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SAND MINING IN INDIA: ADDRESSING IMPACT ON ENVIRONMENT AND CHALLENGES IN REGULATORY FRAMEWORK

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ABSTRACT:

Sand mining refers the technique of extracting sand and gravel from a river to meet specific needs for development and building. But as sand demand rises, thousand tons of sand are being illegally mined, despite the Supreme Court's judgment that forbids sand mining without the necessary approval from the authorized authorities and establishes restrictions on the quantities that can be mined. The prohibition on sand mining and the unjustifiable removal of sand from rivers is based on several factors: as the riverbed's natural covering is made of sand, therefore, stripping this layer causes erosion further downstream, which alters the habitat and beds of the channel and causes rivers, estuaries, and river mouths to grow. The groundwater is also affected by the fall of river bed, resulting shortage of water that impacts local livelihood and agriculture. Sand is the most widely utilized raw material on the earth, after water. The prudent utilization of resources is essential to ensuring future economic growth. The Mines and Minerals (Development and Regulation) Act of 1957¹ empowered state governments to enact regulations to prevent illegal mining, transportation, and storage of minerals. The Ministry of Environment, Forests, and Climate Change (MoEFCC) has also issued in 2016 and 2020 Sustainable Sand Mining Management Guidelines to promote scientific sand mining and environmentally friendly management practices.² There has been an illicit number of illegal sand mining cases which constitutes loss of revenue for State as well as degradation of the environment. To remediate the situation there is an urgent need for monitoring the sand mining activities and taking strict conservation measures for our environment.

Key words: *Sand Mining, Impact, Regulatory framework, Guidelines, Judiciary.*

¹ The Mines and Minerals (Development and Regulation) Act of 1957, Act No. 67 of 1957.

² *Sustainable Sand Mining Management Guidelines 2016*, <https://faolex.fao.org/docs/pdf/IND217080.pdf>.

1. INTRODUCTION:

Sand is one of the most extracted natural resources in the world and constitutes a fundamental raw material for infrastructure development. It is widely used in construction, land reclamation, artificial island development, and coastline stabilization. Despite its economic and developmental significance, sand mining poses serious environmental challenges in the areas from which it is extracted. United Nations Environment Programme (UNEP) stipulates that “Sand and gravel constitute the second most consumed natural resource used on earth after water but also sounded the alarm over the fact that their use far exceeds their natural renewal rates.” Environmental degradation occurs when the rate of removal of sand, gravel and other materials surpasses the capacity of natural processes generate these materials. Because sand is being extracted excessively, the depletion of existing sand reserves is causing substantial harm to fauna and flora at significant levels. At the same time, sand mining is a source of livelihood for the many stakeholders, including miners, transport operators, and block and brick manufacturers among others who depend on this activity for economic sustenance.

However, the growing demand of sand and rapid expansion of mining activities have resulted in considerable environmental impacts at both local and global scales, necessitating urgent regulatory and policy interventions. The nature and extent of these environmental impacts often vary, in part, depending on source of extraction, which typically includes pit sand, river sand, and sea sand.³ In addition to compound the environmental impacts of legal mining and sourcing, illegal activities associated to sand mining and its transportation have been documented in several regions worldwide, which have further aggravated ecological degradation.

India’s annual consumption of sand exceeds 700 million tonnes, most of which is used for construction. This sand is primarily sourced from riverbeds, as river sand possesses desirable grain characteristics for concrete. Unfortunately, Illicit and excessive sand mining in riverbeds is causing an economic and environmental crisis. Illegal sand mining has prompted a series of governmental interventions in India aimed at ensuring environmental sustainability and regulatory compliance. The National Mineral Policy, Sustainable Sand Mining Guidelines⁴ and the Enforcement & Monitoring Guidelines for Sand Mining⁵

³ Walter Leal Filho et al., *The Unsustainable Use of Sand: Reporting on a Global Problem*, 13 SUSTAINABILITY 3356 (2021).

⁴ *Sustainable Sand Mining Management Guidelines 2016*, <https://faolex.fao.org/docs/pdf/IND217080.pdf>.

⁵ *Enforcement & Monitoring Guidelines for Sand Mining*, (2020), <https://www.ielrc.org/content/e2025.pdf>.

strengthen environmental safeguards through compliance mechanisms. Technological initiatives such as the e-Green Watch Portal, GPS tracking, and digital sand traceability systems further enhance regulatory oversight. Legal enforcement is supported by penal provisions under the EP Act 1986⁶ and the MMDR Act 1957⁷, along with relevant sections of the Indian Penal Code and directives issued by the National Green Tribunal, including restrictions on deep riverbed mining and mandatory rehabilitation measures. There are other such sustainable alternatives instead of sand mining such as Manufactured Sand (M-Sand), produced by crushing rocks as an eco-friendly and cost-effective substitute for river sand; implementation of river replenishment policies to determine scientifically sustainable extraction limits; active community participation through Gram Panchayats for local monitoring; and green construction innovations utilizing fly ash, slag, and recycled materials to reduce dependency on natural sand resources. Collectively, these measures reflect a shift toward balancing developmental needs with ecological conservation. Against this backdrop, the present study seeks to critically examine the environmental and regulatory dimensions of sand mining in India. It aims to analyse the effectiveness of existing statutory frameworks, policy guidelines, and monitoring mechanisms governing sand mining activities. Further, the study explores the role of the Indian judiciary in curbing illegal sand mining, assessing how judicial interventions have contributed to environmental protection and regulatory enforcement.

1.1 RESEARCH OBJECTIVES:

1. To understand the impact of river sand mining on the environment in India.
2. To evaluate the existing regulatory frameworks, guidelines in managing sand mining activities in India.
3. To study the role of the Indian judiciary in addressing illegal sand mining.

1.2 RESEARCH QUESTIONS:

1. What are the impacts of river sand mining on the Indian environment?
2. How the current regulatory mechanisms in India are managing and controlling sand mining activities?

⁶ Environment (Protection) Act of 1986, No. 29 of 1986.

⁷ The Mines and Minerals (Development and Regulation) Act of 1957, Act No. 67 of 1957.

3. Whether Indian judiciary is actively involved in addressing illegal sand mining in the country?

2. ENVIRONMENTAL IMPACT OF SAND MINING

According to the UNEP Global Environment Alert Service Report, the adverse environmental impact of sand mining is, lack of proper scientific methodology for river sand mining, which has led to indiscriminate mining practices. In addition, weak governance and corruption have contributed to widespread illegal mining practice in many states of India. The report referred the situation of India in respect of illegal sand mining, which states that sand trade has become an extremely profitable business, leading to the emergence of powerful sand mafias involved in illegal mining and trading. Excessive removal of river aggregates has caused serious ecological in balance, including river pollution and in pH levels. The extraction of sediment from riverbeds disrupts the natural flow of rivers, leading to channel incision both upstream and downstream from the mining sites.

2.1 River Biodiversity damage: Biodiversity is the variation among living organisms from different sources including terrestrial, marine and desert ecosystems. Due to river sand mining many hectares of fertile streamside land annually lost. It affects valuable timber resources and wildlife habitats of riparian areas, fisheries productivity, loss of endangered species and recreational potential.

2.2 Alteration of Rivers: Over-mining of sand can modify the course of a river, shift its bed, erode its banks, and cause flooding. The alteration of river includes deepening of rivers and estuaries, enlargement of river mouths, and coastal inlets, which can also lead to saline-water intrusion from nearby seas.

2.3 Water Quality Degradation: Sand mining adversely impacts water quality as well as there is increased riverbed and bank erosion during mining that leads to higher levels of suspended solids in water.

2.4 Groundwater depletion: Sand mining impair groundwater system, affect water flow and freshwater availability to the local population. Groundwater shortage causes many difficulties as many people use groundwater source for drinking, agriculture, and household purposes.

2.5 Erosion and Land Loss: Sand mining contributes to erosion of coastal areas and riverbanks, making them more vulnerable to floods, storms, and cyclones. This erosion can result in severe land loss for coastal communities.

2.6 Threat to Agriculture: Groundwater depletion and changes in sediment delivery caused by sand mining can pose significant threats to agricultural productivity in affected areas, it reduces land fertility.

2.7 Changes in Sediment Budget: Alteration in the amount of sand reaching oceans disrupts the sediment budget, preventing rivers from replenishing sand on beaches and in deltas. This can lead to coastal erosion and habitat loss.

Apart from all these, Sand mining often leaves behind open pits that collect water during the rainy season, creating health and safety hazards in the form of silicosis, a lung disease caused by inhaling tiny, airborne silica particles. It has also been blamed for flooding in surrounding areas. Although Sand mining provides important economic and developmental benefits, it also generates considerable environmental and socio-economic concerns. It is important for comprehensive policies to be put in place that particularly addresses sand mining. Clear and comprehensive guidelines should be enacted to govern processes for sand mining and the rehabilitation of the land after mining. Such measures would help ensure sand mining is carried out in a sustainable and ecologically responsible manner.

3. REGULATORY FRAMEWORK AND GUIDELINES REGARDING SAND MINING IN INDIA

3.1 Constitution of India:

The constitutional framework governing mineral regulation in India is primarily derived from the Seventh Schedule of the Constitution.

- a) Entry 23 of List II (State List): Mandates that the state government own the minerals located within its borders.⁸
- b) Entry 54 of List I (Central List): Requires the central government to own the minerals within India's exclusive economic zone (EEZ).⁹ The Mines and Minerals (Development and Regulation) (MMDR) Act of 1957 (MMDR Act)¹⁰ was drafted in response to this.

Additionally, under the MMDR Act, minerals are broadly classified into “major” and “minor” minerals. The Central Government retains control over major minerals, whereas regulatory powers concerning minor minerals are largely delegated to the State Governments. Sand, building stones, gravel, ordinary clay, and similar materials are generally categorized as minor minerals. In relation to minor minerals, State Governments are empowered to frame rules

⁸ Constitution of India of 1950, § Seventh Schedule, List II, Entry 23.

⁹ Constitution of India of 1950, § Seventh Schedule, List I, Entry 54.

¹⁰ Act No. 67 of 1957.

regarding the grant of quarry leases, mining permits, fixation of royalty and dead rent, and regulation of extraction and transportation.

However, this decentralised regulatory model has led to significant challenges, particularly in the context of sand mining. Variations in state-level rules, weak enforcement mechanisms, and overlapping jurisdiction between mining authorities and environmental regulators have contributed to illegal extraction and environmental degradation.

3.2 MMDR Act, 1957:

Under Section 3(e) of the MMDR Act of 1957 sand has been notified as a “minor mineral”.¹¹ The term “ordinary sand” is used in abovementioned provision and it has been given a comprehensive understanding through Rule 70 of the Mineral Concession Rules, 1960¹²:

Rule 70¹³: When Sand shall not be treated as a minor mineral if used for the:

- (i) use in refractory and production of ceramic;
- (ii) use for metallurgical purposes;
- (iii) use as optical applications;
- (iv) use as stowing material in coal mines;
- (v) use in the manufacture of silvicrete cement;
- (vi) use in the production of sodium silicate; and
- (vii) use in the manufacture of pottery and glass.

Section 15 of the MMDR Act empowers that, the State Government may, by notification in the Official Gazette create rules for regulating the grant of quarry leases, mining leases or other mineral concessions in respect of minor minerals along with purposes connected thereto.¹⁴

Furthermore, section 23-C of the MMDR Act provides power to the State Governments to make rules for preventing illegal mining, transportation and storage of minerals and for the purposes connected therewith.¹⁵

21 State Governments of various states of India, from south India Andhra Pradesh, Karnataka, Kerala, Tamil Nadu, from North India, Haryana, Himachal Pradesh, Jammu Kashmir, Punjab, Uttar Pradesh, Uttarakhand, From East India, Bihar, Jharkhand, Odisha, West Bengal, from West India, Goa, Gujarat, Maharashtra, Rajasthan, from Central India Chhattisgarh, Madhya Pradesh, from North-East India Nagaland—have proposed regulations to combat the threat of

¹¹ *Id.*

¹² *Mineral Concession Rules*, (1960).

¹³ *Id.*

¹⁴ Act No. 67 of 1957.

¹⁵ *Id.*

illegal mining, acting in compliance with Section 23-C of the Act. 22 State governments have formed task groups to stop illicit mining and evaluate the steps departments have made to monitor the operations of unlawful mining at the State and district levels.¹⁶

Section 4 of the Act specifically states that all kinds of mining without necessary permits is illegal.¹⁷

The MMDR Act, 1957 was amended in 2015, and the Amendment Act increased the penalty for illegal mining to five years in prison and a fine of up to five lakh rupees per hectare of the affected area.¹⁸ The Act also contains provisions for the creation of Special Courts, which aid in the prompt trial of offenses pertaining to illicit mining.¹⁹

Though a statutory obligation cast upon State Governments to enact laws and adopt rules but there is a lack of uniformity between States. Many States have distinct laws regarding minor minerals, which leads to confusion and inconsistency.

3.3 Environment Protection Act, 1986:

Central Government issued Environment Impact Assessment Notification, 2006 under the provisions of the EPA, 1986.²⁰ As per the notification, the mining of minerals with a lease area of five or more hectares would require prior environmental clearance, But, notification does not make any distinction between the major or minor minerals.

The doctrine of public trust extends to natural resources, including air, sea, water, and forests, emphasizing their significance to the public. Therefore, mining sand from riverbeds without proper licensing or permits is deemed an act of mineral theft under Sections 378 and 379 of the Penal Code, 1860.²¹ This is because natural resources are regarded as public property, and the state acts as their trustee.

3.4 Sustainable Sand Mining Management Guidelines 2016:

Sustainable development is based on environmental, social, and economic. It is not possible to achieve sustainable development if there is widespread poverty, even if the environment is protected. Similarly, economic growth that harms the environment is not sustainable. 2016

¹⁶ *Varied Measures to Curb Illegal Mining*, <https://www.pib.gov.in/www.pib.gov.in/Pressreleaseshare.aspx?PRID=1944964> (last visited Feb. 25, 2026).

¹⁷ Act No. 67 of 1957.

¹⁸ The Mines and Minerals (Development and Regulation) Amendment Act of 2015, No 10 of 2015.

¹⁹ *Id.*

²⁰ No. 29 of 1986.

²¹ Sucheta, *Dishonest Removal of Sand from River Different from Illegal Sand Mining*, SCC TIMES (Sept. 8, 2014), <https://www.sconline.com/blog/post/2014/09/08/dishonest-removal-of-sand-from-river-different-from-illegal-sand-mining/>.

guidelines support this fundamental concept by promoting environmental protection while limiting negative impacts on physical, hydrological, and social aspects to ensure sustainable economic growth.²² The guideline has stated that there is no direct and reliable source of data regarding the consumption of sand and aggregates in the country. However, such consumption may be indirectly estimated through indicators such as usage of cement, construction of roads and stowing of mines. The trend for aggregates extraction can be estimated using cement production as a proxy.²³

The objectives of the Guidelines are discussed as follows:²⁴

Sand and gravel mining must carry out in environmentally sustainable and socially responsible manner which will not disturb ecosystem and lives of living beings. Improvisation is required in the monitoring mechanisms of mining and transportation of extracted material. There is a need of conserving the river equilibrium and protect the natural environment by restoration of the ecological system. Aggradation at the downstream areas, especially those with hydraulic structures such as jetties, water intakes points should avoid. Rivers has to be protected from bank and bed erosion beyond its stable profile which means no obstruction to the river flow, water transport and restoring the riparian rights and instream habitats. This also include avoidance in case of polluting of river water which may lead to water quality deterioration. Further, the guidelines ensure importance of preventing the depletion of ground water reserves due to excessive draining out of ground water. Contamination of ground water by prohibiting sand mining on fissures where it works as filter prior to ground water recharge. Maintaining the river equilibrium with the application of sediment transport principles for determining the locations, duration and quantity of extraction is also highlighted. Guideline also aims to streamline and simplify the process for granting of Environmental Clearance (EC) for sustainable mining activity.

4. Enforcement and Monitoring Guidelines for Sand Mining 2020:

The Sustainable Sand Management Guidelines from 2016 have been supplemented by the Ministry of Environment, Forests, and Climate Change with Enforcement & Monitoring Guidelines for Sand Mining 2020. The 2020 guidelines mainly focus on²⁵:

²² Sustainable Sand Mining Management Guidelines 2016, *supra* note 2.

²³ *Id.*

²⁴ *Id.*

²⁵ Enforcement & Monitoring Guidelines for Sand Mining, *supra* note 3.

- **Monitoring from Source to Destination:** The new set of regulations considers a standard methodology for the entire nation and focuses on efficient sand mining monitoring, from the identification of sand mineral sources to its dispatch and end-use by consumers and the general public.²⁶
- **Audits:** States are required to carry out river audits and make comprehensive survey reports on every mining area.²⁷
- **Enforcement:** It gives states instructions to form district-level task forces specifically for this purpose. Rivers that constitute district or state boundaries require the districts or states that border them to establish a joint task force to oversee mining operations and materials as well as contribute appropriately to the creation of District Survey Reports (DSR).²⁸
- **Sustainability:** To lessen the harmful consequences of excessive sand extraction, carry out a replenishing study for river bed sand.²⁹
- There will be no riverbed mining allowed during the rainy season.³⁰

5. JUDICIAL APPROACH REGARDING ILLIGAL SAND MINING IN INDIA

5.1 Deepak Kumar V. State of Haryana & Ors 2012³¹

The Supreme Court has directed that lease for minor minerals, even those covering areas smaller than 5 hectares, must only be granted after obtaining environmental clearance from the Ministry of Environment, Forest and Climate Change. This directive was deemed necessary because environmental degradation caused by unregulated sand mining activities occurring upstream, in-stream, and on flood plains. Previously, minor leases of less than 5 hectares were not required to undergo environmental clearance. The result was unchecked mining and subsequent environmental harm. Additionally, larger mining clusters were split up into smaller units to evade regulations. The Supreme Court observed that the lack of regulation in such mining activities posed a significant threat to biodiversity, including the potential destruction of riverine vegetation, erosion, water pollution, damage to riparian ecology, ecosystem disruption, safety hazards to bridges, weakening of riverbeds, destruction of natural habitats, impact on fish breeding and migration, adverse effects on bird conservation, and increased

²⁶ *Id.*

²⁷ *Id.*

²⁸ *Id.*

²⁹ *Id.*

³⁰ *Id.*

³¹ Deepak Kumar v. State of Haryana & Ors. Etc., AIR 2012 SC 1386 (2012).

salinity in rivers.

5.2 Common Cause v. Union of India 2017³²

A massive mining scandal that involved millions of dollars. Lessees in Odisha's 3 districts have mined iron and manganese ore voraciously, destroying the local ecosystem and forests in the process, and possibly causing incalculable suffering to the local tribal population. The Supreme Court stated under the case that mining operations carried out by any person without a valid mining lease and any other operations conducted in contravention of the terms of the mining scheme, mining plan, and the mining lease amount to illegal mining. The court further clarified that any mining activity violating statutory provisions under legislations such as the Environment (Protection) Act, 1986, the Forest (Conservation) Act, 1980, the Water (Prevention and Control of Pollution) Act, 1974, and the Air (Prevention and Control of Pollution) Act, 1981 and the Wild Life Protection Act, 1972.

5.3 Anjani Kumar v. State of U.P 2017³³

The State Government and its instrumentalities should also ensure that the terms and conditions of the mining leases contain all the relevant clauses to carry out sustainable mining. In this case NGT has provided some directions regarding sand mining. NGT urged; to carry out mining activity environmental clearance needs to be a condition precedent. State Government along with agencies, institutions should ensure protection and replenishment of sand as natural resource. They should also ensure that sustainable mining has to be an important clause in the terms and conditions of the mining lease which the miner needs to properly align with.

6. CONCLUSION:

In order to reduce the adverse environmental effects that come with sand mining, effective control of this industry is essential. Some states have made regulations to control the mining of sand but, some states that have yet to propose regulations to control sand mining are still lagging. To control the illegal sand mining, all the vehicles involve in the process of sand mining should be pre-registered on the designated portal and equipped with GPS tracking system to facilitating effective monitoring. A transit pass may be issued by the competent authorities to the lessee/contractor/permit holder/mineral dealer for the lawful transportation and dispatch of excavated sand. Further, Section 23-C of the MMDR Act, 1957, provides power

³² Common Cause v. Union of India & Ors., 7 SCC 808 (2017).

³³ Anjani Kumar v. State of U.P., Original Application Nos. 557/2017 & connected matters (NGT 2017).

to the State Government to create rules for the prevention of illegal mining, transportation, and storage of minerals. Collective measures by Centre and State can contribute to the sustainable management of sand mining. The summary report by SANDRP highlights the alarming human toll of sand mining related violence in East Indian States and part of North-East. The loss of 135 human lives during 2022-2023 underscore the immediate need of addressing this issue. Ensuring safety of both individual and officers involving in controlling sand mining through strict regulations and enforcement measures. Coordinated actions are required to stop illegal sand mining, save lives and guarantee the sustainable management of riverbed minerals.

Although the increasing global dependence on sand continues to rise along with the extensive quantity of sand and gravel excavated, the significant environmental consequences, and the socio-economic challenges associated with sand mining and use have received very limited attention from policymakers in relation to addressing these issues and public awareness remains low. Furthermore, due to climate change sea level is rising, while coastal regions are facing greater vulnerability, in this case, sand in coastal areas are considered as increasingly important in minimizing the impacts of flooding and erosion. These concerns highlight the urgent requirement for government and international agencies to address, analyse and develop comprehensive regulations that restrict sand extraction to sustainable levels, ensuring that sand is not removed excessively than natural process can replenish it. Such regulatory measures are essential for global, national and regional environmental stability.

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