

ENVIRONMENT IMPACT ASSESSMENT OF RIVER SAND MINING

Mr. Sachin Chandrakant Deshmukh,
Research Scholar,
Shri JJTU, Rajasthan
Dr.O.P.Sharma,
Professor,
Department of Civil engineering,
Shri JJTU, Rajasthan,

Abstract: *Sand mining is a practice that is used to extract sand, from various environments, such as beaches, inland dunes and dredged from ocean beds, and river beds of deltaic regions. The mining is in operation in all the continents of the Globe. Environmental problems occur when the rate of extraction of sand, gravel and other materials exceeds the rate of deposition. Sand budget of a particular environment shall be observed before sand mining. The river bed mining practice is becoming an environmental issue as the demand for sand and gravel increases in industry and construction. However, an increase in population and the rise in industrial and economic developments during the past few decades have aggravated mining of river sand many folds higher than natural replenishments which really made a host of damages to river ecosystems in the world. With the increase in the demand of the river bed materials resulted in illegal mining of river materials like sand from rivers and in some regions the river sand mafia came up to dominate the region. Exploiting the natural resources for the growing needs and all atrocious and fatal to the very life of humans and other organisms on the globe. Today, the illegal river bed materials miners engage modern machinery in mining sand, which it is against the principles of mining, and destroy the resources at an alarming speed. As the environmental impact of river minerals (sand, gravel and boulder) extraction becomes increasingly well understood in recent years, the practice has received increased scrutiny.*

Keywords: *Sand mining, Environmental impacts, Review, hydrological, biological, sociological.*

1. INTRODUCTION

Replacement of natural sand with artificial sand & concrete:

Concrete is the most widely used composite material today. The constituents of concrete are coarse aggregate, fine aggregate, binding material and water. Rapid increase in construction activities leads to acute shortage of conventional construction materials. It is conventional that sand is being used as fine aggregate in concrete. The function of the fine aggregate is to assist in producing workability and uniformity in the mixture. The river deposits are the most common source of fine aggregate. Now-a-days the natural river sand has become scarce and very costly. Hence we are forced to think of alternative material. The quarry dust or artificial sand may be used in the place of river sand fully or partly. A comparatively good strength is expected when sand is replaced fully or partially with or without admixtures.

1. Suitability of artificial sand i.e. Quarry dust in cement concrete

Sand is a major material used for preparation of mortar and concrete and plays a most important role in mix design. In general consumption of natural sand is high, due to the large use of concrete and mortar. Hence the demand of natural sand is very high in developing countries to satisfy the rapid infrastructure growth. The developing country facing shortage of good quality natural sand and particularly in India, natural sand deposits are being used up and causing serious threat to environment as well as the society. Rapid extraction of sand from river bed causing so many problems like losing water retaining soil strata, deepening of the river beds and causing bank slides, loss of vegetation on the bank of rivers. Due to shortage of river sand in India so therefore the need to find an alternative concrete and mortar aggregate material to river sand in construction works has assumed greater importance now a days. Researcher and Engineers have come out with their own ideas to decrease or fully replace the use of river sand and use recent innovations such as artificial sand. About 20 to 25 percent of the total production in each crusher unit is left out as the waste material-quarry dust. The ideal percentage of the replacement of sand with the quarry dust is 55 per cent to 75 per cent in case of compressive strength. The use of artificial sand in concrete is desirable because of benefits such as useful disposal of a byproduct, increased workability, reduction of cement consumption, increased sulfate resistance, increased resistance to alkali-silica reaction and decreased permeability. The demand for natural sand is quite high owing to rapid infrastructural growth which results supply scarcity. Therefore, construction industries are in stress to identify alternative materials to replace the demand for

natural sand. On the other hand, the advantages of utilization of byproducts or aggregates obtained as waste materials are pronounced in the aspects of reduction in environmental load & waste management cost, reduction of production cost as well as augmenting the quality of concrete. The fine aggregate has been replaced by quarry dust a by-product of stone crushing unit and few admixtures to find a comparative analysis for different parameters which are tested in the laboratories to find the suitability of the replacement adhered to the Indian Standard specifications for its strength.

Table 1: Relation of compressive strength and percentage of replacement for M₁₅ grade at 7 days and 28 days in N/mm²

% Replacement	Nature Sand Kg	Artificial Sand Kg	7 Days strength in (N/mm) ²	28 Days strength in (N/mm ²)
0%	2.815	0	20.44	22.22
20%	2.252	0.563	24	24.88
40%	1.689	1.126	28.88	30.22
60%	1.126	1.689	33.77	35.11
80%	0.563	2.252	28.44	28
100%	0	2.815	22.22	25.77

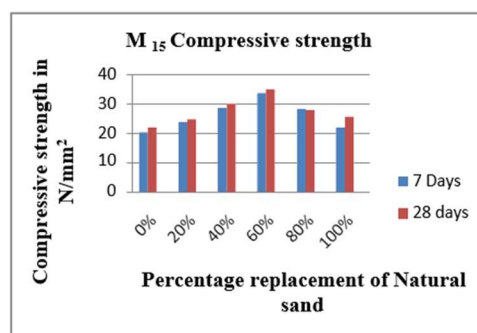


Fig 1: Co-relation between Percentage Replacement of Natural Sand by Artificial Sand and Compressive Strength of Concrete at 7 and 28 Days for M₁₅

2. PROBLEMS FACED BY CIVIL ENGINEERING COMMUNITY REGARDING NATURAL SAND

The huge quantity of concrete is consumed by construction industry all over the world. In India, the conventional concrete is produced by using natural sand, cement, coarse aggregate and water. One major challenge facing the civil engineering community is to involving the use of high performance, environmental friendly materials produced at reasonable cost. In the context of concrete, which is the predominant building material, it is necessary to identify less expensive substitutes. Now-a-days sand is not readily suitable; it should be transported from long distance. Those resources are also exhausting very rapidly. With natural sand deposits the world over drying up, there is an acute need for a product that matches the properties of natural sand in concrete. In the last few years, it has become clear that the availability of good quality natural sand is decreasing. With few local exceptions, it seems to be a global trend also dwindling sand sources poses the environmental problem and hence government restrictions on sand quarrying resulted in scarcity and significant increase in its cost. So it is need of the time to find some substitute to natural river sand.

Issues about sand mining:

1. Important source of revenue generation
2. Lack of transparency
3. Defects/shortfalls in present system
4. Oligopsony- Very few bidders (cartel).
5. Mafia- criminal elements
6. Political support
7. Involvement of government servants.

3. POTENTIAL MANAGEMENT AND MITIGATION APPROACHES

Addressing the environmental and social impacts associated with legal and illegal sand mining is not easy. Sand and concrete are as ingrained in modern societies and economies as fossil fuels, and similarly will require a global change in attitude and practices if river systems are to be preserved. Sand's accessibility and extremely low cost combined with the widespread use of concrete in the construction industry make decreasing demand or finding alternative supplies a challenge.

1. Improved governance

Without improved governance in the countries experiencing high rates of in-stream sand mining, the over extraction at licenced sites and the prevalence of unlicensed sites will continue. In many of these countries the issue of governance is not limited to sand mining in rivers, but to the general management of natural resources as well as other aspects of trade and industry. Investigating methods to improve governance at a national level in developing countries is beyond the scope of this investigation.

2. Sustainable extraction of river sand

In theory, sand and gravel mining in rivers should be sustainable if the quantity of material extracted is within the volume 'replenished' by the system, and sufficient sand and gravel remains in the system to maintain downstream river beds, deltas and coastal environments. The interactions between land use and sediment delivery and how these can change as land use changes (perhaps through construction using the extracted sand) must also be considered when employing this approach. However, this technique requires a high level of technical expertise and extensive data sets. There is no evidence in the literature that they have been successfully implemented as a management tool for aggregate extraction.

Guidelines for river sand mining (ACCORDING TO MOEF)

- To ensure the River bed mining is done in environmentally sustainable and socially responsible manner.
- To ensure availability of adequate quantity of aggregate in a sustainable manner.
- To improve the effectiveness of monitoring of mining and transportation of mined out material.
- Ensure conservation of the river equilibrium and its natural environment by protection and restoration of the ecological system.
- Avoid aggradations at the downstream reach especially those with hydraulic structures such as jetties, water intakes etc.
- Ensure that the rivers are protected from bank and bed erosion beyond its stable profile.

- No obstruction to the river flow, water transport and restoring the riparian rights and instream habitats.
- Avoid pollution of river water leading to water quality deterioration.
- To prevent depletion of ground water reserves due to excessive draining out of ground water.
- To prevent ground water pollution by prohibiting sand mining on fissures where it works as a filter prior to ground water recharge.
- To maintain the river equilibrium with the application of sediment transport principles in determining the locations, period and quantity to be extracted.
- Streamlining and simplifying the process for grant of environmental clearance (EC) for sustainable mining.

4. CASE STUDY:

Table 2-Site Information about Bhandarkoot to Takali

1.Name of Site	Bhandarkoot to Takali
2. Project Location (Plot / Gate No.)	30 km away from Solapur
3.Name of River	Bhima River
4.Name of Village	Takali
5.Tehsil	South Solapur
6.District	Solapur
7.Name of Minor Mineral	River Sand
8.Nearby villages in Takali	Nandani, Kurghot, Malkavathe, Karkal, Auj Mandrup, Chinchpur, Barur, Bandalgi,. Bolkavathe, Hattarsang, Kudal
9.Elevation of Site	469 m above sea level
10.Total Proposed Production	43390 Brass
11.Ultimate depth of mining	1.1 m
12.Nearest road from site	NH-52
13.Nearest Town and District	Solapur District

Table 3- B) Site Information about Begampur

1.Name of Site	Begampur
2. Project Location (Plot / Gate No.)	41 km away from Solapur
3.Name of River	Bhima River
4.Name of Village	Begampur
5.Tehsil	Mohol
6.District	Solapur
7.Name of Minor Mineral	River Sand
8.Nearby villages in Takali	Arbali, Ardhanari, Tamdardi, Ichgaon, Rahatewadi
9.Elevation of Site	457m above sea level
10.Total Proposed Production	116924 Brass
11.Ultimate depth of mining	1.5m
12.Nearest road from site	NH-166
13.Nearest Town and District	Solapur District

5. CONCLUSION:

Sand is indispensable for many economic activities, and construction industry plays a major role in sand demand. Rapid population growth and urbanization increased demand for construction minerals. Being in direct connection with the construction sector, demand for construction sand is growing exponentially in countries where this sector is very active. Even if it can be found everywhere, sand that is used for different industries is becoming scarce so the pressure on existing sources is very high. In the recent years, countries have been maintaining their relative global positions in production. Sand industry brings many benefits to countries involved in this sector, but, besides economic and social benefits, sand exploitation also has negative effects on the environment. Sand mining involves a high degree of environmental degradation in every stage of mine's life; therefore, specific measures must be adopted to mitigate environmental impacts. Special attention must be paid to undeveloped and developing countries, where lack of regulation, illegal mining, etc. seriously affects the environment. Companies must to be

conscious about the environmental impacts, to start thinking about the environmental costs and to include it as a part of production cost. A company that operates in this sector, must focused both on determining, monitoring and reducing negative environmental impacts of this activity and also on finding and applying solutions for various risks, such as those associated with climate change. To minimize the environmental impacts, all parties involved in sand mining process are responsible for taking the right measures. Sand sustains the rivers and the percolation of water to far off distances both for the growth of trees to sustain drinking water and raise cultivation. It is almost a lifeline to the human existence. Without considering the precise gift provided by nature, commercial exploitation for short term gains by pumping out the sand indiscriminately from the rivers, dunes and beaches will destroy whole environment. People employ huge machineries like cranes and other pumping mechanism causing untold natural calamities and loss to the society. In order to maintain the balance between the environment and sand mining, the Governments should regulate the mining. Scientifically river bed mining has a major impact on the rivers which has become a major source for increase in depth of river bed. In total project has negative and significant impact creating negative impacts in socio-economic environment.

References:

1. <https://www.hindustantimes.com/mumbai-news/illegal-sand-miners-in-india-make-1-611-cr-profit-every-year-australian-film/story-o0wzzmQhL3ON42JlkeBM9H.html>
2. https://www.lokmat.com/maharashtra/solapur-sand-mafia-tried-kill-tehsildars/?utm_source=Lokmat.com&utm_medium=InfiniteArticle-Desktop
3. Dr. P.Perumal B. Muhit ,American Journal of Civil Engineering and Architecture,2013, vol.1.No 5,103-106
4. 3. S. Haque , Md. RaibulAlam, American Journal of Civil Engineering and Architecture, 2013, vol.1.No 5,103-106.
5. Ahmed E. Ahmed & Ahemed A. El-Kour, 1989, Properties of concrete incorporating natural and crushed stone very fine sand, ACIV Material journal, Vol-86, No. 4, pp. 417-424.