

Challenges of Maximising River Sand Exploitation in Selangor, Malaysia

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Abstract

River sand is a resource that generates income and Malaysia is abundantly endowed with it. The state of Selangor, Malaysia has many rivers and sand exploitation sites are mostly found in these rivers. An important aspect which is given great attention is the potential of the contribution to the state coffer that can be garnered from it. As Malaysia develops, the growth of the building and construction industry expand, and demand for river sand as a construction material increases. In most drainage systems in Malaysia, this resource is ubiquitous. Due to its abundance and easily-exploitable nature, this resource is often unscrupulously exploited in a way which is not to the benefit of the state government as well as to the people in general. This study analyzes the challenges faced by the industry in light of the fast paced development that is taking place in Malaysia and also the regional development in neighboring countries that also affects the health of this industry. The methodology used in this study is based on field observation of river sand excavation and exploitation as well as participant-observation of the transportation and carting away of the resource. The findings of this study points to the porous netting of the coffer of the state of Selangor with regard to benefitting monetarily from the exploitation of this resource.

Keywords: *River sand, exploitation, Selangor*

Introduction

Sand is the important ingredient in many industrial processes and crucial input to the final products and thus place heavy dependence on the mineral. Sand is the essential ingredient in the construction sector because “We can't make a single brick without sand. We need sand for piling, concreting, to build roads and drains,” (MBAM, 2010). Not only in the construction sector sand is much sought, some manufacturing sectors are also dependent on sand as raw materials as most building material manufacturers have limited stocks to fall back on and “If they do not get their sand supply, production of tiles, bricks, concrete beams, pillars could be halted”. (FMM, 2006).

The extent to which some industries are depending on the availability of sand suggests that there are no other close substitutes for sand available. With the lack or non-existence of substitutes coupled with the fact that it is an essential item to some industries, the demand for sand tends to be inelastic. With the demand tends to be inelastic, a price increase would not cause the quantity demanded for sand to drop that much.

Sand is a loose granular material blanketing beaches, riverbeds and deserts of the world. It is composed of different materials that vary depending on location and comes in an array of colours such white, black, green or even pink. The most common component of sand is silicon dioxide in the

form of quartz. The Earth's landmasses are made up of rocks and minerals, including quartz, feldspar and mica and weathering processes break down these rocks and minerals into smaller grains.

Quartz is hard and insoluble in water and does not decompose easily from the weathering processes. Streams, rivers and wind transport quartz particles to the seashore, where the quartz accumulates as light-coloured beach sand.

River sand is generally classified as fine sand which has size range of 0.075 to 0.425 mm. Due to the process of attrition as they are carried along the flow of the stream, the granules assumed a rounded grains, much like rounded pebbles on river beds. This property gives it a distinct advantage in the building industry. Sand and gravel had been used in industry for a long time, especially in the construction and building industry.

Statement of the Problem

River sand is a resource obtained from the rivers. Due to the intensified development that takes place in Malaysia, as well as development in neighboring countries, and because it is an important ingredient in the construction industry, sand has become a much sought-after material. Malaysia has many rivers and most of these rivers are imbued with sand. Due to high demand on river sand, this resource has been extensively exploited, and in the state of Selangor in Malaysia, where the level of development is highest, the demand for the resource is much greater. The state authority set up a consortium called *Kumpulan Semesta Sendirian Berhad* to oversee the exploitation of sand. Due to its high demand, and almost ubiquitous nature, sand is easily exploited. Since the extraction of resource should bring in income to the state, it is expected that the exploitation of this resource contribute to the income of the state. The problem is many of the activities are done illegally, which deny the state from benefitting monetarily from the activity, as such it is a challenge to the state authorities to make sure that the exploitation of this resource in the state of Selangor brings in income to the state.

Literature review

Sand and gravel are mined world-wide and account for the largest volume of solid material extracted globally. Formed by erosive processes over thousands of years (John, 2009), they are now being extracted at a rate far greater than their renewal.

Globally, between 47 and 59 billion tonne of the material is mined every year (Steinberger et al., 2010), of which sand and gravel, also known as aggregates, account for both the largest share (from 68% to 85%) and the fastest extraction increase (Krausmann et al., 2009). Surprisingly, although more sand and gravel are mined than any other material, reliable data on their extraction in certain developed countries are available only for recent years (Krausmann et al., 2009).

One way to estimate the global use of aggregates indirectly is through the production of cement for concrete (concrete is made with cement, water, sand and gravel). The production of cement is reported by 150 countries and reached 3.7 billion tonne in 2012 (USGS, 2013). For each tone of cement, the building industry needs about six to seven times more tonne of sand and gravel (USGS, 2013). Thus, the world's use of aggregates for concrete can be estimated at 25.9 billion to 29.6 billion tonne a year for 2012 alone.

Added to this are all the aggregates used in land reclamation, shoreline developments and road embankments (for which the global statistics are unavailable), plus the 180 million tons of sand used in industry (USGS, 2012). Aggregates also contribute to 90% of asphalt pavements and 80% of concrete roads (Robinson and Brown, 2002). China alone built 146,400 kilometres of road in one year (EDE, 2013) — an indication of the world demand for aggregates.

Taking all these estimates into account, a conservative estimate for the world consumption of aggregates exceeds 40 billion tons a year. This is twice the yearly amount of sediment carried by all of the rivers of the world (Milliman and Syvitski, 1992), making humankind the largest agent of transformation with respect to aggregates (Radford, 2005)

Sand Exploitation in Malaysia. The demand for sand prior to 2007 was about 15 to 17 million tons and during the implementation of the 10th Malaysia Plan the requirement of sand consumption could approximately reach 20 million tons (MBAM, 2010). Sand is never low in demand, in fact the demand for it in places like Selangor and the Klang Valley is on the uptrend. As the country's economy grows better particularly in the construction and construction related industries, so does the demand for sand. In the 10th Malaysia Plan, the demand for sand in the state of Selangor alone could climb higher since the state is projected to increase its total Gross Domestic Product (GDP) from RM120.186 billion in 2010 to RM157.932 billion in 2015 and construction sector's GDP from RM4.68 billion in 2010 to RM7.74 billion in 2015 (Malaysia, 2010). As the 10th Malaysia Plan output machinery goes into full gear, the need for sand will increase as more projects are expected to be implemented in the year 2011 to 2015 (MBAM, 2010). In 2010, there was already a concern that the supply of sand may not be able to meet the ever increasing demand. In order to overcome this problem MBAM suggested that the government should consider opening up more sand pits and issue more licenses, according to market demand to avoid shortage of sand supply. The possibility of supply shortage is real as it had already happened before in 2006 where as a result of the shortage, the price of sand shot up by as much as RM40 a tonne compared with RM15 to RM18 a ton (2006 price). The shortage in supply of sand could also cause delays or worse still, bring projects to a standstill. The implementation of the 10th Malaysia Plan fuelled a higher demand for sand and caused shortage of supply of sand, which can lead to illegal sand quarrying activities.

Sand exploitation in Selangor. The state of Selangor has a huge deposit of sand embedded in its rivers and streams, and the exploitation of the resource has brought substantial income to the coffers of the state. The Kumpulan Semesta Sendirian Berhad, the consortium entrusted by the state government to regulate and manage the exploitation of this resource. The locations at which river sand is quarried in Selangor are shown in Table 1.

Table 1. Locations of Sand Quarries in Selangor

District	River	No. of Sites
Gombak	Sg. Kelang	1
Petaling	Sg. Damansara	2
Sepang	Sg. Langat	5
Sepang	Sg. Semenyih	1
Sepang	Sg. Rasau	1
Hulu Selangor	Sg. Inki	2
Hulu Selangor	Sg. Kerling	2
Hulu Selangor	Sg. Batang Kali	2
Hulu Selangor	Sg. Selangor	4
Hulu Langat	Sg. Langat	5
Hulu Langat	Sg. Semenyih	1
Total		27

Source: KSSB (2012)

This is a clear indication of the potential of the wealth that can be generated from the resource. Since this resource is spread throughout the drainage system of the state, and very little vigilance can be implemented and enforced to make sure that it does not fall prey to foul play, there is every chance that it can be exploited without the knowledge of the authority. This will always result in the siphoning off of the bounty that should actually go

to the state coffers. It has been reported that the state loses about half a million ringgit a day as a result of illegal sand mining and quarrying (The Star, 2010).

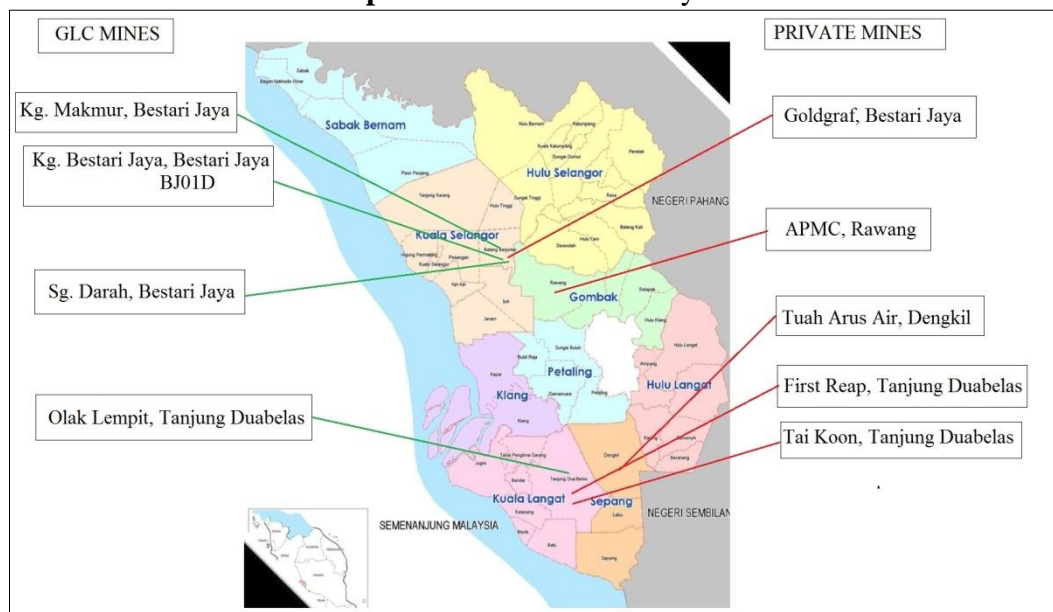
Sand exploitation within the purview of KSSB. KSSB estimates that demand for sand in the state of Selangor is in the region 1.6 million tons in 2014, but operations from KSSB only manages to supply about 0.8 million tonnes. The remaining demand is met by productions in other states. Royalty due from sand exploitation activities by the contractors of KSSB in the state of Selangor is payable at the offices of District and Land Office of the relevant locations based on actual quantity of sand carried that matches the docket for each truckload indicating the actual quantity of sand moved from the quarry site.

KSSB is tasked to ensure that sand mining activities are carried out in accordance with the terms spelt out by the technical departments as well as environment-friendly by various Standard Operating Procedures such as SOP for Permit Application for GLC mines, SOP for Permit Application for the monitoring of every stage of enforcement. Illegal sand exploitation is rampant in Malaysia, and the state of Selangor is no exempt from such activities. However, in order to curb and control the activity, KSSB gives consideration to illegal operators to legalize their operations or to participate in the tender process to be appointed as contractors to KSSB. Therefore KSSB is tasked to supply sufficient quantity of sand in order to reduce the activities of illegal sand mining. KSSB also works hand in hand with the authorities in monitoring and enforcement towards illegal sand mining activities. Private mine operators and sand washing contractors are allowed to sell sand at their own price. For GLC mines, prices offered (2014) in the northern Peninsula is RM 24.00 per tones, while in the south, the price is RM 26.00 per tones, because of the higher demand.

The Study Area

The general study area is the state of Selangor. Map 1 shows areas where sand exploitation takes place. It must be borne in mind that the areas as indicated by the map are those authorized by KSSB, which falls into two categories, the GLC mines and the private mines.

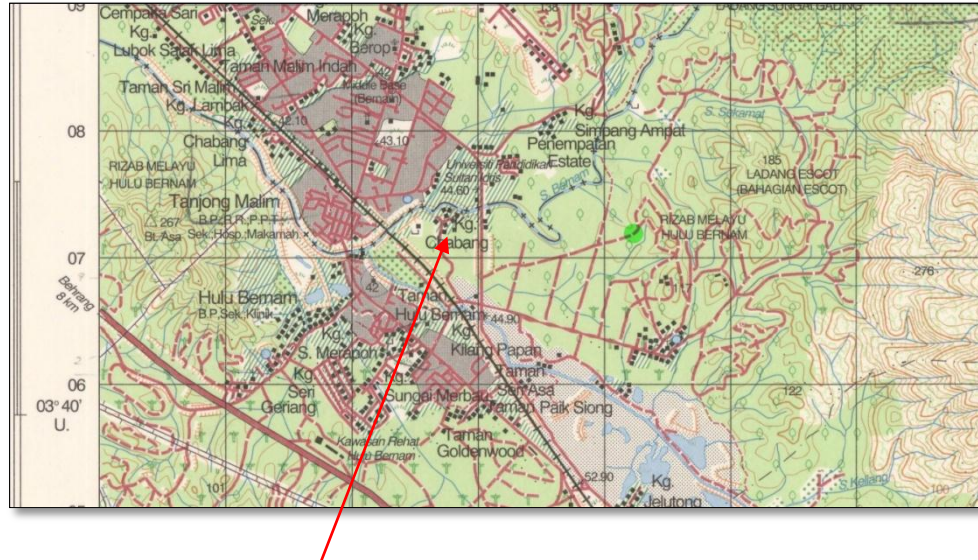
Map 1. Location of the study area



The specific study site was a sand mining pit along the bank of Sungai Inki, a tributary of the Sungai Bernam (Map 2). The coordinates of the study site are 3°40'57.356 N and 101°32'31.782 E. The site is about 1 km from the nearest main road that connects Sultan

Abdul Jalil Campus of UPSI and Kalumpang, and is accessible as soon as one exits into this road from the Tanjung Malim toll plaza and get into an access dirt road that leads to the pit.

Map 2. Arrow shows the Sungai Inki Sand Mining Pit



A second specific study site is the stretch of highway (PLUS North-south Highway) from the Tanjung Malim toll plaza to Sungai Buluh rest area, which covers a distance of about 60 km.

Methodology

Test 1: The first part of the study employed site-based observation of the activities of sand mining. Originally the observation period was planned to be 7 days, but due to an unseen obstacle, the exercise was cut short to three days. Primary data was gathered by means of observation in order to record the amount of sand produced by the site. The observation was not only done at the quarry site, but also at the weighing station where lorries ferrying the sand are weighed.

Test 2: The second part of the study involved observation of lorries carrying sand along the stretch of the highway, and it was to determine the number of lorries that can be observed plying the stretch with a certain period of time.

Results

Test 1: Results of the observation done at the Sungai Inki sand pit is shown in Table 2. For two days the observation was done during the night, that was to see whether any activity was done during the observation period, and it turned out to be negative.

Table 2. Details of Truck Activities at Sungai Inki Sand Pit

Date	Time	Incoming	Outgoing	15 tones	30 tones	
3/3/14	22:00 -06:00	none	none	none		
4/3/14	22:00 -06:00	none	none	none		
5/3/14	07:00-08:40	8	none	5	3	
	09:00-09:45	none	3		3	
	10:00-11:00	none	3	3		
	11:15-12:00	none	2	2		
	13:00-15:00	2	none	2		
	15:00	Observation abandoned				

Transportation of sand was only observed on the third day, but further observation was interrupted as indicated in the table.

Test 2: Table 3 shows results of observation done along the stretch of the highway mentioned earlier. The lorries that ply the route during the period of observation consisted of various sizes, but the majority of which is of the heavy type as shown in Photo 1.

Table 3: Details Of Observation Done Along The Highway Stretch

	Date	Time	Minutes	No of lorries
1	30/10/15	15:30-16:04	34	11
2	29/10/15	18:00 – 19:00	60	7
3	23/10/15	14:45 – 15:30	45	3
4	21/10/15	15:15 – 16:00	45	6
5	16/10/15	14:45 – 15:30	45	8
6	13/10/15	14:30 – 15:14	45	8
7	23/9/15	14:15 – 15:25	40	6
8	18/9/15	15:00 – 15:50	50	12
9	11/9/15	15:45 – 16:30	45	5
10	9/9/15	14:45 – 15:35	50	5
11	26/8/15	15:00 – 15:50	50	5
12	21/8/15	15:30 – 16:20	50	5
13	19/8/15	15:00 – 15:50	50	2



Photo 1: A Typical Sand Carrying Truck

Findings and Analysis

Test 1: Since this site is gazetted by the authority, the activity can be categorized as legal. The normal procedure after a truck is loaded with sand is to have the truck weighed at a weighing station, and the royalty which will be charged to the concessionaire will be calculated based on the weight of the sand recorded. KSSB charges RM 6.00 per ton (KSSB, 2012).

According to the observation of this study, 5 trucks headed to the weighing station, and assuming that all 5 carried a load of 15 tonne each, the total tonnage would be 75 tones with a total royalty that ought to be paid to KSSB amounting to RM 450.00.

But according to the observation also, the three 30 tonne truck seemed not to adhere to the rules of the game. The three trucks did not head to the weighing station, but instead drove off to some other location. Also according to the interview conducted informally with

drivers of the 30 tonne trucks, each truck was filled to the maximum capacity, often overloading the truck up 60 tonne of load. It means that, if that exercise was meant to dodge paying the royalty, then it means that the shipment on the observation period was 180 tonne with a royalty of RM 1080.00 which ought to be paid to KSSB but seemingly they got away with it.

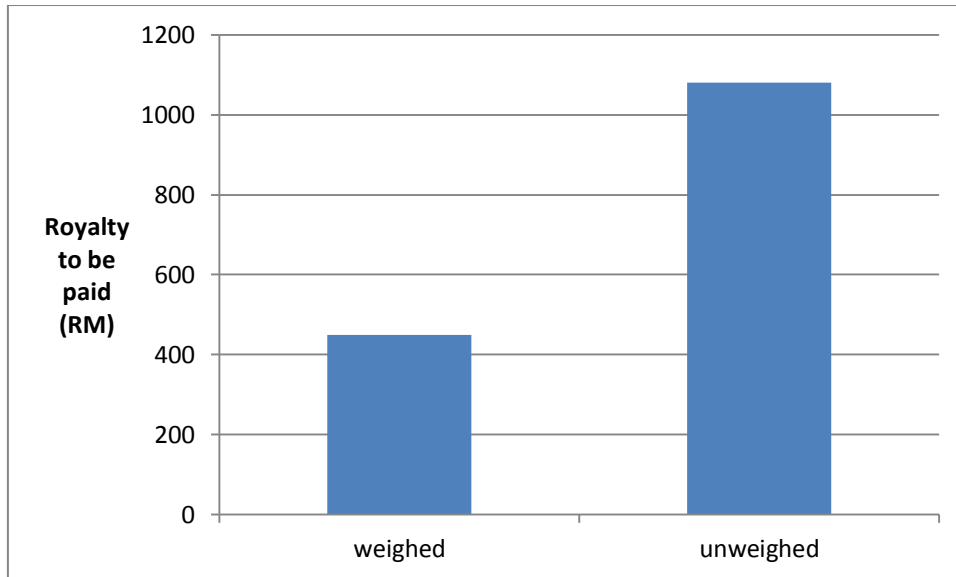


Figure 1: Comparison of royalty that ought to be paid based on data of observation period. Figure shows the amount of income that is paid to the authority, and the amount of money that slips away during the period of observation.

Test 2: Analysis of the observation done bore results as shown in Table 4. It has been observed that the trucks were heading towards the direction of Kuala Lumpur, and it is assumed that they were on the return trip with sand fully laden. Calculation was based on the beginning of the return trip starts at 15:00 and ends at 19:00, and this yields the number of trucks ferrying the sand on a working day to be 48. Using information gained in Test 1 that only small trucks are used for the purpose of legal transportation of sand, the trucks encountered during observations of Test 2 are assumed to be evading paying the royalty due to them.

Table 4. Characteristics of observation along the highway

Mean (minutes)	Mean (trucks)	sd	Median	Max	Min
47.91667	6.384615	2.844247	6	12	2

After exercising extrapolation on the data obtained during the observation period, the picture arrived is as shown by Table 5 below.

Table 5: Number trucks estimated along the observation route

Day	Week	Year
48	336	17472

It is estimated that along this route alone in one year about 17,472 trucks were used to transport the sand, by observation also, almost all of those trucks are filled to the maximum

giving each of them a carrying weight of 60 tonnes. This would amount to a royalty of RM 6,289,920 which should have been paid to the authorities.

Discussion and Conclusion

The amount of royalty paid by KSSB to the Selangor state government from 2008 to 2011 was RM 32,506,187 (KSSB, 2012) which is meager as compared to the real potential of generation of income from sand mining activities. The state government has set the target of collecting RM 150 million of revenue from sand mining activities in 2012 (Selangor times, 2012), but it is yet to achieve the target.

Illegal sand mining is a big challenge in the exploitation of the resource, and this has been going on for quite some time, but the situation in the state of Selangor is serious. Some sources put is as 26 illegal mines, while others put up a higher number. Whatever the real number is, the government of Selangor is losing a lot of revenue everyday as a result of this activity.

In conclusion, the findings of this study showed that even a legally operated sand mine may not adhere fully to rules and regulations of the governing body of this activity, and this causes a perforation to the amount of revenue that should have been collected by the authority. Another finding is that there exist such a robust activity of sand transportation, which is a clear indication of the value that is generated by this resource.

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