

Issues and challenges in river management due to excessive sand mining

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1.0 Introduction

Sri Lanka's construction industry requires over 7 million cubic meters of sand annually which is obtained from the country's river beds, river sides or mined from previous riverbeds and sand dunes in the coast (7). Demand for river sand was increased remarkably during the past few years due to construction boom taken place under the rapid development programs. Post-Tsunami re-construction too pressurised the demand for sand further. Manual harvesting of river sand was the practice until late 1990's. After illegal mechanized mining came into practice, large scale malpractices of sand mining started. This has caused adverse impacts on river morphology and the country is witnessing loss of water security and ecosystem damage due to lowering of water tables in rivers. Bank erosion, land degradation and salinity intrusion along the river, damage to irrigation, road and other infrastructure, excessive coastal erosion and increased health hazards are implications of this mismanagement of rivers. Objective of this paper is to highlight the adverse impacts of excessive sand mining on river morphology and natural eco system and the effects on community. It further highlights the role playing by some advocacy groups, media and civil society to agitate the authorities to control the unauthorized sand mining in the absence of proper legislations for conservation of river system.

2.0 Overview of the rivers in Sri Lanka

The land area of Sri Lanka 65,525 sq km is comprised with 103 distinct river basins and 94 small coastal basins. The rivers radiate from central highlands to all corners of the island pausing a view of a cycle wheel with porks. All rivers are less than 160km in length except one river, Mahaweli Ganga, which is 335 km long. (Please see Fig 1)

Rainfall is unevenly distributed and meteorologically the country divides itself into four distinct zones namely wet, intermediate, dry and arid. Eighty watersheds account for the surface water supply of the dry zone. Rivers in wet zone are noted for their flood hazards in their densely populated and well cultivated lower reaches. Most of the major perennial rivers in South West quadrant of the country run through the two distinct reaches, viz. upper reach in the hilly region and the lower reach in the alluvial plains. Upper reaches of these rivers are boulder type which has steep slope and bed consists of a mixture of boulders, gravel and sand. Deduru and Maha Oya rivers, which will be

quoted in this paper are in the boarder of wet zone and dry zone and more than 75% of the length run through the flood plains.

All the rivers can be categorized as the live wire of a large cross section of the community that depends on them. Those rivers supply water for irrigation, domestic use and industries, bed loads for extraction of sand necessary for construction industry, fishes for consumption and rich riverine wetlands that provide variety of raw materials and services for livelihood of rural community and for many trades.

All the rivers around the country replenish the coast with the bed load that collect while traversing, specially through the highlands. Hence the stability of the coast too depends on the river network that nourishes it with sufficient sand.

3.0 Extracting of River Sand for constructions and it's implications

River sand is an essential raw material in construction industry and introducing of alternate materials has not been successful due to many reasons. Reluctance to accept alternatives for this traditional material, shortage of financially viable resources and lack of attention from the researchers to guide the users are some of the reasons. Geological Survey and Mines Bureau (GSMB) established in 1992 has the authority to regulate sand mining. In the 90's decade sand mining sites expanded dramatically where in some river basins it had been 2.5 times more than in number, of original sites. [9]

Mechanized harvesting of sand is not allowed by GSMB. But illegal mechanised mining started in 1990's has resulted in heavy localized turbidity, lowering of water tables, river bank erosion, land degradation and salinity intrusion resulting in hardship both to the population and riverine ecosystems. [9] Sea erosion is another significant secondary effect due to insufficient sediment flow through the rivers. In particular, concerns are raised about the increasing damage to drinking water sources, loss and damage to irrigation systems and agricultural lands and spread of vector borne diseases by providing the breeding grounds for mosquitoes.

The issue is more widespread than is officially accepted, affecting many rivers, wetlands, coastal belt and water bodies throughout the country. According to a conservative guesstimate at least 25% of Sri Lanka's 103 rivers are negatively affected due to illicit river sand mining at some point along its course. [9]

4.0 Legal coverage

Sand is a property of the state which requires a permit for mining and transport as defined in the Mines and Minerals Act No. 33 of (1992) of Sri Lanka. [6] Artisanal sand mining had been the norm in Sri Lanka until the current law Mines and Minerals Act No.33 of 1992 (replacing the former Mines and Minerals Law No.4 of 1973) established the Geological Survey and Mines Bureau which regulates the exploration for, and mining of "minerals" which includes sand. The Geological Survey and Mines Bureau (GSMB) is responsible in identifying locations and quantities of sand deposits. Expressions of

interests or tenders for mining are called by the District Administrator, Divisional Secretary since the custodian of the rivers and the state lands vested with them. As such two government agencies need to collaborate on issuing licenses.

The monitoring mechanism is not functioning properly as the organisational structures of these two organisations are not strong enough with facilities and human strength. It has been found that the license form issued to applicants does not in some cases contain all the conditions stipulated by the Act, or contains them in a diluted form. This is again due to weak enforcing, monitoring and feed back mechanism.

These licenses are required by the Act to contain a number of conditions including a requirement that the licensee comply with all written laws relating to the environment and to rehabilitate the land to which the mining license relates. Therefore with fragmented responsibility, as well as external pressures from the sand miners, there is poor regulation and enforcement in sand mining sites.

5.0 Damage to infrastructure Facilities

Uncontrolled sand mining has caused destruction to the natural morphology of many rivers, which had instigated structural problems to structures across the rivers such as bridges, barrages and fresh water intakes.

Damages to infrastructure facilities as a direct impact of sand mining are observed in many river basins. Some of the examples quoted below refer to Deduruoya, Ma Oya and Kelan Ganga which run through wet zone.

Irrigation intakes

An ancient stick dam called Kottapabbata constructed 1500 years ago across Deduru Oya but survived till end of last century is almost destroyed recently even though the barrage has not been in operation. This provides evidence of direct impact of recent excessive sand mining in this river bed.

Irrigation intake structures for gravity and lift irrigation schemes such as barrages and pump houses along the rivers are badly affected. Lowering the bed level of rivers, in some cases by more than 2 m, has totally disrupted pumping in a lift irrigation scheme. Irrigation authorities had to lower the intake level of a pump house of lift irrigation scheme called Wellangiriya recently, which had being in operation for more than 40 years serving a farming community comprising with more than 300 families, without disruption.[10] (Please see fig 1 for location D1 in Deduru Oya at pumping site).

In another irrigation scheme, Sengal Oya, constructed in 1994, irrigation water was supplemented by a direct gravity flow from same Deduru Oya river for more than 800ha of water shortage paddy lands. The intake level in the river that allowed free flow in the conveyance canal was lowered by about 4 feet during 1995-2000 period and hence supplementary irrigation water for the whole system of irrigation network was denied. It

became necessary to head up water level in the river to divert water by constructing a barrage across the river. This was to allow the gravity flow to continue after lowering the river bed due to removal of sand. Even after constructing the barrage, excessive sand mining had taken place in down stream of the structure which led the barrage to fail totally. (Please see fig 1 for location D2 and fig 2 for view of the river stretch that had disturbed due to erosion). Farming community that depend on paddy cultivation now face immense hardship due to lack of water as their livelihood has been disturbed.[10]

Highway bridges

More than 8 bridges in main highways all over the country have become victims of excessive sand mining. A conservative estimate of replacing an endangered bridge would be SL Rs 600 million. The worst being the one across the Deduru Oya. Sand mining has been prohibited recently in the stretch 2 km up stream and 2 km down stream of the river as a protective measure. [10] Since the road authorities do not possess legal hold over the legislation for river management and sand mining they had to depend on other organisations for enforcement of law.

Rail Bridges

In the rail road network of the country, more than 10 main bridges across major rivers have been badly affected due to sand mining. The rail bridge at Bangadeniya across Deduru Oya has been identified as a severely affected structure due to exposure of foundation during last decade. This bridge(location D3) is more than 100 years old but was structurally sound until the foundation got affected due to sand mining. [10] Railway authorities have taken steps to reduce the speed as a precautionary measure.

Highways

Many highways running parallel to endangered river could be observed getting damaged frequently. The road stretch at Alawwa running parallel to Ma Oya (Please see fig 1 for the location D4) which is a major link road of the province with the capital city, totally subsided in June 2007 disrupting the whole vehicular traffic. Similarly another stretch in a major highway shown in Fig 1 (location -D5) running parallel to Kelani river got subsided in June this year disrupting vehicular traffic for more than 3 weeks. The main water supply pipelines conveying water to the capital city also got severely damaged as this line was founded by the side of the road parallel to river bank.

Flood protection levies

In three major rivers (Kelani, Kalu and Niwala) flood protection levies have been constructed as a structural measure for flood prevention. The capital city Colombo too is protected by such an embankment network which have been located close to the Kelani river bank that constructed in 1930's. (Location-D6) During a flood occurred in May 2007 some of the sections of the embankments have been severely scoured due to rampage of flood water. The hydraulic behaviour of the flow during the flood showed that the unplanned sand removal has caused severe bank erosion and change of flow path that made damages to flood levies.

Electricity Transmission lines.

Electricity transmission lines is another infrastructure facility that has got affected. A high tension line running parallel to Deduru Oya could be witnessed as one affected due to severe bank erosion. One pylon which was constructed more than 50 m away from Deduru Oya river bank 30 years ago had to be relocated since the bank had moved closed to the structure. No proper account has been made on other transmission lines at the moment.

Domestic water supply intakes.

Portable water supplies to heavily populate coastal belt including capital city Colombo is supplied by the water drawn from the main rivers. Locations of these intakes have been designed carefully after studying the profile of the river, low flow conditions and the change of tidal levels. When most of these intakes were located few decades back it was not anticipated the river beds would lower to the levels now prevail. With the current levels of river beds that had been unexpectedly lowered, sea water intrusion along the river has become a permanent threat to water quality and quantity. It has now become necessary to change the location of intake in some water supply schemes. Replacement of a water supply intake may cost SL Rs 20 million (for new facilities) while the original investment has now become defunct.

Coastal Erosion

Coastal erosion is reported as severe in Southern and Western beaches where the endangered rivers no longer carry the bed load necessary to maintain equilibrium of the coast. Reducing of the sand supply from the rivers is one of the major cause for coastal erosion. A study conducted by the Coast Conservation Department on the damage of the coast has proposed nourishing with off shore sand and this project is in the process of implementing. The beach from Kalutara to Chilaw (SW quadrant) is being nourished in phases by pumping off shore sand mechanically. [2]

River flow measuring mechanism

Most of the rivers in Sri Lanka are gauged more than 60 years back for measuring and recording of river flow measurements. Continuity of these measurements at a particular location is necessary without disturbance for future planning and research purposes. The rating curves are established for a measuring location, considering the cross section of the river. It is the normal practice to record gauge readings and compute flow volume with the established cross section of the river. The fast changing cross sections has created practical difficulty of establishing the valid rating curves. (one of the locations in Kelani river given as D7) The reliability of the hydrological measurements has become a serious issue amongst the water resources planners.

Riverine Biodiversity

Biodiversity along the river paths in Sri Lanka is diverse and rich.[3] It harbours several endemic and threaded species, animals, medicinal plants and other plants that would provide raw materials for domestic industries. Excessive damage to river banks and salt water intrusion in to the river caused due to sand mining has lead to loss of aquatic biodiversity. It is increasingly evident that due to instability of banks, huge trees have been uprooted and thick canopy therefore has disappeared. Some rear birds who seek crowded forests to breed and rare their young are in threat due to loss of thick vegetation cover. The native fish varieties that can be found only in wet zone rivers found to be depleting. There is a decline in medicinal and other plants that supplied the materials for traditional grass root level medical remedies and traditional trades on which a majority of residents depended which once were very abundant. However a proper study to assess the damage to riverine ecosystems and biodiversity has not been done so far.

6.0 Social Issues related with sand mining

There are two fold of social issues created by sand mining. One from those who are being victimised by change of river morphology, while the other is from those who benefit from sand mining. The sharp price increase of sand during the last decade (over 250%) has encouraged the creation of a powerful “Sand Mafia” operating uncontrolled in many parts of the island. Within a poor regulatory environment the issue is further complicated by the prevailing security concerns. Rural population who depends as agricultural wage labourers can earn high wages in illegal RSM (three times the normal daily casual labour wage.). The politically powerful pressure groups can rein in interventions from the Police and local administration. Substantial numbers of young males prefer to earn money in RSM since quick money can be earned even though they risk their future by engaging in the illegal activities. [9]

The victimised group comprised with those who had lost or depleted their livelihood earnings due to impacts of river sand mining and who lost their properties due to wash away of river banks. There are drifts between those two groups who are living in the same area. But usually the powerful group at the moment is those who engage in illegal sand mining since they have the regional political backing and financial stability.

7.0 Intervention by the Voluntary Organisation

It can be observed that pressure groups are getting formed to address the issues locally in many river basins. This narration is about an ongoing activity which has gone through several successful milestones.

A professional women’s volunteer organisation, NetWwater (Network of Women Water Professionals) who engaged in water awareness programs in 2005 has identified sand mining as a threatening issue while conducting community based programs in a severely affected area, in Deudru Oya river basin. After studying the extent of negative impacts in Deduru Oya river and neighbouring Ma Oya river, NetWwater activists

catalyzed the formation of an awareness and advocacy network through intensive national media coverage, building critical mass among activists, building national profile for the issue and enhancing awareness on the need for alternatives. [9]

A linkup built up with other active civil society groups, religious institutions and universities led to the linkage of RSM action committees for three affected rivers. Awareness programs were carried out for schools, community, agencies responsible for regulation including police.

Before the formation of the joint Community Service Organisation (CSO), it was observed that local communities along Deduru Oya had been formed under the guidance of. Chief Incumbent monk of an ancient Buddhist temple. Even though their campaign had been on appealing nature, after some time, turned aggressive. The activists used tactics of physically blocking the roads, broke windscreens and use nail boards used to puncture the tyres of vehicles transporting sand.

Women are seen as front runners in physical protests. They played an active role in maintaining roadblocks, effectively acting as human shields. This is partly due to the fact that opponents and the Police are generally seen as reluctant of controlling women demonstrators.

In early 2006 it was felt that a change of strategy is needed and efforts were made by local DO community, to seek contact with CSO support outside the area to launch an national awareness program. Their objective was to seek support to highlight the issue, seen as a local problem so far, to be brought to national level. They had understood that it the issue handles merely as a provincial problem, there would not be a way out to solve the problem.

Ongoing programs for Deduru Oya for 2008 include continued judicial activism, awareness programs for Police, media programs, teambuilding activities for local CBOs and environmental rights awareness programs for citizens.

Conclusion

In the absence of a clear policy, regulatory and legal framework for sand mining in rivers, an unaccounted damage has been occurred already. Isolated court decisions given after hearing some cases filed by environmental groups, sand miners and government organisations need for regulation has been identified. When some areas are covered with the banning order the attempts are made to explore new locations, new rivers in other regions. Hence water ways, ecosystems and rural infrastructure of the areas where extensive sand mining had been so far carried out are getting increasingly threatened of damage.

This has created a situation that illegal sand mining has spread all over the country sparing only the areas where security concerns prevail. The list of structural damages

occurred so far shows the magnitude of the issue. Even though it takes very little time to aggravate the situation, restoration of the damaged system would take a long time. It is necessary to declare a clear policy, enforce legal framework and establish institutional structure to regulate and monitor river sand mining in order to contain the problem at least at this level. The civil society has a big role in this process as the network of the 103 rivers and its tributaries can not be monitored and managed by a single organization.

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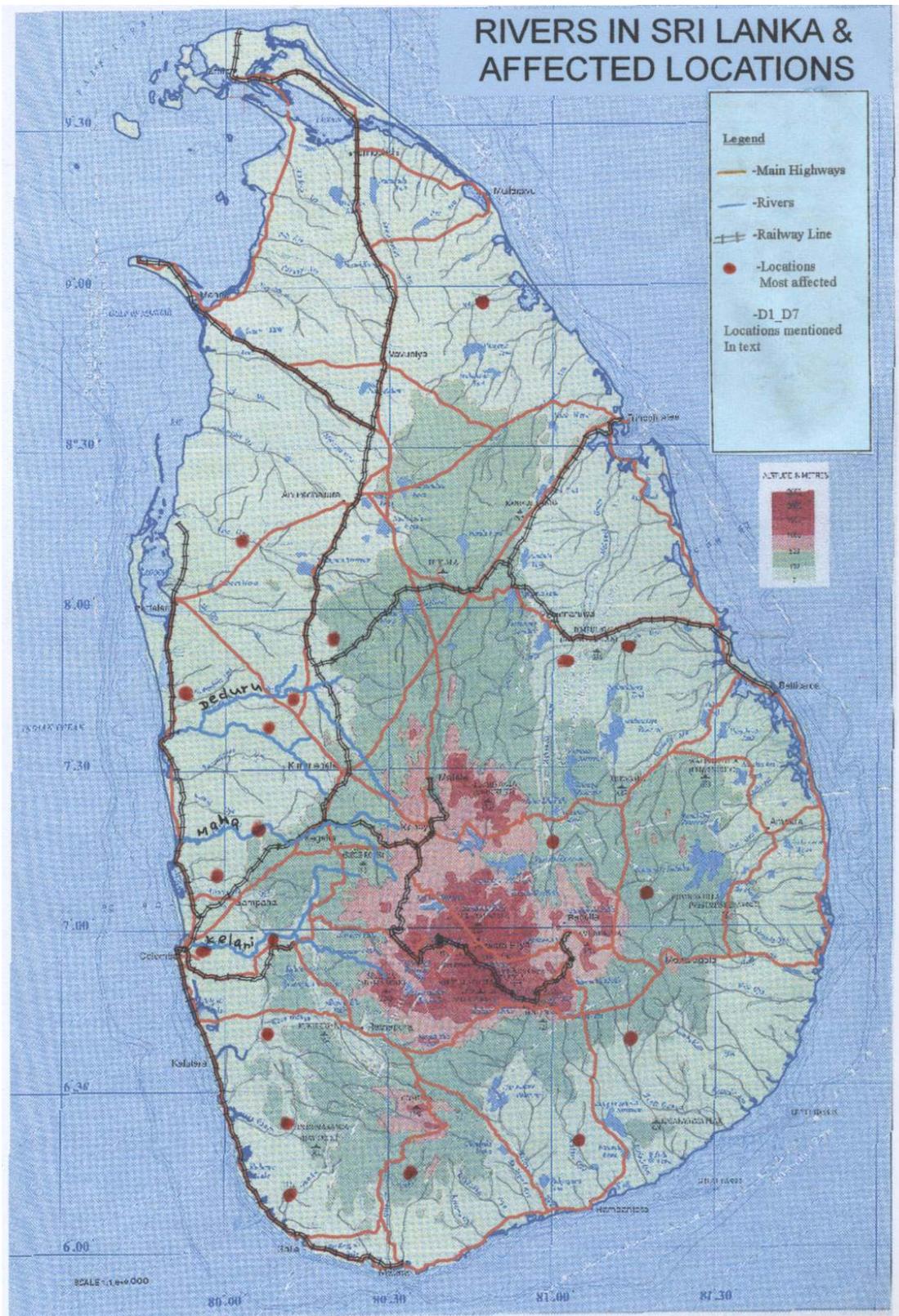


Fig 1; Rivers in Sri Lanka and most affected locations (Deduru Oya, Maha Oya and Kelani river are highlighted)



Fig 2- Wellangiriya -Pumping location for lift irrigation scheme