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CHALLENGES TO ENVIRONMENTAL SUSTAINABILITY : A STUDY ON THE IMPACT OF SAND MINING ON ALAPPAD VILLAGE, KERALA

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ABSTRACT

The paper provides an outline of the impact of sand mining on environment in Kerala, with special reference to the Alappad, Kollam. Today our environment is facing a series of challenges which are both natural and manmade like global warming, climate change, ozone depletion, different kinds of pollution, natural disasters like floods, droughts etc. Mining is the practice of extracting sand from an open pit, sea beaches, rivers and ocean beds, river banks, deltas or inland dunes. The extracted sand can be suitable for various types of manufacturing. As population grow and rates of urbanization also increases, these high levels of demand have often led to the use of unsustainable sand extraction processes and illegal sand mining. The extraction of sand is rampant in many rivers of India. With the construction boom fuelling the demand, weak governance and widespread corruption are facilitating uncontrolled and illegal mining of sand and gravel in the rivers, threatening their very existence. For the past few years, Kerala's attention has been focused on the seaside village of Alappad. Alappad mineral sand extraction was initiated by Kerala Minerals and Metals Limited (KMML), a government sector venture in Kollam, and Indian Rare Earths (IRE). Abandoned homes, deserted school, heaps of sand, a lone temple and dried up mangroves are the worst impact of mining. How does the black sand extraction in Alappad effects the society and environment? Why Illegal sand mining is rampant in Alappad region and how it affects the local people? What is the reaction of different stakeholders in Alappad issue? Here are a few of the concerns that I will seek to answer through this paper.

KEYWORDS: *Alappad Village, Coastal Erosion, Environmental Sustainability, Sand Mining, KMML, Soil infertility, Fish Mangroves*

INTRODUCTION

"The earth, the air, the land, and the water are not an inheritance from our forefathers but on loan from our children. So we have to handover to them at least as it was handed over to us."(Mahatma Gandhi)

Environment issues are emerging as the sensitive topic of discussion. Today our environment is facing a number of challenges which are both natural and manmade like global warming, climate change, ozone depletion, different kinds of pollution, natural disasters like floods, droughts etc. According to the United Nations Environment Programme, sand and gravel are the second most used natural resources after water. As a key component of cement, asphalt and glass, sand plays a major role in every aspect of our lives, from infrastructure and roads to our personal electronic devices (UNEP, 2022). The coastal areas are made up of particular ecosystems where the land, sea, and weather constantly interact and influence an area of space. These regions sustain a high species diversity of flora and fauna and are influenced by both terrestrial and marine activities. The area around the coast is home to an enormous variety of ecosystems, each with its own unique biological and abiotic processes, including coral reefs, mangroves, sea grasses, sand dunes, vegetated stung, mudflats, salt marshes, estuaries, and lagoons (Nair, 2019). Sand extraction has seen drastic growth over the past two centuries, primarily due to its use in construction industry. Removing sand from riverbeds and coastlines can also threaten biodiversity by destroying nesting and breeding habitats and reducing shielding against severe weather conditions such as floods or storm surges. Evidently, the negative impact of sand extraction on the environment extends to human health and ecosystems, bringing great social and economic harm. West Bengal, Odisha, Gujarat, Maharashtra, and the states of Kerala, Tamil Nadu, Andhra Pradesh, Karnataka, and Goa are connected by coastal zones in North India. Minerals such as ilmenite, rutile, zircon, monazite, sillimanite, and garnet are abundant in these seashore areas and can be utilized for large industrial purposes. Kerala is renowned for having a more pristine environment than any other Indian state. The people of Kerala are highly conscious of the need to safeguard the environment. Rivers are dying due to various reasons. The main reason for devastation of rivers ecology in Kerala is unselective and uncontrolled sand mining. The seaside village of Alappad is located in Kerala's Kollam district. The

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Indian rare earths ltd (IRE) Kerala minerals and metal limited (KMML), a public sector company started mining in alappad since 1965. IRE and KMML still continue to do extensive mining in the area irrespective of peoples protests. Mining and related activities have significant impacts on surface as well as the ground water resources. Pollution and water scarcity is the main problem in connection with mining (Tekedil and Srivastava, 2015). The public has been facing severe displacement, water scarcity, sea erosion and unemployment. The illegal sand mining affects the fish mangroves and wetlands.

CONCEPTUALISING ENVIRONMENTAL SUSTAINABILITY

The responsibility to conserve natural resources and protect global ecosystems for the promotion of current and future health and well-being is termed environmental sustainability (World Commission on Environment and Development, 1987). Sustainability extends beyond a focus solely on environmental concerns, encompassing social and economic dimensions. Sustainability theories make an effort to incorporate and emphasize social solutions to environmental and cultural issues. Sustainability sheds light on the interdependence of economic and social systems and the environmental degradation caused by human activity, as well as the threats that global environmental issues provide to human systems. Thus, the idea of sustainability brings up a very fundamental question: Is it possible for human activity to continue and achieve its objectives without depleting the resources it depends on (Javanmardi, Ehsan, and Xie, 2023). According to Brian Barry (1997), "certain ecological goods must continue to exist in order to preserve certain chances for future generations" (Jenkins). Governance is one of the most significant actor for ensuring effective environmental management and conservation actions. Concepts regarding the environment and governance of natural resources stretch back to the 1950s (Davidson and Frickel 2004). The goal was to comprehend how various governance procedures or policies affect intended results like livelihoods, preservation, restoration, and sustainable use or development. A central objective of environmental governance is maintaining or improving the ability of environmental systems to function and to produce ecosystem services through the persistence of species, habitats or biodiversity. The study of ecological governance focuses on the capacity, functioning, and/or performance of the institutional, structural, and procedural elements of governance (Bennett and Satterfield, 2018).

Regarding the theoretical perspective on sustainability, the collective action idea concentrated on locally driven resource governance solutions. It is a substitute for other widely accepted methods of resolving the same issues, like privatization or hierarchical state compliance. The self-organization of social movements and activism on a variety of subjects, primarily environmental problems, has also been explained by collective action theory (Lubell, 2002). Understanding the connections between formal institutions, unofficial networks, and people at various scales is the foundation of adaptive governance and allows for robust, cooperative environmental management (Gunderson and Holling 2002). Adaptive governance has been implemented in a variety of scientific contexts in coastal regions, such as disaster preparedness (Adger et al. 2005), marine transboundary governance (Tuda et al. 2019), fishing management response to changes (Cinner et al. 2012), and climate change adaptation (Hughes et al. 2007). One distinctive aspect of interactive governance theory is that it evaluates the social, organizational aspects of governance after first determining the special traits and difficulties of the system to be controlled or the possibilities and challenges it offers. Due to conflicting interests and goals, as well as challenges in forging a shared path ahead, it is challenging to achieve an integrated, comprehensive, methodical, and transparent strategy for coastal zone management (Chuenpagdee et al. 2008). Equitable governance is safeguarded when laws and policies are present to protect local rights and tenure, ensure that consent is freely given, and groups have access to justice to defend against incursions or facilitate reparations and/or compensation for past wrongs (FAO, 2017). Therefore, the significance of governance in environmental management, conservation and reiterate the need for greater attention to understanding the myriad systems of environmental governance.

SAND MINING: A GLOBAL ENVIRONMENTAL CRISIS

After water, sand is the most consumed natural resource in the globe. It has come to a point where sand is called "the new gold" and the indiscriminate extraction of this new gold is destroying physical and biological environments all over the world (Rentier and Cammeraat, 2022). Sand is a provisioning ecosystem service and often extracted from aquatic environments, such as rivers and coasts. This is because water is an important means of transportation for sediment. The primary use of sand is for construction, since concrete consists for 75% of sand. This huge demand for sand has caused the prevalence of sand mining to become a worldwide environmental issue (Asabonga et al., 2016). The phenomena of coastal extraction is caused by humans and occurs in Morocco, the Caribbean Islands, India, and South Africa. It is carried out by a procedure known as dragging, with inadequate management (Nair, 2018). As per Volza's Global Import data

2023 World imports most of its River sand from Cambodia, China and India. Natural sand exports from all countries totaled US$1.81 billion in 2022. Year over year, the value of exported natural sands rose 6.5% compared to $1.7 billion during 2021 (International Trade Centre, 2023). According to a report by Statista Research Department, The United States was the leading producer of sand and gravel worldwide, produced 97 million metric tons in 2022 (2023).

The demand for construction-grade sand is growing at a tremendous rate and the world is expected to run out of this resource by 2050. Construction-grade sand, hereafter referred to as 'sand', can be found in (former) aquatic environments, such as rivers and is a provisioning ecosystem service. Even under controlled circumstances, the practice of extracting the sand from the riverbed and -banks impacts the environment. Sand mining (extraction) is defined as the removal of primary (virgin) natural sand and sand resources (mineral sands and aggregates) from the natural environment (terrestrial, riverine, coastal, or marine) for extracting valuable minerals, metals, crushed stone, sand and gravel for subsequent processing (UNEP, 2019). The UN Environment Programme (UNEP) explains that "sand plays a strategic role in delivering ecosystem services, vital infrastructure for economic development, providing livelihoods within communities and maintaining biodiversity. It is linked to all 17 Sustainable Development Goals (SDGs) either directly or indirectly." United Nations Environment Programme (UNEP) remarked that an average of 6 billion tons of sand are taken from marine environments every year. The Marine Sand Watch estimates that between 4 and 8 billion tons of sand and each year additional materials are extracted from the maritime and coastal environments (UNEP, 2023).

Although regional and international structures are in place to stop illegal sand extraction, they haven't been able to stop this threat. According to the UN Convention on the Law of the Sea (UNCLOS), "States are required by Articles 208 and 214 to establish and implement laws and regulations that aid in preventing, reducing, and controlling pollution in the marine environment caused by activities such as sand mining". Article 194(2) of the Convention requires the State to take appropriate measures to guarantee that its mining and extraction operations do not cause harm to other States or their environment (UN Convention on Law of the Sea, 1982). The Convention on Biological Diversity aims to promote international cooperation in the defence and conservation of marine biodiversity while making the necessary contributions to repairing damaged ecosystems. In order to protect the sustainable use of natural resources, States are encouraged to work together in accordance with Articles 5, 6, and 7 of the Convention. At the same time, they must identify, monitor, and restore any environments that have suffered significant harm from mining activities. The member states are required explicitly by Article 7 to identify, track, and evaluate the environmental effects of sand mining and additional operations (Convention on Biological Diversity, 1992). Destruction along numerous shorelines is directly caused by sand dune mining. It destroys the pleasing appearance of the beach, is highly harmful to the flora and wildlife, and regularly damages other coastal ecosystems that are connected to the beach, including wetlands. Disturbances in the coastline and underwater sand cause muddy waters, detrimental to organisms like coral that depend on sunshine to thrive. It can also destroy fisheries, causing financial harm to the owners. A noteworthy consequence of beach sand mining is the absence of defense against storm surges resulting from tropical storms and tsunamis. Beach sand mining was probably the source of higher storm surges in some of the areas affected by the 2004 Indian Ocean tsunami, which led to a higher death toll. More giant waves in some of the villages hit by the 2004 Indian Ocean tsunami were likely caused by beach sand mining, which increased the number of casualties (Nair, 2018).

Removing significant amounts of material from dynamic environments like rivers and coasts, and static environments such as quarries, results in widespread environmental change (UNEP, 2014). Marine sand mining via benthic dredging causes changes in water turbidity and results in a net drop in faunal biomass and richness (Desprez et al., 2010) or a change in species arrangement (UNEP, 2014). The loss of agricultural land due to river erosion may have an impact on agricultural production (UNEP, 2014). The primary sources of aggregates for construction and land reclamation are rivers and seas. Rivers that have had silt removed from them will sever their course through the valley floor both upstream and downstream of the extraction location. This causes horizontal channel fragility and bed material grinding (UNEP, 2014). Sand mining can lead to a loss of aquifer storage. The dropping of the aquatic bench can affect agricultural production (Kondolf, 1997).

Beach erosion has escalated as a result of damming and mining, which have decreased the amount of sediment that rivers bring to many coastal locations (Kondolf, 1997). In 2018, the World Wildlife Fund (WWF) warned that sand mining of river deltas, such as the Yangtze and Mekong, is increasing the risk of climate-related disasters, because there's not enough sediment to protect against flooding. Sand mining is the world's largest mining endeavor, responsible for 85 per cent of all mineral extraction. In addition, it has the least regulations, making it perhaps the most corrupt and harmful to the environment (Pearce, 2019). The environmental effects of sand

excavating in India range from eroded riverbanks and lost biodiversity to disrupted sedimentation processes and altered river courses. We have no official estimates of how much sand is being mined in India, nor of the share of legal versus illegal extraction within the industry. As construction continues to boom, the country's sand market is expected to grow at a compound annual rate of 6.2% between 2023 and 2028. In an effort to deal with illegal sand mining, India's Ministry of Environment, Forest and Climate Change released a set of guidelines in 2016 aimed at regulating the extraction of sand and gravel, while adopting 'required environmental safeguards' (Kumari, 2023). Sand extraction impacts the natural environment in many ways. For instance, sand extraction in three major rivers in central Kerala had caused the riverbanks to become unstable, increasing the flood frequency and intensity. Removing sand can also lower water aquifers, erode beaches and destroy animal habitats (Perinchery, 2022). Hence, Rivers face multiple environmental issues due to different forms of anthropogenic activities, of which sand extraction is the most critical. Illegal sand mining without taking care of the environment is more rampant than legally regulated mining

THE STATE OF ENVIRONMENTAL ISSUES IN KERALA

Kerala is widely recognized for having a cleaner environment than the other states of India. The people are highly conscious of the need to safeguard the environment. Through its many departments, the Kerala government carries out a number of regulatory and promotional initiatives for the conservation and safeguarding of the environment. A large amount of air, water, and land pollution has resulted from population growth combined with fast urbanization, industrialization, and consumerism without proper care for the environment (GoK, 2023). Kerala was one of the first states in India to set up a state pollution control board. Its purpose is to track and manage pollution reduction methods. The government constituted environment protection programme planning committee (EPPPC) and an environmental protection, task forces for supporting the implementation on environmental protection. In order to tackle the problem of water and manage water resources responsibly, the Kerala government has released a state water policy. The state government founded the Kerala State Biodiversity Board to initiate action regarding the collection, preservation, and long-term use of the extensive biological diversity of the state (KSEP, 2009). Massive afforestation programmes launched by Social Forestry wing of the Forest Dept. since the year 2006 onwards are Ente Maram Padhathi, Vazhiyora Thanal Padhathi, Haritha Theeram Padhathi, Nammude Maram Padhathi and Haritha Keralam Padhathi (Kerala Forest Department, 2010). The calm and beautiful environment that once characterized this "God's own land" is being undermined by droughts, water shortages, sand mining that kills rivers and rivulets, changes in land use patterns that cause severe erosion of the soil, a decline in ecosystems, and an increase in the frequency of catastrophic events like earthquakes and landslides (Civic, 2008).

With a length of 576 kilometers, the coastline area makes up around 16.4% of the state's total area. Kerala's forty-one west-flowing rivers release approximately 45,060 Mm3 of water into the sea annually. There are seven lagoons, or kayals, and 27 rivers. Mud banks are uncommon occurrences that are widely recognized to occur in Kerala. Approximately thirty per cent of the population resides in coastal areas. Furthermore, the coastal regions are home to a large number of industries (GoK, 2020). The population is the primary factor putting pressure on the marine and coastal environments. Kerala produces almost 25% of India's total marine fish. In the coastal belt, a sizable portion is governed by urban government. Approximately 2000 small-scale, and 300 medium- and large-scale companies immediately discharge their wastewater into freshwater or marine environments. An estimated one million m3 of sewage are produced daily in coastal areas, with roughly 30,000 m3 of that amount ending up in surface water bodies. According to Indian National Centre for Ocean Information Services (INCOIS), the coastline around the districts of Kannur, Kochi, Alappuzha, and Kasaragod are highly vulnerable to coastal processes, including sea erosion and sea level rise (The Hindu, February 13, 2022). It is obvious that resources like mangroves, fisheries, sand, and land are being overused. Coastal erosion has been exacerbated by the establishment of ports and harbours, sand mining for building and industry, and the siting of residential areas, businesses, and recreational pursuits. The ecology is being subjected to extreme strain due to the unprecedented surge in tourism (CDS, 2021). A report by the National Center for Coastal Research (NCCR) has found that 45 per cent of the coastline of Kerala is subject to varying degrees of erosion for over two and a half decades (Kaumudi, 2021).

The inconsiderate, unscientific sand extraction of rivers in Kerala is probably the biggest cause that has destroyed the natural environment of the rivers. Sand extraction has caused a significant catastrophe for all 44 of Kerala's rivers (The Hindu, 2017). The remittances from non-resident Indians and people's innate desire to erect extravagant residential constructions fuel the building boom, which in turn causes uncontrolled sand mining from rivers. As a result, the level of water has dropped the capacity to hold water has decreased, and the variety of life forms prospering in the declining ecosystem has been negatively impacted (Ismail, 2015). The amount of water in the wells and canals next to the river is decreased when

the sand is taken away from the riverbank. Riverbanks have lowered or sunk as a result of sand evacuation, which encourages the incursion of saline water into freshwater, posing significant risks to irrigation and drinking water. Kerala has a long history of environmental, and social movements that have triumphed over the iron grip of the ruling class on several occasions. Golden chapters in the history of people's movements include the legendary Silent Valley movement, the Chaliyar River movement, the movement against the Coca-Cola factory in Palakkad, the current Anti Beach-Sand Mining movement, and other environmental movements headed by local communities and assisted by social activists. In all of Kerala's taluks, Taluk Level Special Squads are in charge of keeping an eye on illicit sand extraction (The Hindu, 2021). The indefinite relay satyagraha being staged under the support different Samiti against mineral sand-mining in Kerala (Gok, 2022).

THE IMPACT OF BLACK SAND MINING IN ALAPPAD VILLAGE

Profile of the Study

The methodology used in the study is mainly empirical, historical and observational. The data were gathered from primary and secondary sources. Primary data were obtained with the help of field visit and interview. Altogether 150 samples were selected and interviewed on the basis of accidental sampling method. Secondary data were limited in nature books, articles, newspaper, clipping internet source relevant to the focus of study were gathered and collected. Alappad is a large village located in Karunagappally Taluka of Kollam district, Kerala with total 5229 families residing. Agriculture is the main profession of this village. The Alappad village has population of 21655 of which 10689 are males while 10966 are females as per Population Census 2011. In 2011, literacy rate of Alappad village was 95.52 % compared to 94.00 % of Kerala As of 2011 census there are 1026 females per 1000 male in the village. Alappad has 33% (7787) population engaged in either main or marginal works. 55% male and 17% female population are working population. The Alappatan Coir is the world's foremost market. The coastal sand dunes in Alappad Village are rich in minerals ilmenite, rutile, zircon, monazite, leucoxene (brown ilmenite), sillimanite and garnet (GoK).

ALAPPAD SAND MINING ISSUE

In Kerala's Kollam district, the stretch of coastline between Chavara and Alappad has a long history of locals fighting mining firms for their livelihoods. The presence of the minerals ilmenite, rutile, zircon, monazite, leucoxene (brown ilmenite), sillimanite and garnet in coastal sand dunes of Kollam was discovered in 1920s. On a journey through this coastal belt, one can spot abandoned houses, temples, schools and many more building where people once lived. Red coloured ponds and dried up mangroves forests are another painful sight (Haritha, 2018). Since the 1960s, there has been widespread mineral beach sand mining in Kerala. The abandoned structure is what's left behind from people's fruitless protests and never-ending strikes. The local villages are disappearing from the Kerala map one by one. A village named Panmana has turned in to a heap of sand and an abandoned temple stands, around which thousands of fishermen once lived in Alppad panjayat, activists remarks that due to beach erosion, a shortage of drinking water, and a paucity of fish, more than 6,000 fishing families have left the area over the years (Elankath, 2018). Kavithottam, another village on the coastline, also has only 50 families left. In 2010 almost all indigenous communities were evicted from Kavithottam region in Chavara, promising that they will be allowed to rehabilitate back in their own land after completing the mining within three years, but even eight years after those evictions. No rehabilitation has occurred, more than 500 families are homeless. The villages of Kollam Neendakara to Kayamkulam are in danger of being evicted due to severe coastline degradation that has been threatening to swallow them up for a while. The majority of people have been compelled to leave their homes, often without receiving any payment from the government or mining corporations (Rawat, 2020).

In 1958, Gramodharani is an organisation started agitation by concentrating on vellanathuruth. The main demand of the struggle is for job security struggle began with the leadership of KU. Kumaran , PT Jakep and surendran after one month , as per certain consideration the struggle dispersed . As a result 15 persons are get employment in private company of the time. 1960 Hopkins, Williams are the private institution owned sand mining in October 10, 1960 the company disclosed. Other sand mining owned company are Travancore Minerals Company and American Minerals Company. In 1964 on words central government takes the ownership of Hopkins and Williams company, American minerals company and Travancore minerals company Even that time FX Perera sons a company continued to manage sand mining (The Indian Express, 2019). In 1970, Kerala government takes the responsibility of the company in the name of KMML. Even though government take the responsibility of sand mining by 1964 in the name of IRE, the sand excavating restarted since 1970. Sand extraction based on human labour transformed into mechanised procedure under the ownership of public institutions the beginning of mechanisation changes occurred in the river basins. Following that struggles were going on for the

protection of fish folk. The foremost strike initiated under the leadership of chellapan, the president of Alappad Panchayat. But police suppressed these struggles. CPI as a major political party started various agitations, but authority always suppressed these movements. Protests were then started against the Lahti charge in the form of a March (Mathrubhumi, 2019).

At the present, the condition of Alappad is so worse. Sand mining completely affected the environment. The people in these areas of Alappad region are not affordable to transform their life situation to other spaces. Protest needs to be stranger, the government and the people have the responsibility to protect even the remaining land in Alappad. In 1995 many foreign companies had tried mining in the coastal area, continuous protest from the public and activists forced them to drop the projects. With the banner "Save Alappad, Stop Mining," the locals of Alappad initiated the protest against the extraction of black sand. 89.5 square kilometers made up the village's total size (Deccan Chronicle, 2019). However, it is currently only 7.5 square kilometers. Vellanathuruth, a mining site here, might disappear any time as the area is close to sea and backwater is closing on the land day by day. Over 20,000 acres of land turned to sea. IRE has been mining at 82 areas in Vellanathuruth. The company has purchased land for mining in other wards of Alappad Panchayat. Since the companies have got clearances from respective departments of state government as well favourable orders from the High Court of Kerala, the opposition voices are silenced. There is no data on people who were evicted without any assistance for their loss and no enquiry about polluted drinking water sources of this coastal belt. Though activists quote the numbers of families vacated from the region, there is no official data on it (The Indian Express, 2019).

In 2004, Tsunami was affected the Alappad coastal area. The protest has received attention on social media, with many organisations and prominent personalities extending support. The ‘Save Alappad, Stop Mining’ campaign has gained traction on social media with several film stars joining it. Activists in Alappad panchayat maintain that around 6,000 fishermen and their families have left the area over the years as a result of erosion of the shoreline, a shortage of potable water, and a lack of fish. Even without compensation from the government or the mining companies, most people have been forced to abandon their homes. The people of Alappad are doing a constant indefinite hunger strike. Environmental protection voluntary committees from different sectors support this struggle. The NGOs and action councils also conducted strong actions against the artificial mining. Major political parties in Kerala failed to effectively address the problem (Times of India, 2019). Not only that, even they were not engaged in popular agitation. For the disengagement, various political parties claimed un responsible opinions regarding sand mining issue. In Chittoor region near Chavara, there are open ponds that have been used by companies for dumping chemical waste. It has been years since the residents there stopped using these drinking water sources. After repeated agitations the companies started providing drinking water to the residents in Chavara region, but not regularly the water and other resources were abundant in the area .the fish availability was abundant and water scarcity and poverty is another problem of in the region. Massive coastal erosion is another effect of the mining. According to litho map of the area, in 1995 the alappad village's area was 89.5 kilometres square now it is just 8 kilo metres square (Nair, 2019).

THE IMPACT OF BLACK SAND MINING IN ALAPPAD : MAJOR OBSERVATIONS

- The survey data shows that, 50% of the respondents of the study area were engaged in fishing. It was followed by government servants, MGNREGS workers and private job.
- Regarding the economic position of the people, Majority of them belongs to BPL category.
- 50% of the respondents expressed dissatisfaction with policies taken by the government as part of ecological protection
- 90% of the respondents were fully disappointed with the functioning of the company
- Mining and related activities have significant impacts on surface as well as the ground water resources. Pollution and water scarcity is the major issue in connection with mining. In the survey, 70% of the survey respondents felt that mining has declined ground water source
- A thumbing majority ie, 80% of the respondents expressed their dissent with the functioning of the pollution control board government
- Majority ie, 80% of the respondents were against the attitude of the company towards local peoples. It is interesting to note that, even a single respondent of the survey never commented positively to the management.
- Social media has made the struggle more visible and now the government is left with no other options but to intervene
- The survey result clearly demonstrated that, the illegal sand mining affect the fish mangroves and wetlands
- 70% of the respondents were dissatisfied with the actions of panchayath authorities on this issue

- An important finding of the study is that indiscriminate mining of the sand can continue regardless of damage to the ecosystem and the livelihood of the people
- It observed that unregulated mining of large volumes of sand along beaches leads to their massive erosion
- The mining leads to contamination of soil, groundwater and surface water by chemicals from mining processes.
- The IRE and KMML company's huge mining in alappad and the mining highly effect the coastal area and its threat of the sustainable ecosystem
- It was discovered that the village is still experiencing protests against IREL's improper extraction of sand.
- Another findings was that the media, judiciary, political parties and government are neutral in Alappad issue
- IRE and KMML companies continued mining without considering legal provisions
- It was observed that the sand mining affect the agriculture sector to a great extent
- Another finding of the study is that unscientific excavation resulted in sand accumulation.
- It was found that the role of panchayat in solving and reducing black sand mining issue is not effective
- The study revealed that Mining and related activities have significant impacts on surface as well as the ground water resources.

CONCLUSION

The sustainable development is one of the most Important concept with are widely discussed throughout the world. Compared to other living things, humans interact with the environment with greater intensity. We are taking a significant amount of sand out of the environment, which has significant effects. The global climate risk index CRI states that India is the sixth vulnerable country in the world in terms of facing extreme weather events. In India most of the states are facing the after effects of global warming and climate changes. These all are happening due to the unwanted intervention of human in nature. The natural environment is under menace from human actions, leading to habitat loss, loss of biodiversity and spread of invasive species. The main reason for destruction of rivers ecology in Kerala is indiscriminate and uncontrolled sand mining. The black sand of Kollam district in coastal Kerala is classified as 'strategic' because it contains minerals for atomic energy and defence applications. Therefore. indiscriminate mining of sand can continue, regardless of damage of the eco-system and the livelihood of people. The government institutions are not monitoring the unsustainable practices of mining firms, which are damaging coastal zones to increase their profits. Major political parties in Kerala failed to effectively address the issue. Different issues were elicited by the local people. The people faced severe displacement, water scarcity, sea erosion and unemployment. If the situation continues like Alappad most of the coastal villages will be vanished from the Indian Map. Hence, a holistic approach must be developed to settle the issue. State must initiate an effective mechanism to address sand mining issue in Alappad. Bird Johnson rightly remarked that "The environment is where we all meet; where we all have a mutual interest; it is the one thing all of us share."

REFERENCES

Adger, W.N. , Huq, S. , Mace, M.J. , Paavola, J. (Eds.), Justice in Vulnerability and Adaptation to Climate Change, MIT Press, Cambridge (2005)

An anti-mining campaign in Kerala that's got support from ... (n.d.). Retrieved from https://www.thenewsminute.com/article/anti-mining-campaign-kerala-thats-got-supportactor-tovino-and-vijay-fans-94680

Asabonga, M., Betek, C., Musampa, C., Mpundu, N., Motebang, D.V., 2016. The physical and environmental impacts of sand mining. Trans.R.Soc.S.Afr. (5), 2–10.

Bennett, N. J., Govan, H., & Satterfield, T. (2015). Ocean grabbing. Marine Policy, 57, 61–68

Bennett, Nathan J., Satterfield, Terre (2018). Environmental governance: A practical framework to guide design, evaluation, and analysis. https://doi.org/10.1111/conl.12600Citations: 129

Bennett, Nathan J., Satterfield, Terre (2018).Environmental governance: A practical framework to guide design, evaluation, and analysis. https://doi.org/10.1111/conl.12600Citations: 128

Chuenpagdee, Ratana, Jentoft Svein (2009), Governability Assessment for Fisheries and Coastal Systems: A Reality Check. Human Ecology, 37(1) pp. 109-120.

Cinner, J.E., McClanahan, T.R., Graham, N. Daw, T.M , Maina, J., Stead, S.M., Wamukota, A., Brown, K. and Bodin (2012). Vulnerability of coastal communities to key

impacts of climate change on coral reef fisheries. Global Environmental Change. 22(1) , pp 12-20

Current Biology .DOI 10.1016/j.cub.2006.12.049

Davidson, Debra J., Frickel, Scott (2004).Understanding Environmental Governance: A Critical Review .Organization & Environment, 17(4) pp. 471-492

Gunderson, L. H., and C. S. Holling. 2002. Panarchy: understanding transformations in human and natural systems. Island Press, Washington, D.C., USA.

https://cds.edu/wp-content/uploads/RULSG-Policy-dialogue-05-coastal-families-displaced.pdf

https://e360.yale.edu/features/the-hidden-environmental-toll-of-mining-the-worlds-sand
Kumari, Shalinee (2023). New platform unites tech and activism to monitor sand mining in India. https://www.thethirdpole.net/en/nature/new-platform-unites-tech-and-activism-to-monitor-sand-mining-in-india/

https://en.gaonconnection.com/the-disappearing-fisherfolk-and-the-vanishing-villages-of-kerala/

https://englisharchives.mathrubhumi.com/news/kerala/save-alappad-protest-strengthens-across-state-1.3468469

https://keralakaumudi.com/en/news/news.php?id=702640&u=#:~:text=THIRUVANANTHAPURAM%3A%20A%20study%20conducted%20by,two%20and%20a%20half%20decades.

https://scroll.in/article/899319/sand-mining-in-coastal-kerala-is-swallowing-villages-and-displacing-thousands

https://sustainabledevelopment.un.org/content/documents/5987our-common-future.pdf

https://timesofindia.indiatimes.com/city/thiruvananthapuram/why-is-keralas-alappad-village-getting-eaten-up-by-the-sea/articleshow/67571565.cms

https://village.kerala.gov.in/Office_websites/contactus.php?nm=364AlappadVillageOffice(KLM)

https://wedocs.unep.org/bitstream/handle/20.500.11822/33636/TELDAST.pdf?sequence=1&isAllowed=y

https://www.unep.org/news-and-stories/press-release/our-use-sand-brings-us-against-wall-says-unep-report

https://www.unep.org/news-and-stories/press-release/unep-marine-sand-watch-reveals-massive-extraction-worlds-oceans

https://www.unep.org/news-and-stories/story/problem-our-dwindling-sand-reserves

https://www.worldstopexports.com/top-sand-exporters-by-country/

Hughes, Terence, P.,1, Rodrigues, Maria, J., Bellwood, David, R., Ceccarelli, Daniela, McCook, Laurence, Moltschaniwskyj, Natalie, Pratchett, Morgan, S., Steneck, Robert S and Willis, Bette (2007). Phase Shifts, Herbivory, and the Resilience of Coral Reefs to Climate Change

Nair, Anupama, G (2019).Impact of mining on Coastal zone: Alappadu Beach- A Case study. *International Journal of Law, Education, Social and Sports Studies*. 6(1).

Perinchery, Aathira (2022). India's Sand Problem in the Fore as UN Report Warns of a Crisis. https://thewire.in/environment/need-to-get-a-grip-on-sand-extraction-un-report-on-impending-global-sand-crisis

Rawat, Bhim Singh Due to the extensive beach sand mining, villages in Kollam are vanishing from the map of Kerala

Rentier, E.S. and Cammeraat L.H. (2022). The environmental impacts of river sand mining. Science of the Total Environment. https://www.sciencedirect.com/science/article/pii/S0048969722029746

Tekedil Humsa, Zeenat and Srivastava, R. K. (2015). Impact of Rare Earth Mining and Processing on Soil and Water Environment at Chavara, Kollam, Kerala: A case study. https://core.ac.uk/reader/82003840

Tudaa, Omondi, Karke, Salit and Newton Alice (2019). Exploring the prospects for adaptive governance in Marine Transboundary conservation in East Africa. *Marine Policy*. 104, pp 75-84