankan rivers over centuries, with increasing frequency and intensity, noted with time.

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Currently, there are more than 500 legally permitted sand mining sites in Mahiyangana area along the Mahaweli river in left bank and right bank . Illegal sand mining happens seldomly in the same area too. Anyway over exploitation of river sand, violating prescribed conditions during sand extraction and damaging river bank threaten the very existence of the river and leads to significant environmental degradation and ecological imbalance. Sand mining can degrade and alter Mahaweli river and its floodplain at an alarming rate unless all possible means to be taken without delay. The major impacts of sand mining in the study area were found to be destruction of river bank and natural vegetation, ecological imbalance, collapsing of river banks, habitat destruction, degradation of the aesthetic beauty of the surroundings, deforestation of floodplains, and modified stream structure and functionality.

2 Literaure Survey

River sand mining is the process of removal of sand, gravel and boulders from the river with view to get sand out of that other two material. Sand is a movable, non-cohesive granuler material whose size varies between 1mm to 4mm. The term 'sand' is used to cover almost any rock or mineral, but technically it is limited to quartz sand with a minor impurity of mica, iron oxides and feldspar. Sand and gravel occur as sedimentary beds, lenses and pockets lying on or close to the surface or inter-bedded with other sedimentary formations. Mostly that takes place in the river channel and floodplain deposits.

Over the recent decades in Sri Lanka, demand for the sand has been increasing drastically with rapid growth of constructions. Since the river sand fill major portion of the country`s sand requirement while being restricted the extraction of river sand from middle and lower reaches of the major streams, it has become critical situation for mining activities. Despite all regulations and imposed conditions by government regulatory institute i.e. Geological Survey & Mines Bureau, river sand mining

activities have been far exceeded the safe limits of the number of rivers and streams. Because of the over exploitation of river sand, river systems have degraded in massive scale such as

1. Excessive river bank erosion will cause the loss of land, local flooding , damages to the infrastructure of river banks.
2. Deepening of river beds will cause the intrusion of saline water into the coastal fresh water acquifers, drop of groundwater table close to rivers.
3. Reduction of sediment flow to the beaches will cause the increase of coastal erosion.

Hence, now it is inevitable that river sand mining practices need to be implemented in sustainable way without delay. On the other hand, alternatives such as dune sand, washed sea sand, manufactured sand, sand extracted from lands should be introduced.

In river sand mining of Sri Lanka, it can be seen two types of mining practices i.e. instream mining and floodplain mining. The latter practice has not been allowed under licences issued for river sand mining in Mahaweli river.

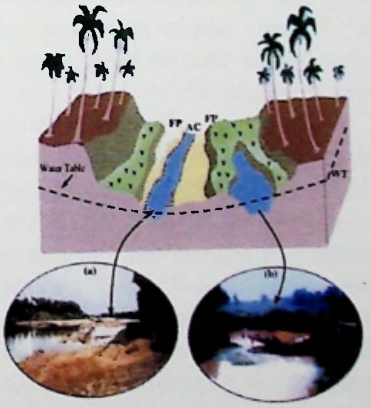

Figure 1: A Representative Model for Instream Mining (a) and Floodplain Mining for River Sand.

Instream sand deposits are easily accessible, well-sorted, and generally free from fine particulates such as silt and clay. Hence, it is extensively used in construction industry for concrete preparation and plastering. Different methods are adopted to extract sand from the active channels of river systems.

Floodplains and terraces (former floodplains) are the sites of sediment storage in river systems and can contain large quantities of sand and gravel. Floodplain mining pits often extend below the water table, which can provide a convenient water source for separating desired particle sizes from the excavated materials. The deep pits left after floodplain mining often coalesce due to collapse of the separating boundary walls of the pits. Under high flow regimes of monsoon. some of the pits can even be captured by the river ultimately leading to valley widening and disfiguration of the natural channels. All these processes not only change the aesthetics of study area, but also impose tremendous pressure in the geo-environmental and socio-economic settings of the region.

3 Current Practices of Artisanal Sand Mining in Mahaweli River

Basically, instream sand mining can be seen in Mahaweli river crossing Mahiyangana area. Non mechanized fibre glass boats are used for transporting sand mined from the river upto the ferry front temporarily made just off to river bank. The quantities (monthly basis) to be mined and all other conditions have been mentioned in the sand mining licence issued by GSMB. Miners are engaged in sand mining activities accordingly and they follow conditions and

instructions as law enforcing bodies (Geological Survey & Mines Bureau, Central Environmental Authority, Police / Special Task Force and certain environmental activists) focus extensively on violations during sand mining activities nowadays. However, sometimes, it is reported that certain unscrupulous miners in organized manner tend to extract river sand deposited in floodplain basins or from river banks as well. This happens most cases when water level decreases specially during drought season and surfacing such floodplains in the river or river bank.

Figure 2: Instream Mining in Mahaweli River.

Figure 3: Floodplain Mining in Mahaweli River.

3.1 Identified Issues

Some issues could be identified related to sand mining opertions of this particular area concerned for this case study.

- Not rehabilitating of abandoned sand mining sites even up to certain extent to minimize environmental imbalance caused to river and river basins.
- Illegal sand mining practises and over extraction of sand violating conditions declared by regulating body in areas where no people live close-by or highly isolated areas (Viranagama, Rotalawala, CTC and Ginnoruwa)
- Most of the folks engaged in sand mining activities are less educated so that it is very difficult to convince them the importance of conserving natural flora and fauna along river banks, consequences of over extraction and sustainability of the industry.
- Maintaining huge sand stock piles scattered in many places close to river bank other than declared locations which creating arid (-non cultivatable) land situation with time as no good vegetation or plants can grow on a top soil layer.
- Heaping of stocks of pebbles and ball stones vicinity areas of river bank after screening process before despatching sand to the market.

3.2 Recent Measures taken for Sustainable River Sand Mining

Currently, there are many measures already implemented and practising in artisanal river sand mining in Mahaweli river specially in Mahiyangana area. The mindset of sand mining community has subjected to very positive thinking pattern because unless this particular mining industry is driven in sustainable

manner, they have realized that future livelihood is in danger. Some distinct steps already taken for sustainable river sand mining are given below.

- Introduction of novel concept named " Green sand ferry " for all river sand mining locations in Mahiyangana area. Subsequently this concept was opted for all other river sand mining sites in island-wise basis. By applying that concept, it could prevent many destructive damages caused to river bank and the river. Entering tractors into the river has been totally obstructed by introducing this new concept. In addition, now the passage of river bank is covered with plants such as ' Kumbuk' , 'Mee' and 'Attika' and acts as green belt.
- Release of ball stones, pebbles, coarse aggregates found during sand mining process back to the river instead of heaping on land areas where sand stock piles maintained.
- Declared plots of land for sand stock piles

4 Discussion

The measures already taken are very instrumental in conserving river bank, ecological system of the river. Below measures are very important when allowing river sand mining in the area concerned under this case study.

- For any new sand mining locations in the river, it would be better if the access roads are prepared as fish-bone pattern, from which river bank erosion can be minimized due to river water level fluctuations time to time and especially during high rainy periods.

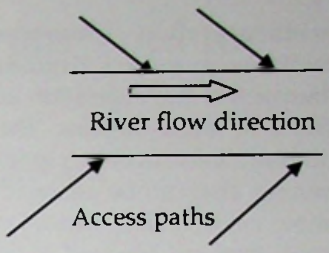

Figure 3: Fish Bone Pattern Access to River for Sand Ferrys.

- A proper method of estimating available sand reserves/ deposits in the river is required. Based on that results, it is easy to establish a rationale to decide monthly production quantities given in mining licences. But it is worth to mention that estimation of sand reserve/ deposit in the active channels and floodplain/overbank areas of the river basins is an expensive and tedious process.

5 Conclusion

Artisinal river sand mining practices currently carry out in Mahaweli river in Mahiyangana area are very much instrumental and supportive to maintain sustainable way of river sand mining for ever increasing sand demand mainly for construction purposes. Now it is high time to focus more serious consideration of the potential long term consequences of widespread sand mining, and contribute to formulation of policies to protect and conserve rivers and river valleys due to sand mining.

This study practices and proposed remedial actions would be much worth to replicate any other river or water stream of Sri lanka where artisanal sand mining happens in large scale and threatened by irresponsible mining. By applying such practices , it is obvious that we can protect our

exisiting river ecosystem and minimize river bank degradation and damages to the vegetation adjacent to rivers or water streams. The mindset of rural folk involved in river sand mining also can be changed to think about environment, natural vegetation once they are engaged in river sand mining.

Findings and proposed measures of this study will help create public awareness on the ecological and social economic values of rivers, guide the concerned regulatory authorities for more serious consideration of the potential long term consequences of widespread sand mining, and contribute to formulation of new policies to protect and conserve the river and river valleys from any destruction by sand mining.

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