

Impact of Sand Mining on Asian Countries-A Review

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Abstract:

Sand mining resulted deterioration of environment in several Asian Countries. Illegal sand mining adds fuel to it. Ecosystems were badly damaged in Cambodia, Indonesia, Malaysia and Sri Lanka. Dunes from Israel lost their beauty. Floods were caused loss of assets and crops in Cagayan and Java. Plants and animals severely affected from the sand mining in Cagayan, Cambodia, Jerusalem, Liberia, Malaysia, Singapore, Sri Lanka and Israel. Fisheries industry collapsed in Cagayan, Cambodia, Kosrae, Singapore and Srilanka. River bank erosion noticed in Cagayan, Java, Kosrae, Liberia. Beaches were eroded and the coasts lost their natural morphology. From the present study, it is observed that there is a need to regulate sand mining activities, if not done so far. The damage should be an eye opener for the rest of the world.

Keyword: Sand mining, Asian Countries, Environmental damage, Rivers, Beaches and Fisheries.

I. INTRODUCTION

Since, the long time sand has been using as a construction material. Though the sand has some benefits the sand mining has severe effects on various environments where from it is excavated (Ex. rivers, beaches and dunes). In the present study an attempt is made to review the effects of sand mining in various Asian countries [1].

Cagayan

To investigate concerns of retreating coastlines, loss of livelihood and displacement due to black sand mining, the Center for Environmental Concerns –Philippines conducted an Environmental Investigative Mission (EIM) on four municipalities in Cagayan province namely: Aparri, Gonzaga, Camalaniugan and Lal-lo from September 18-19, 2010. Magnetite sand is being mined along Cagayan River in the municipalities of Camalaniugan, Lal-lo and some parts of Aparri[2].

In Brgy, sapping some parts of the riverbank structure that control flooding and erosion were destroyed. Residents are now wary of the eventual collapse of the structure. Further downstream in Brgy, Bisagu and Aparri nearly 100 households lost their home, where residents say that the river claimed nearly half of their barangay's land area. Approximately 80 meters of land stretching 700 meters from Brgy, Dugo to Brgy. Gen. Batalla was reportedly eaten away by the river within a year, since typhoon Pepeng hit the region last year. Rice, corn, vegetables and coconut farmlands in Brgy, Jurisdiction has been flooding after heavy rains. Bank erosion is also present in the area.

Magnetite sand mining physically alters the river by disturbing the sediment supply of the fluvial system and by modifying the channel geometry. Sand mining reduces the sediment being supplied to areas downstream of the mining operation. Reduced sediment supply generally leads to channel incision and lowering of the river bed, which, in turn may cause bank instabilities [3].

Mining also locally modifies the channel geometry by increasing the channel depth at the sites of extraction. In cases where there is on-site separation of magnetite from the sand, the dumping of 'waste' sediment causes other parts of the channel to become shallower. The changes in the channel geometry may lead to a modification of the existing flow regime, which may cause undesired enhancement of flooding, deposition and/or erosion at specific sites. Extraction of sand at or close to the base of river banks can remove basal support, increase the height of the bank, and thus induce bank instability. Mining activities threaten the supply of fish and other aquatic products. The extraction of black sand from the river/ocean bed disturbs the habitat of benthic organism- one of the key elements of aquatic life [4].

Sand dunes develop over a long period of time by accumulating sand in a slow evolutionary process of succession. Destruction of this area thereby means the destruction of a precious ecosystem that has been formed over many decades and that cannot easily be reconstructed [5]. The operations directly remove sand from the system,

and/or deprive areas in the down current direction of their sand input. Recovery of a mined out coast, cannot be guaranteed. Based on the experience of several areas in La Union province, coastal erosion has continued to affect the areas even decades after the cessation of magnetite mining.

A. Cambodia

Massive sand dredging operation on the Tatai River amid concerns it is decimating the waterway and ruining the tourist trade. The island city-state, the epicenter of a global sand industry worth more than US\$6 billion annually, imports around 3.8 million tons of sand each year for land reclamation and construction projects. But following an Indonesian Government ban on sand exports in January 2007, Cambodia - with its loose regulatory framework and pristine coastal environment - is now squarely in the sights of foreign dredging companies. It also confirmed that the Peam Krasop Wildlife Sanctuary, a 25,897-hectare protection zone established in 1993 to protect one of the world's last intact coastal mangrove ecosystems, lies at the center of Winton's extensive sand-mining operations. The use of 20 to 30 boats, which each had a 500-cubic-metre capacity, eight cranes and four pumps, was "excessive", and running dredgers 24-hours a day and pumping sand very close to river banks was a mistake. A sand dredging operation of "unprecedented scale" on the Tatai River, in Koh Kong province, had decimated fish stocks, ruined eco-tourism projects and released foul-smelling gases into the air [6].

B. Koh Kong province

A Chinese company is extracting thousands of tons of sand from coastal areas in Koh Kong province each day, raising the spectre of long-term damage to the region's fragile estuarine and marine ecosystems.

Locals are now alarmed by the scale of sand dredging along the Tatai River. The rate of dredging is so extreme that any effects from sand flushed upstream by sea currents would be inconsequential. The banks of the rivers near outside of Tatai town had begun falling in because of operations [7].

C. India

In India almost all the states are affected by the sand mining. The Rivers of Andhra Pradesh[8], Assam, Chattisgarh, Goa, Gujarat, Haryana, Jammu and Kashmir, Kerala(Photo 1), Madhya Pradesh, Manipur, Nagaland, Orissa, Tamilnadu, Uttar Pradesh, Uttarakhand and West Bengal are damaged.

The Valmiki Tiger reserve forest of Arunachal Pradesh, Forests in Assam, Kullu Valley in Himachal Pradesh, Vembanad lake in Kerala,

Coastal areas of Maharashtra, Kerala, Goa are also affected from sand mining activities.



Fig-1 A View of the Dried-up Bharathapuzha River, Kerala, India. - K.K. Mustafah

Source:

<http://www.thehindubusinessline.in/2004/03/18>

D. Indonesia

Malaysia banned the export of sand in 1997, and since then, Indonesia has been supplying sand to Singapore. Indonesia has announced a ban on land sand exports. Indonesia says the ban on the export of sand is due to environmental reasons and to protect Indonesia's borders [9].

E. Israel

The Israel Land Administration (ILA), the government agency that owns most of the land in Israel, has become concerned about building contractors who have been driving large trucks into the Negev desert to cart away sand for use in the production of concrete.

In response to the theft, the ILA has put one of the last major sand dunes in the Negev up for sale, with the hope of deterring further stealing. The administration is currently preparing to decide which contractor will dig up the sand from a dune in the Arava Valley and move it to Eilat, where it will be sold to builders.

Local activists, together with the Israel Union for Environmental Defence, are mounting a high court challenge to block the move, claiming that the sale could ruin the natural beauty of the dune, as well as the habitat of rare species of plants and animals that thrive there. Both the theft of sand and the determination of the ILA to sell a dune are symptoms of a wider problem facing Israel[10].

F. Java

The hills of Cisarua hold great potential as their sand is of very high quality, so much so that illegal mining activity is threatening the destruction of the ecosystems of the hills. Tugumukti village, Cisarua, Indonesia [11]. Even if we consider the logic of simple dredging to solve flooding and bank erosion, recent field observations and resident accounts point to the fact that these operations are ineffective in addressing these problems. In contrast to the expected outcome, flooding and bank erosion have persisted or worsened. The latter has caused the destruction of houses, infrastructures and farmlands [12].

G. Jerusalem

The contentious Samar sands, located north of Eilat, are slated to be mined for construction use in the nearby city, but environmental activists have been protesting this decision for months, due to the uniquely isolated biodiversity located within the sands. Of the original 1,100 hectares of sand, only 20 percent remain after previous mining stints, and the flora and fauna still residing there are thought to have genetic links to those in the Sahara Desert. According to the environmental organizations mining the sand in the Samar would be a fatal blow to the animals in the dunes and to an area of leisure and recreation, and there are alternatives available that would prevent the destruction of the dunes [13].

H. Kosrae

Sand mining from the beaches of Kosrae is a major cause of much of the coastal erosion. Much of the erosion stems back to the removal of much larger quantities of coral rubble and sand from the reef flat during the period when the circumferential road was being upgraded and other large scale development projects were being constructed. At present most Government and major construction projects use sand and aggregates from licensed sand mining sites. As a result of this the erosion rate is slowing down as the beaches and reef flat gradually recover from such activities.

I. Liberia

Lands, Mines and Energy officials(2005) expressed grave concern at the alarming rates at which commercial sand miners are destroying and damaging the Atlantic Ocean outlets thus posing a serious and imminent danger as well as threats to many Liberians that presently nears Monrovia;s sandy beaches[14]. Disturbance of underwater and coastal sand causes turbidity in the water, which is harmful for such organisms as corals that need sunlight. It also destroys fisheries, causing problems for people who rely on fishing for their livelihoods [15].

One major impact of beach sand mining is the loss of protection from storms surges associated with tropical cyclones and tsunamis. Some communities affected by the 2004 tsunami in the Indian Ocean had higher storm surges probably due to beach sand mining resulting in fatalities. Sometimes it is difficult to tell that a beach has been mined. Sand extraction becomes difficult to recognize as the beach readjusts to a new profile after a few storms.

Now the sand miners are also exploiting beach sand, which has a tendency to suspend forever the immense tourism development potential Liberia boasts along its impressive 350-mile coastline. The Ministry of Lands, Mines and Energy (2012) has announced the closure of all beaches across the country to sand mining and all beach sand mining activities must be directed to river sand mining[16].

J. Malaysia

Despite numerous prohibitions and regulations, illegal sand mining continues rapidly in the Selangor state. Selangor loses over RM100 mil in revenue every year due to illegal sand mining activities. Illegal sand mining areas include Bestari Jaya, Rawang and Kuala Langat. In some places, this has been going on for more than 20 years. The state government had issued a total of 46 sand mining permits in private lands, but the number of illegal activities detected was double that number. The Selangor government has identified 30 small illegal sand mining sites with an output of up to 600 lorry loads a day in various districts in the state. Illegal mining activities result lake like topography along Sungai Sembah in Kuala Selangor Sungai Sembah it flows into Sungai Selangor and tapped for drinking water at present it is under erosion and water turned murky [17].

Ashraf et al., (2011) studied the impact of sand mining in Bestari Jaya catchment. It is drained by Selangor River. According to their study on an average, 11.73 million ty^{-1} of sand and gravel are being extracted from the active channels and 0.414 million ty^{-1} , of sand from the river floodplains. The quantity of instream mining is about 40 times the higher than the sand input estimated in the gauging stations. As a result of indiscriminate sand mining, the riverbed in the storage zone is getting lowered at a rate of 7 to 15 cm y^{-1} over the past two decades. This, in turn, imposes severe damages to the physical and biological environments of these river systems. Ashraf et al. (2011) concluded that;

K. Singapore

Singapore imports about 15 million tonnes of sand annually, largely used in expanding the land mass of the island[18]. The densely populated state of Singapore has expanded in size by more than 20

per cent since the 1960s by reclaiming vast amounts of land from the sea, in doing so becoming the world's biggest importer of sand – 14.2 million tonnes in 2008.

Most of its exports have come from neighbouring Indonesia, Malaysia and Vietnam but all three have now attempted to limit or ban exports of sand. With plans to expand its surface area by a further 7 per cent by 2020, Singapore is becoming increasingly reliant on another one of its neighbours, Cambodia, to meet its demand. Although Cambodia publicly maintains that it has banned sand exports, an investigation by the NGO Global Witness has estimated that 796,000 tonnes of sand with a retail value of US\$248 million are still being extracted and exported to Singapore every year from just one province, Koh Kong.

The extraction is coming at a significant environmental cost. Dredging reduces water quality by increasing turbidity, blocking sunlight and killing off plant life, including sea grass and coral. Sand extraction also disrupts natural sedimentary regimes causing increased erosion and greater flood risks. There have also been reports of significant declines in fish stocks. Sand dredging licences, Global Witness maintains, are being allocated inside protected mangrove and sea grass habitats. Local newspapers have also reported villagers being attacked and killed during forced evictions from areas of increased sand extraction.

Illegal and legal sand-mining activities in Gauteng, North West, Limpopo and KwaZulu-Natal have attracted the attention of conservationists, who say areas destroyed to meet growing demands for building materials may never be rehabilitated because topsoil is a non-renewable resource. In Gauteng, illegal sand mining operations have destroyed large tracts of land adjoining, and within, the provincial government's Blue IQ project - the Dinokeng Game Reserve near Cullinan - thus threatening to cripple the province's own economic development plan for the area [19]. The Serengeti in north-eastern Gauteng is also listed as an irreplaceable conservation site by the Gauteng department of agriculture, conservation and environment. Please by land owners through the Serengeti Conservancy and the Cullinan Agricultural Union to various government departments over the past 13 years to halt the destruction have come to nought. In the Dinokeng area illegal sand miners have redirected the Krokodilspruit and the Boekenhoutspruit so they can mine sections of riverbeds to supply sand for paving. They have moved into wetlands, mined areas until they reached bedrock, illegally used water resources without the necessary permits and flattened trees and uprooted vegetation that might never be restored. The water in some parts is so polluted - it is milky brown

in colour from silt build-up - which local residents have to rely on borehole water. Sludge that washed on to lush patches of grass during the last good rains smothered everything beneath it.

L. Sri Lanka

Sri Lanka is one of the countries, worst affected by sand mining activity [20]. In the recent past rapid development has led to an increased demand for river sand as a construction material. Instream sand mining is a common practice because the mining locations are usually near the markets or along the transportation route, hence reducing the transportation costs. This has resulted various problems that require urgent action by the authorities. These include river bank erosion, river bed degradation, river buffer zone encroachment and deterioration of river water quality and groundwater availability.

Over-mining of rivers in Sri Lanka causes many problems like salination of public drinking water supply schemes due to the intrusion of sea water into the river, collapse of river bank, erosion of riverbank land areas and many more. Priyadasa [21] and Priyadasa and Naverathna [22] studied impact of sand mining on three rivers i.e. Walawe Ganga, Nilwala Ganga and Deduruoya in the western and southern parts of Sri Lanka that have different levels of river sand mining activities and problems. With reference to hydrological assessment Nilwala River in the southern part of Sri Lanka has a long history of sand mining activity along the upper reach. Walawe River recently has been a major source of sand for construction with the development of the southern region of Sri Lanka. Presently due to a legal order fewer activities of sand mining are on-going in Deduruoya in the western part of Sri Lanka. The study revealed that in recent decades the Deduruoya River has been deeply damaged and degraded by unsustainable mechanized river sand mining. Water resources of the area are highly affected by over extraction of river sand that has lead to declining ground water levels. Due to uncontrolled and illogical extraction of sand the depth to groundwater has deepened to 12-15 meters and goes down to 30 meters in certain places. Over-mining in the Nilwala River causes many problems like salinization of public drinking water supply due to the intrusion of sea water into the river, collapse of river bank and loss of river land. River sand mining and inland sand mining along the Walawe river during the past two decades has deepened the riverbed by an average three to four meters, while there are some points where it has dropped by more than six meters.

According to a volunteer team of Net Wales [23] the situation is rather alarming in certain major rivers including Kalu Ganga, Walawe ganga, Kelani

ganga, Nilwala ganga, Deduru Oya, Ma Oya and Kirindi Oya. Some of the impacts are as follows; The exposure of the riverbed to solar radiation following deep mining has resulted in its drying up. This has decreased the water volume and caused salt water intrusion into rivers and ground water. Continued sand mining has led to obstruction in the free flow of water in the rivers. Uprooted plants, damaged to plant parts such as branches, loss of tree species, disturbances to survival, habitat loss.

Loss of aquatic habitats (specially for fish), loss of fish species (Koraliya), decreased species diversity due to loss of sensitive species, loss of spawning grounds for aquatic species and river bank dwelling species, disturbances to food webs, habitat loss for bank dwelling species such as aquatic birds, reptiles, amphibians Ecosystem stability. Destruction of roads and damages to bridges are another result of rampant sand mining damage to Hunuwela to Kahawatta road and the Bridge crossing the Weganga is observed[24]. Another concern is that the sand mining in river bed has bared the bases of the pillars of the bridges to the extent that the foundations that are supposed to remain under the riverbed are now exposed.

CONCLUSION

The study reviewed the effects of sand mining on various countries of the Asia. Sometimes, the activity creating havoc in certain parts. So, it is suggested to view the problem in a serious manner and take the necessary steps to save the people and environment, if not taken so far.

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