REGULATION OF SAND SUPPLY

ROLE OF THE GEOLOGICAL SURVEY AND MINES BUREAU

Eng. K. V. Jagath
B.Sc. Eng. (SL)
MIT(SL)
REGIONAL MINING ENGINEER

Geological Survey and Mines Bureau
SRI LANKA
GSMB

Vision
Connecting earth, natural resources & people to drive socio economic development of Sri Lanka.

Mission
In achieving its vision GSMB advocates for the collective interests of Sri Lanka's natural resources and the environment through education and collaboration with our industry members, government, and other stakeholders.
ACTs and REGULATIONS

- Mines and Mineral Act No 33 of 1992
- Mines and Minerals (Amendment) Act, No.66 of 2009
GSMB…

- The Bureau comes under the purview of the Ministry of Mahaweli Development & Environment
- Provides the institutional support structure to the entire mineral sector while administering the Mines and Minerals Act.
REGIONAL OFFICE STRUCTURE OF GSMB
Functions of the Bureau

- Control mining operations in Sri Lanka by issuing licenses (mining, exploration, trading and special licenses including transport & export permits)
- Maintain mineral titling maps
- Collect royalties and levies on mineral commodities
- Maintain a computerized inventory of mineral resources
- Undertake research
- Carry out mineral exploration and mapping including other investigations
- Maintain analytical and other laboratories and regional centers
- Publish geological maps, bulletins and other documents including all other aspects concerned with the geology and mineral resources of the country
LICENSE INFORMATION

- Under the Mines & Minerals Act No. 33 of 1992, the GSMB issues following types of licenses.

  - Exploration Licences
  - Mining Licences (Artisanal, Industrial, Reserved Minerals)
  - Trading Licences
  - Export Licences
  - Transport Licences
MINERALS INDUSTRY

An Overview

Sri Lanka, though a small nation, is reasonably endowed with industrial minerals but not with metallic and energy minerals. The industrial minerals base of Sri Lanka as a group constitute the most important physical resource-base in terms of quantity and value. No energy minerals have been found yet on land or within the Exclusive Economic Zone of Sri Lanka offshore.
MINERAL SAND OCCURRENCES ALONG THE BEACH ZONES OF SRI LANKA

Pesalai (Mannar District)

Kirinda (Hambantota District)

Kathiraveli (Batticaloa District)

Lankapatuna (Trincomalee District)
CERAMIC RAW MATERIALS:

- **Kaolin or China clay:**
  - Confined to the south west sector of the island.
  - Residual deposits
  - Occur as lenses and pockets of kaolin in swampy ground.
  - The two best known deposits are at Boralegamuwa and Meetiyagoda,
  - Lanka ceramic ltd., The main producer in the country.
Ball Clay:

- best ball clays occur at Dediyawala in the Kaluthara district.
- Over 90% of particles in the clay material are less than 10 microns in diameter.
- The reserves of ball clay are sufficient for the next 5 to 6 decades.
- Ball clays also occur in the Nilwala Ganga flood plains and in other areas.
Alluvial Clay:

- Sri Lanka is devoid of exploitable deposits of consolidated clays such as mudstones and shales used mainly in the brick and tile industry of the world.
- Over 50% of the brick and tile industry is concentrated in the lower reaches of the Maha Oya in the Kochchikade and Dankotuwa areas where a large number of tile factories operate on alluvial clays to produce over 60 mln. roofing tiles per annum.
FLEDSPAR

- The main occurrences of feldspar are found at Haputale, Kaikawala, Timbolketiya, Elahera, Namal Oya and Koslanda is in the Owella Estate, Rattota which is mined by Lanka Ceramic Ltd.

- Number of small to medium feldspar occurrences have been reported recently in Ratnapura
QUARTZ (SILICA):

- The best deposits occur in the Opanaike, Pelmadulla, Pussella, Rattota, Ratnapura and Galaha areas.
Silica Sand:

- The best known silica sand deposits are found in the Marawila, Madampe and Nattandiya areas.
- A very large deposit occurs in the Ampan-Vallipuram area in the Jaffna Peninsula.
- Main silica sand uses are Piramal Glass Ltd., Lanka Tiles PLC and Royal Ceramic Lanka Ltd.
- Export of silica sand in any form is not permitted.
Silica Sand Mining & Processing

Silica Sand Mining

Removing Impurities by Washing

Particle Size Separation
Calcite:

- The best known deposit occurs in the Blangoda area.
- It is used mostly for the manufacture of ceramic products, in the chemical industry, in formulation of glazes and as fillers and in the paint, fertilizer, lime, cement and whiting industry.
- The transparent and clear crystals are used in the optical industry.
CONSTRUCTION MATERIALS:

- **Miocene Limestone:**
  - The miocene limestone occurs in the north western coastal belt and the jaffna peninsula.
  - Surficial deposits.
  - Best known outcrops are located north of karativu, near puttalam, from aruakkalu hill to kudremalai point.
Dimension Stone:

- Dimension stones are cut to specific shapes and sizes for use in buildings and for other construction purposes.
- Sri Lanka has large resources of rocks suitable for dimension stone, but dimension stone and polished slabs are still turned out in limited quantities.
- Different types of dimension stone are imported to meet the local demand.
Crushed and Broken Rock:

- Different sizes of broken and crushed rock are produced according to the requirements of building and road construction industries.
- Total number of licensed metal quarries in operation is 1,435.
- Annual production of crushed and broken rock is about 7.28 million cubic meters.
INLAND CORAL:

- The best known coral deposits are found in the Akurala - Hikkaduwa area.
- Coral deposits are also found overlying the Miocene limestone in the Jaffna Penninsula.
- Other areas where coral beds have been recorded are Kuchchaveli and Delft Island.
FERTILIZER MATERIALS:

- Dolomite:
  - Dolomite deposits are found in the Digana, Talatuoya, Matale, Badulla and Ratnapura of areas.
  - The magnesium content varies and dolomite with a MgO content of 18-22% is of common occurrence.
**Apatite (Phosphate Rock):**

- The famous apatite (Phosphate rock) deposit is situated in the North Central province in the district of Anuradhapura.
- Total reserves are estimated around 60 million tonnes.
- The deposit occurs in the form of a number of surface hillocks.
OTHER MINERALS

GRAPHITE

- The best known areas for graphite are confined to the Central, Sabaragamuwa, Southern, North-Western and North Central provinces.
- The two largest operating mines are Bogala Graphite Mine and Kahatagaha mine are operated by Bogala Graphite Lanka PLC and fully-government-owned Kahatagaha Graphite Lanka Ltd.
- High purity Carbon over 99% with low ash content
- Nearly 95% of the Run of Mines (ROM) above 90% Carbon
Mica

- Mainly confined to the central hill country are found in the Talagoda, Madumana, Pallekelle, Talatu-oya, Badulla, Maskeliya, Madugoda, Udumulla, Naula, Haldummulla, Mailapitiya, Kebitigollewa and Madampe areas.

- The important commercial types of mica are muscovite \((K_2O \cdot 3Al_2O_3 \cdot 6SiO_2 \cdot 2H_2O)\) and phlogopite \((K_2O \cdot 6MgO \cdot Al_2O_3 \cdot 6 SiO_2 \cdot 2H_2O)\).

- Mica is classified as sheet, scrap and flakes.
**Seruwila Copper – Magnetite Deposit**

- Near Trincomalee
- First base metal find in the country by the department of geological survey, the predecessor to the geological survey and mines bureau.
- Ore reserve of 4 million tonnes of which 40% is iron (Fe) and 1.5 to 2% is copper (Cu).
- Indications of the presence of minor amounts of nickel, cobalt, silver, and bismuth
River Sand:

- Sand used as a construction material consists of more than 95% of Quartz, and has the chemical composition of SiO2.
- largely accumulated in inner limbs of the meanders of major rivers, but available in different quantities even in small streams.
- Sand mining is done only manually.
INLAND SAND
Occur in Marshy Lands and flood plains

SEA SAND
Off Shore Sand

Processing Sand
DETAILS OF ISSUED LICENCES BY GSMB FROM 2013 – 2018/6

The bar chart shows the number of licences issued for Sand, Aggregate, and Gravel from 2013 to 2018/6. The number of licences for Sand is significantly higher than for Aggregate and Gravel. The chart includes data for each year from 2013 to 2018/6.
DISTRIBUTION OF ISSUED MINING LICENSES ACCORDING TO MINERAL CATEGORIES-2018/4

- Sand: 63%
- Aggregate: 24%
- Gravel: 8%
- Clay: 1%
- Others: 4%
ROYALTY PERCENTAGE WISE

Year | Royalty
--- | ---
2013 | 70%
2014 | 70%
2015 | 70%
2016 | 70%
2017 | 90%
2018/6 | 100%

Legend:
- Other
- Exports
- Gravel
- Aggregate
- Sand
Mineral Quantities covered by GSMB Licenses

![Graph showing the quantity of minerals covered by GSMB licenses from 2013 to 2018/6. The x-axis represents the years 2013 to 2018/6, and the y-axis represents the quantity in millions. The graph includes data for Gravel, Aggregate, and Sand.](image-url)
Sand Quantities covered by GSMB Licenses

- Process sand
- Inland sand
- River sand
- Sea sand
- Sand

Year

Quantity (cubes)

Millions

2016 2017 2018/6
## SAND DEMAND VS SAND PRODUCTION

<table>
<thead>
<tr>
<th>Description</th>
<th>Year 2013</th>
<th>Year 2014</th>
<th>Year 2015</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cement (MT '000)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local production</td>
<td>1910</td>
<td>1884</td>
<td>2287</td>
</tr>
<tr>
<td>Imports</td>
<td>4123</td>
<td>4363</td>
<td>4092</td>
</tr>
<tr>
<td><strong>Total cement usage within the country</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>6033</td>
<td>6247</td>
<td>6379</td>
</tr>
<tr>
<td><strong>Equivalent sand cubes</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1 cube = 2.83 m$^3$ Sand specific gravity = 2600 kg/m$^3$)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>cement: sand as 1:3.5</td>
<td>2869734</td>
<td>2971528</td>
<td>3034316</td>
</tr>
<tr>
<td>cement: sand as 1:4</td>
<td>3279696</td>
<td>3396032</td>
<td>3467790</td>
</tr>
<tr>
<td>cement: sand as 1:4.5</td>
<td>3689658</td>
<td>3820535</td>
<td>3901264</td>
</tr>
<tr>
<td>cement: sand as 1:5</td>
<td>4099619</td>
<td>4245039</td>
<td>4334738</td>
</tr>
</tbody>
</table>
# Sand Quantities Covered by the GSMB Transport Licenses

<table>
<thead>
<tr>
<th>Description</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2013</td>
</tr>
<tr>
<td>Royalty on sand (Rs.)</td>
<td></td>
</tr>
<tr>
<td>Current year</td>
<td>294,087,692</td>
</tr>
<tr>
<td>Previous year</td>
<td>19,327,538</td>
</tr>
<tr>
<td>Total Royalty on sand</td>
<td>313,415,229</td>
</tr>
<tr>
<td>Sand cubes</td>
<td></td>
</tr>
<tr>
<td>(Royalty/cube = Rs. 80</td>
<td></td>
</tr>
<tr>
<td>until 22/10/2013,</td>
<td></td>
</tr>
<tr>
<td>Rs. 160 from 23/10/2013)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3283521</td>
</tr>
</tbody>
</table>
## Gap between sand demand and supply

<table>
<thead>
<tr>
<th>Cement/sand amounts (cubes)</th>
<th>Year</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2013</td>
<td>2014</td>
<td>2015</td>
<td></td>
</tr>
<tr>
<td>Cement</td>
<td>676763</td>
<td>700768</td>
<td>715576</td>
<td></td>
</tr>
<tr>
<td>Calculated sand demand</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>cement: sand as 1:3.5</td>
<td>3013220</td>
<td>3120104</td>
<td>3186032</td>
<td></td>
</tr>
<tr>
<td>cement: sand as 1:4</td>
<td>3443680</td>
<td>3565833</td>
<td>3641180</td>
<td></td>
</tr>
<tr>
<td>cement: sand as 1:4.5</td>
<td>3874140</td>
<td>4011562</td>
<td>4096327</td>
<td></td>
</tr>
<tr>
<td>cement: sand as 1:5</td>
<td>4304600</td>
<td>4457291</td>
<td>4551475</td>
<td></td>
</tr>
<tr>
<td>Sand amount covered by GSMB TPLs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3283521</td>
<td>3025484</td>
<td>3249788</td>
<td></td>
</tr>
</tbody>
</table>
## PERCENTAGE TO CEMENT BASED CALCULATED SAND AMOUNT

<table>
<thead>
<tr>
<th>cement: sand</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:3.5 ratio</td>
<td>-9</td>
<td>3</td>
<td>-2</td>
</tr>
<tr>
<td>1:4 ratio</td>
<td>5</td>
<td>15</td>
<td>11</td>
</tr>
<tr>
<td>1:4.5 ratio</td>
<td>15</td>
<td>25</td>
<td>21</td>
</tr>
<tr>
<td>1:5 ratio</td>
<td>24</td>
<td>32</td>
<td>29</td>
</tr>
</tbody>
</table>
Above graph indicate that more than 65% of sand circulate within the country was covered by the GSMB licenses, if we assume cement: sand ratio as 1:5
EXISTING WEAKNESSES, DRAWBACKS AND ISSUES

- High demand of building materials due to recent development projects
- People who need to purchase minerals must depend on the Mining license holder
- Time consumption to obtain a license
- Forged Transport licenses
- No online checking of the legality of issued Transport licenses
- No proper enforcement mechanism either GSMB or police on illegal activities
SOME ENVIRONMENTAL PROBLEMS DUE TO EXCESSIVE SAND MINING

Land Degradation
River Bank Erosion
Salinity Intrusion
Loss of Bio Diversity
Long-term solutions

- Research and development to find an alternative materials to fulfil the demand and supply gap of natural building materials
- Transport licenses must be issued to the transporters

As river sand gradually diminishes, we should find alternatives.
ALTERNATIVES FOR SAND

- Off shore sand
Thank you..!