

Environmental impact of sand mining in India and its evaluation using SWOT Analysis- A Review

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ABSTRACT-

Mining is not a new born practice, it present in our society since the human civilization started. Mining is an important activity for the long-term economic development. It offers growth of the local economy and life of the local people. But with this it provides enormous amount of pollution to that area. Among other minerals now a day's sand is the widely extracted mineral of the world this article reviews about the environmental impact of sand mining with SWOT analysis and concludes with some suggestions of sustainable sand mining and suitable alternatives of sand.

Key Words- Sand, Mining, India, impact

INTRODUCTION

Sand is a naturally occurring aggregates produced from many years of rock erosion. The rate of its replenishment is slower than the rate of its formation. Sand mining refers to the phenomenon of extraction of sand from various source such as ; riverbed, seashore and others. But particularly river sand is mined more regularly than other sources because sand and gravel of rivers are more viable and profitable than others. It is mined more regularly since it is less expensive to mine. (Emily tastet 2019). Sand is the second most exploited minerals on earth after water, and their use has tripped in the last two decades to reach an estimated 40-50 billion metric tons per year (UNEP 2019). The main reason of sand mining is for the construction purpose but except this the usage of sand increased several times as compared to just past 50 years. Now a days from the mobile we stuck in to the whole day to the home we live everything has sand in it.

“The tiny grain becomes the gigantic part of our life”

HISTORY

Sand was used as early as 600 BC, to grind and polish stones, and to make sharpened the tools and other objects. The stones were rubbed on a piece of wetted sandstone to give the cutting edges.

In 3500-300 BC, the first bead with a glass glaze appeared in Egypt. Sand was used to produce glass as early as 1607 with the foundry of short- lived Jamestown colony in Virginia. In 1739 the first sustainable glass making venture was formed in Wistarburgh, New Jersey by Casper Winstar.

The extraction and production of sand increases extremely by the incorporation of sand for making roads during World War first through 1920's

The use of sand for house construction in late 1940s and early 1950s pushed its demand on the highest level. Today the demand and production of sand is 20 times higher than last some year, from small construction dealer to large semiconductor chip industries this tiny grain is like the gold for them.

COMPOSITION OF SAND-

The composition of sand mainly depends upon the local rock sources and conditions ,thereby it is highly variable , but the most common constituent of sand is silica (silicon dioxide).it is naturally in the form of quartz ,due to its nature and chemical inertness and considerable hardness, is resistant to weathering. The bright white sands found in the tropical and subtropical coastal settings are eroded limestone and may contain coral and shell fragments in addition to other organic or organically derived fragmental material.

Characterization on the basis of their particle size.

Soil Type		Particle size(mm)
• CLAY		<0.002
• SILT		0.002-0.075
• SAND	FINE	0.075-0.42
	MEDIUM	0.42-2.0
	COARSE	2.0-4.75
• GRAVEL		4.75-75

TYPES OF SAND-

On the basis of their origin sand are divided into many three types which are written as follows

PIT SAND-

This kind of sand is coarser than the other type of sand the grains of these sand are rough, angular, sharpened harsh, it is free from salts and other impurities because of which it is a conventional selection for concreting. This type of sand found in red orange colour. It is secured from deep pits dug 1 to 2 meters from below the topsoil.

RIVER SAND

These Sand formed by the continuous weathering of rocks flowing in to the river, it is formed by the corrosion of water current and is obtained from river stream and banks .river sand is generally white or grey in colour. Unlike pit sand the particles of sand of river are smooth, rounded and of fine quality. Hence it is used globally for various construction purposes.

SEA SAND

Sea sand (also known as coastal or offshore sand) refers to the sand eroded by seawater. It is secured from seashores and has a distinct brown colour. The grains of sea sand are very fine in quality with a circular shape. But the sea salt have lots of impurities in it such as salt , waster particles and other marine impurities which tend to absorb moisture more frequently than the other type of sand , therefore it is being avoided for the construction purposes.

IMPORTANCE OF SAND-

Sand is an indispensable resource for our economic development. But this important material must be purchased with all care and vigilance. Sand extracted from, sand mining can be used in a variety of ways. Some of them are mentioned below.

- Concrete/Constructions
- Moulding
- Sandbags
- Lime Sand brick

- Drainage
- Filters
- ROAD TRANSPORTATION
- Glass industry
- Petroleum Fracking
- Paint industry
- Chemical Production

METHODOLOGY-

Doctrinal method of research purely based on the research paper, articles in a journals, news reports magazines and book has been employed for this study.

SAND MINING IN INDIA

- **Sone River, koelwar Bihar**

This paper concluded that the silica content is higher in the water and the turbidity is also higher at that part of river, the D.O. observed at that area was also less due to high turbidity and less light penetration.(Kumar et al.2021)

- **Kulsi river ,Assam-**

In this river the endangered species of dolphin was found but due to excessive sand mining it becomes the threat for there growth.(Mohan,2000)

- **Muvattupuzha River, Kerala-**

Sand mining causes broadening of floodplain in that area and the mixing of salt water is the biggest issue of that area it affects the hydro geological quality of that area, and the wells, underground water and other sources of potable water suffers from salinity.(Maya et al.2021)

- **Ramganga river Dam, kalagarh Uttarakhand**

Physical properties of water changes more as comparison to its chemical features due to sand mining, it fluctuates more easily.(Daityariet al.,2017)

- **Kangsabati River, South Bengal**

Sand mining deteriorates the quality of water the water of sand mining area is not acceptable. Poor water quality also affects the species diversity and richness of that area.(Bhattacharya et al. 2019)

- **Umtynggar, Meghalaya**

Excessive sand mining causes high river bank erosion and changes the original morphology of the river. (Shymbin et al. 2022)

- **Ganga river , around Patna**

Due to sand mining the turbidity increases and the transparency of water decreases.it also impacts on the zooplankton of that water body(Prabhakar et al. 2019)

- **Kangsabati river , West Bengal-**

The instream living organisms suffers a lot by this sand mininh activity. Anguillide and Mastacembelidae species families were found vulnerable. Toxicants contamination and the habitat loss are the main reason of deterioration of the benthic life.(Bhattacharya, 2018)

- **Itthikar river, South West Coast of India**

Due to high turbudity in water the production of fishes and other aquatic species suffers which disturbs the equilibrium of ecosystem. And ruins the whole ecosystem of that mining area.(Sheeba ,2009)

● **Pampa river kerala India-**

Pampa river gets its large amount of water from its tributary” Ithipalliyar” river but the flow of this rivers water has been blocked many time due to continuous sand mining. Pampa River has already disappeared.

● **Godavari river, Maharashtra India**

The largest river of south India Godavari was also a victim of excessive sand mining the Marathwada region of Maharashtra state is one of the hotspot of sand minig . The river in that area is almost dried up and the villagers are dependent on water tankers to get potable water.

Impact of sand mining –

Environmental impacts-

Sand mining results in the destruction of aquatic life and habitat through large changes in the channel morphology. The ill effects include bed degradation, bed coarsening lowerbed water tables near then streambed, and channel instability. These physical impacts caused degradation of aquatic life. Sand mining also harms the bridge structures if dug deeper. Due to removal of sand , ground water table in the vicinity of the river will drop, affecting the moisture content in the soils. Due to the drop in river water levels, quantity and quality of water intake for drinking water will be affected badly.

PHYSICAL ENVIRONMENT	CHEMICAL ENVIRONMENT	BIOLOGICAL ENVIRONMENT	ANTHROPOGENIC ENVIRONMENT
<ul style="list-style-type: none"> ● Riverbed widening and deepening ● Riverbed, slope and bank instability ● Increased erosions ● Reduced sand replenishment ● Altered hydro geological table ● Habitat loss 	<ul style="list-style-type: none"> ● Increased turbidity and total suspended solids(TSS) ● Increased concentration of heavy metals ● Decrease in dissolved oxygen level(D.O.) ● Increase in biological Oxygen demand of the water(B.O.D.) ● Pollution of air, water, soil,and noise 	<ul style="list-style-type: none"> ● Habitat loss and fragmentatio n ● Reduced respiration and photosynthes is ● Reduced presence of benthic organisms ● Species growth suffers due to continuous disturbance. 	<ul style="list-style-type: none"> ● Destruction of infrastructure ● Loss of agricultural land ● Reduced yield of farmers and fisheries. ● Increased risk of waterborne disease ● Conflicts among local communities arises.

Social impacts-

In Jalpaiguri district of West Bengal a 10 year old boy , Eyas Oran tripped while playing with his friends on an islet of the Leesh river , he fell into a 15 by 30 feet illegal sand mining pit and drowned on July 18 , 2009. According to the investigation of Police, the pit was illegally dug to extract Sand and rock for construction purpose.

Rampant Sand mining was threatening the Patal- Bari a heritage building on the banks of Hooghly at Chanderhagore. There are many Himalyan River passing through northern west Bengal are rich source of boulders sands and rocks and it is a golden chance for illegal miners to mined it and sell it into the high prices for their benefit.

The sand mafias are growing enormously in the Odisha state and due to neglegance of govt. and indirect support of local politicians they became intrepid. In may 2019, journalist named Pratap Patra was attacked and severely injured by Sand mafias because of his reports against illegal sand mining.

In January 2020 a young activist named Manto Tarei was crushed to death as he tried to stop sand miners on the banks of Janbhira river in Susumari village Odisha.

Like this a RTI activist named Rajan Kumar Das was found dead in Kendrapada in February 2020. Das was known for his voice against the illegal sand quarrying brick killins and some allegedly corrupt NGO's in that area.

In Jatpura district of Jharkhand three men of same family were killed because of their protest against sand mafias.

The administration in a few of district of Jharkhand has also tried to take some steps to fight with the problem of sand mining by blocking the road in the Garhwa district. Repeated threats to the family of officials and administrative transfers were quite common .in such an incidence, the illegal sand miners pelted stones at the team of officials lead by Nitish Kumar Sing while raiding the banks of Damodar river.

In Bastar region of Chattisgarh state the editor named bhoomkal was publically beaten and slashed with sharp weapons for reporting against sand mafia just 100 meter away from the Kanker police station.

In the state of Assam a tributary of the Khulsi river (tributary of Brahmaputra) Kharkhari river which is famous for being the habitat of freshwater Dolphins, more than 40 villages face acute shortage of water due to lowering of riverbed, such unsustainable sand mining cause heavy loss to farmers of paddy crop production.

Literature review-

Shaji J. and Dr. R. Anilkumar(2014); described in their study the environmental impacts of Neyyar river basin , the illegal sand mining created many problems in terms of environment setting and water quality of that area.

Binoy Aliyas , Mattamana et.al (2013): in his work studies about how indiscriminate and unscientific sand mining becomes a threat to the ricer system of Kerala. Their study focuses on the determination of sand in flowing different stretches of the Periyar River and thereby optimizing the Sand removal by considering several Socio – economic and topographical features.

M.Naveen Saviour(2012) this article discusses the direct and indirect impacts of sand mning to the environment of Indian regions . the water pollution is a visible evident of its harmful impacts. The stream of minning area changes its colour to reddish orange.

P.R. Arun et. al(2006); this paper deals with the impacts of sand mining on the physical and biological environments of river system of kerala. And few suggestions were given to improve the overall environmental condition of Keralas river basin.

Koelwar, Sinha &Sharma(2003) in their work discussed about illegal sand mining in Sone river in the state of Bihar . The sand of the Sone river is highly preferred for the construction purposes. NGT also put a ban on sand mining in this area but in spite of a ban the minig works are still continues in that area and the price of sand during monsoon season has gone around Rs. 15000 to 18000 thousand per truck load.

Puko (2016) in their study concludes that the increase in demand of sand in every area of the development like construction, electronics increases its illegal mining and its demand is beyond its renewal capacity which cause huge disturbance to the whole environment.

Pereira (2012) reported that India has the third largest construction business in the world after the USA and China, so sand demand is also high here.

Kukreti(2017) in his research speculated that 1.4 billions tons of sand will be required in India by 2020. And its growing as the year passes.

Shreebha and Padmlal (2011) in their work reported about environmental impacts of unscientific sand mining such as water pollution, changes in pH level, noise and air pollution.

Pitchaiah (2017) reported that sand mining has reduced the water holding capacity of the river in Kerala. Due to the indiscriminate sand mining the sand bed level of major rivers in kerala state such as Pampa, Periyar have been lowered up to four to six meters.

Kamboj (2019) studied impacts of sand mining in river Ganga near Bhogpur village in district Haridwar . in his report he defined the impact of sand mining in channel morphology of the River Ganga. The changing pattern of channels has caused the degradation of water quality and aquatic biodiversity of the river.

Sinha (2019) in his work reported the shifting of river path , he mentioned in his work that lateral shifting of river is a typical characteristics of any tropical river, but due to excessive sand mining and building of brick kilns have led to shifting of river away from Patna. Excessive sand mining in Sone river which meets River Ganga also caused the change in the flow of the Sone river.

SWOT ANALYSIS OF SAND MINING

STRENGTH	WEAKNESS	OPPORTUNITY	THREAT
<ul style="list-style-type: none"> Facilitate navigating Good drainage system for agriculture to control flooding Sand demand is fulfilled. Employment is increased Growth in country's economy Exportation of sand to other countries. 	<ul style="list-style-type: none"> Excavation more than legally allowed. Disruption of rivers ecosystem Natural filter of river has been affected Habitat destruction Diseases due to open pit after mining. 	<ul style="list-style-type: none"> Replenishment of river Development of more drainage facility Increase in employment Increase in river surface area More foreign connection due to exportation of sand Economic development of country 	<ul style="list-style-type: none"> River get Unable to replenish its sand bed. Lowering water table Increase in pollution Extinction of endemic species Shortage of drinking water Farming and fishery culture get affected.

ALTERNATIVES OF NATURAL SAND-

- Construction and demolition waste
- Copper slag
- Crushed stone sand
- Foundry sand
- Bottom Ash

CONCLUSION

With the help of the SWOT Analysis and study of various research papers articles and news report we can conclude that Sand mining is a Necessary evil. By the help of SWOT analysis it can be seen, that sand mining has many economic and social benefit also but this doesn't compensate with the harm which it cause to the environment. So definitely we can't just stop the use of sand and ban sand mining so easily, but we have to find out some sustainable processes of sand mining and some alternatives of sand to decrease the demand of sand. And the most important thing in India is a proper implementation of proper guidelines for sand mining.

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