Member Country Report of Malaysia

Submitted by

Malaysia Delegation

(For Agenda Item 3)
ANNUAL MEMBER COUNTRY REPORT


GEO-RESOURCES SECTOR

1. MINERAL PROGRAMME

1.1 Summary

During the review period, reconnaissance mineral explorations for metallic minerals were conducted in the states of Sabah, Sarawak, Perak, Kelantan and Kedah. Follow-up / detailed surveys were carried out over previously identified anomalous areas in Pahang, Johor, Terengganu, Kelantan, Perak and Sarawak. The industrial mineral investigation was conducted in several states in Peninsular Malaysia, Sarawak and Sabah for granite dimension stone, limestone, feldspar source, construction and river sand, clay and other minerals such as rutile and mica. During the period, coal exploration continued in Sarawak and Sabah. Research programmes continued for clay, silica, rock, advanced material and rehabilitation technologies.

1.2 Annual Review of Technical Programmes / Activities

1.2.1 Mineral Exploration for Metallic Minerals

Reconnaissance regional geochemical surveys were carried out over a total area of 3,679 sq. km. The surveys show gold potential in Sabah and tin in Kelantan.

<table>
<thead>
<tr>
<th>State</th>
<th>Area</th>
<th>Coverage (km²)</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sabah</td>
<td>Sungai Ulu Bole, Lahad Datu</td>
<td>770</td>
<td>Gold potential</td>
</tr>
<tr>
<td>Sarawak</td>
<td>Miri &amp; Baram</td>
<td>2,539</td>
<td>No known results</td>
</tr>
<tr>
<td>Perak</td>
<td>Bintang Hijau &amp; Hulu Selama</td>
<td>300</td>
<td>No known results</td>
</tr>
<tr>
<td>Kelantan</td>
<td>Kula Betis, Gua Musang</td>
<td>18</td>
<td>Tin potential</td>
</tr>
<tr>
<td>Kedah</td>
<td>Gunung Jerai</td>
<td>52</td>
<td>No known results</td>
</tr>
</tbody>
</table>

Total Coverage: 3,679
Follow-up geochemical surveys were carried out over a total area of 349.2 sq. km. Gold anomalies or mineralizations were detected in several areas in the states of Pahang, Johor, Terengganu and Kelantan. Several areas in the states of Pahang and Perak have been identified as tin prospects.

<table>
<thead>
<tr>
<th>State</th>
<th>Area</th>
<th>Coverage (km²)</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pahang</td>
<td>-Bukit Ibam</td>
<td>57</td>
<td>-Gold mineralization detected</td>
</tr>
<tr>
<td></td>
<td>-Sungai Lembing</td>
<td>92</td>
<td>-Tin potential</td>
</tr>
<tr>
<td>Johor</td>
<td>-Mersing Forest Reserve</td>
<td>23</td>
<td>-Gold anomaly</td>
</tr>
<tr>
<td>Terengganu</td>
<td>-Sungai Tarom</td>
<td>0.9</td>
<td>-Gold flakes in concentrates</td>
</tr>
<tr>
<td></td>
<td>-Sungai Hitam</td>
<td>4</td>
<td>-Gold flakes in concentrates</td>
</tr>
<tr>
<td>Kelantan</td>
<td>-Sungai Riau, Chiku, Gua Musang</td>
<td>10.5</td>
<td>-High gold value in soil samples</td>
</tr>
<tr>
<td>Perak</td>
<td>-Pondok Tanjung Selama</td>
<td>100</td>
<td>-Tin potential</td>
</tr>
<tr>
<td>Sarawak</td>
<td>-Serian</td>
<td>57</td>
<td>-No known results</td>
</tr>
<tr>
<td></td>
<td>-Gunung Rawan</td>
<td>4.8</td>
<td>-No known results</td>
</tr>
</tbody>
</table>

**Total Coverage: 349.2**

### 1.2.2 Industrial Minerals / Non-metallic Minerals

**Dimension Stone**

Reconnaissance and follow-up surveys for dimension stone were conducted in the states of Johore, Sarawak and Sabah. The total estimated potential reserve is about 2 billion metric tonnes.

<table>
<thead>
<tr>
<th>State</th>
<th>Area</th>
<th>Coverage (km²)</th>
<th>Results / Estimated potential reserve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Johore</td>
<td>Kota Tinggi District</td>
<td>0.75</td>
<td>25 million metric tonnes</td>
</tr>
<tr>
<td></td>
<td>Johore Baharu District</td>
<td>0.25</td>
<td></td>
</tr>
<tr>
<td>Sarawak</td>
<td>Gunung Jagoi, Bau</td>
<td>35</td>
<td>No known results</td>
</tr>
<tr>
<td>Sabah</td>
<td>Sukau</td>
<td>50</td>
<td>1550 million metric tonnes</td>
</tr>
<tr>
<td></td>
<td>Sapulut</td>
<td>5</td>
<td>256 million metric tonnes</td>
</tr>
</tbody>
</table>

**Total Coverage: 91.0**
Limestone

The limestone resource surveys were conducted in Gua Jadur and Gua Timah areas in the Lipis District, Pahang, covering an area of 13.8 sq.km. Rock samples collected were tested to be calcium-rich.

Feldspar

Feldspar investigation was carried out in the states of Kelantan, Pahang, Negeri Sembilan and Perak. The chemical analysis on the samples collected show relatively high flux (Na₂O+K₂O) content ranging from 6.9 to 10.72%.

<table>
<thead>
<tr>
<th>State</th>
<th>Area</th>
<th>Coverage (km²)</th>
<th>Results / Estimated potential reserve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kelantan</td>
<td>Ulu Sungai Keneras, Gua Musang</td>
<td>1.65</td>
<td>Flux (Na₂O+K₂O) content = 10.72% -143 million metric tonnes</td>
</tr>
<tr>
<td>Pahang</td>
<td>Kanchil Block, Merapoh</td>
<td></td>
<td>Flux content = 8.40 – 9.05%</td>
</tr>
<tr>
<td>Negeri Sembilan</td>
<td>Gemencheh</td>
<td>70.4</td>
<td>Flux content = 6.9%</td>
</tr>
<tr>
<td>Perak</td>
<td>Gerik</td>
<td>3</td>
<td>Flux content = 7.0%</td>
</tr>
</tbody>
</table>

Sand

Investigations for construction sand were carried out in Kedah, Selangor and Sarawak over a total area of 14.4 sq. km and the overall reserve was estimated at 33.3 million metric tonnes.

<table>
<thead>
<tr>
<th>State</th>
<th>Area</th>
<th>Coverage (km²)</th>
<th>Results / Estimated potential reserve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kedah</td>
<td>Padang Terap</td>
<td>3.6</td>
<td>12.7 million metric tonnes</td>
</tr>
<tr>
<td>Selangor</td>
<td>Kuala Selangor Ulu Selangor</td>
<td>5.9</td>
<td>18.6 million metric tonnes</td>
</tr>
<tr>
<td>Sarawak</td>
<td>Lundu Saratok</td>
<td>1.9</td>
<td>2.0 million metric tonnes</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>14.4</td>
<td>33.3 million metric tonnes</td>
</tr>
</tbody>
</table>

The survey for river sand deposit in Terengganu was undertaken along Sungai Terengganu, Sungai Telemung, Sungai Nerus, Sungai Tersat, Sungai Berang, Sungai Paka and Sungai Kemaman covering a total length of 275 km.
Clay

A clay investigation was undertaken in the Kimanis area, Sabah with a coverage of 0.8 sq. km. The estimated reserve is 12.9 million tonnes. The analysis show that the clay is suitable for the making of tiles, porcelain and tableware. An investigation for ball and structural clay was carried out in Hulu Sungai Penipah, Mukah, Sarawak, covering an area of 1.3 sq.km. The estimated reserve is 3.8 million tonnes. The deposit is suitable for wall and floor tiles, roofing tile, sanitary pipe and vase.

Coal

Coal exploration in Sarawak was carried out in 2 areas in Miri covering 30 sq. km and 65 sq. km respectively. Only thin lenses of coal were found. Chemical analysis results showed that the total sulphur contents are rather high ranging from 0.73% - 11.3%, whereas the gross calorific values (dry) range from 3,945 kcal/kg to 7,735 kcal/kg. Based on the ASTM classification, the coal samples are of high volatile bituminous coal in rank. The conversion and updating of coal data from Merit Pila and Mukah- Balingan reports into the digital format are still in progress.

The Coal Resources Evaluation Project was continued in the Pinangah area, Sabah covering a total area of 45 sq. km. The survey identified 13 new coal outcrops, having thicknesses between 1 m to 7.2 m. The chemical analysis results of coal samples from the area showed low to medium moisture content (average, 3.3 % a.d), low ash (average, 7.1 % dry), low to medium sulphur (average, 0.7 % dry), high volatile matter (average, 39.1% dry) and medium to high gross calorific value (average 30.2 MJ/kg on an air dried basis). The coal samples are of high volatile A to C bituminous coal (hvAb – hvCb) in rank. A few coal samples showed coking coal properties.

Other Minerals

Reconnaissance surveys were undertaken in Sokor, Tanah Merah in the state of Kelantan for rutile and sericite with coverages of 12 sq. km and 4 sq. km respectively.

1.2.3 Mineral Research and Development

The main scope of mineral R&D activities is value adding of local mineral and metal resources, such as silica sand, clay, kaolin, limestone and advanced material.

The three main R&D studies carried out by the Silica Based Technology Section were the production of crystal glass, borosilicate glass and the recycling of optical glass. These three studies have a substantial impact on the mineral industry in the nation.

R&D activities on the production of quality ceramic of commercial value based on local raw clay materials were extended to the states of Perak, Kedah, Kelantan, Pahang, Sabah dan Sarawak. Besides the study of local clay as components of ceramic bodies, R&D activities also included on the use of other local raw materials like silica sand, feldspar and kaolin for formulating ceramic bodies. All these researches aim at improving the formulation process, fabrication, glaze and decoration in order to make the end products more competitive for commercialization.

The Rock Based Technology Section has embarked on the synthesis of Precipitated Calcium Carbonate from low grade limestone using the ionic solution carbonation method. The carbonation process is carried out by “in-flight” using a specially designed proto-type reactor. The laboratory experimental results showed the yield of high grade PCC was low.
Efforts are now focused on developing synthesis techniques to increase the efficiency of the process.

During the period, studies were carried out on the synthesis and the production of nanohydroxyapatite based on the use of local raw materials as the starting material to produce advanced material with potential for commercialisation. The research was directed towards the production of artificial bones, hydroxyapatite and prototype capacitors in the laboratory. The studies showed that local silica and limestone have potential to be used for producing artificial bones.

The Metallurgy Technology Section endeavours the optimization of the use of local mineral resources by undertaking studies to improve the processing techniques. In the study of feldspar resources, besides identifying processing techniques and suitability of the products for industrial use, research on the techniques of separating and producing high grade mica as a by-product was also carried out. In the sericite studies, activities included getting additional characterisation information of the source, processing to reduce the heavy metal content in the product and preliminary studies on its suitability for use in the cosmetics industry and for waste treatment process. Studies on industrial waste treatment using catalyst and Titanium Doping on Silica by photocatalysis were also carried out. The aim of the studies is to test whether the catalyst synthesis in the laboratory can be used to treat waste containing cyanide. These studies are chosen because of its important to overcome the problem of cyanide discharge from gold mines in the country.

The Mining and Quarry Technology Division carried out detailed studies on clay mineralogy and morphology using the Scanning Electron Microscope in order to understand the clay’s occurrence and characteristics. These studies which involve clay and kaolin from different parts of the country will assist in the development of better clay products from local resources. Fundamental studies on iron in clay were also carried out to understand the iron’s occurrence and to try to find possible ways of treating the iron. Studies were also conducted on the use of our local mineral resources for producing zeolite.

1.3 Proposed Future Activities and Assistance Required from CCOP in Support of Future Activities:

Malaysia will continue with:

(i) Data collection through geochemical and offshore surveys.
(ii) Evaluation of industrial mineral resources.
(iii) R&D work on local resources.

Assistance from CCOP is required in:

(i) Processing, integration and interpretation of geochemical, geophysical and geological data.
(ii) Expertise in R&D with specific reference to industrial minerals.

1.4 Others

The progress of the mineral industry in Malaysia is expected to keep in tandem with its economic development. During the period, the Malaysian mining industry remains robust with an increase in the mineral commodity price due to the continuous demands for minerals such as tin, gold and iron ore especially from China. The aggregate and silica sand productions also charted significant increases as a result of higher demands for the products in Singapore.
There were 66 mines and 321 quarries operating during the period. The mining activities are mostly in Perak, Pahang, Johor, Kelantan, Terengganu and Sarawak, whereas quarrying activities are found in all the states in order to meet the local needs for rock materials.

2. ENERGY PROGRAMME

2.1 Summary

During the review period of July 2007 to June 2008, several oil companies have carried out data reviews on the prospectivity of Malaysian exploration acreage, leading to six (6) new Production Sharing Contracts (PSCs) being awarded to oil companies for Exploration investment.

There were extensive exploration activities in Malaysia carried out by PETRONAS and its Production Sharing Contractors. A total 112,337 line km of 2D and 3D seismic data was acquired and twenty-one (21) exploration wells were drilled resulting in several significant oil and gas discoveries.

A total of one-hundred and thirteen (113) development wells were also drilled during the period.

Crude oil and gas production averages were 568 Kbpd and 7.0 Bscf/d respectively.

2.2 Annual Review of Technical Programmes / Activities

2.2.1 New Production Sharing Contracts (PSC) Signed

A total of six (6) exploration PSCs were signed during the review period. Details of the exploration PSCs signed are tabled below:

<table>
<thead>
<tr>
<th>Block Name</th>
<th>Date PSC Signed</th>
<th>Operator</th>
</tr>
</thead>
<tbody>
<tr>
<td>SK333</td>
<td>7 December 2007</td>
<td>Nippon Oil Expl. Limited</td>
</tr>
<tr>
<td>PM308A</td>
<td>7 April 2008</td>
<td>Lundin Malaysia B.V</td>
</tr>
<tr>
<td>PM308B</td>
<td>7 April 2008</td>
<td>Lundin Malaysia B.V</td>
</tr>
<tr>
<td>SB303</td>
<td>7 April 2008</td>
<td>Lundin Malaysia B.V</td>
</tr>
<tr>
<td>PM303 / PM324</td>
<td>22 May 2008</td>
<td>TOTAL E &amp; P Malaysia</td>
</tr>
<tr>
<td>SK310</td>
<td>17 June 2008</td>
<td>Newfield Sarawak Malaysia Inc.</td>
</tr>
</tbody>
</table>

2.2.2 Geophysical surveys

A total of 1,942 sq km of new 3D and 8,794 line km new 2D seismic data were acquired during the period. The details are as follows:

<table>
<thead>
<tr>
<th>REGION</th>
<th>NEW 3D SEISMIC (sq km)</th>
<th>NEW 2D SEISMIC (line km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peninsular Malaysia</td>
<td>545</td>
<td>3,302</td>
</tr>
<tr>
<td>Sabah</td>
<td>697</td>
<td>3,846</td>
</tr>
<tr>
<td>Sarawak</td>
<td>700</td>
<td>1,646</td>
</tr>
<tr>
<td>Total</td>
<td><strong>1942</strong></td>
<td><strong>8,794</strong></td>
</tr>
</tbody>
</table>
2.2.3 Exploration and Development Drilling

A total of twenty-one (21) exploration wells (16 wildcats and 5 appraisals) and one-hundred and thirteen (113) development wells were drilled during this period.

2.2.4 Production of Oil and Gas

Average Malaysia’s crude oil production was 568 Kbpd and daily production of gas was 7 Bscf.

For Malaysia total crude oil production, 55% was produced from Peninsular Malaysia oil fields, 24% from Sarawak and the remaining 21% was produced from Sabah.

For gas production, 55% was produced from Sarawak offshore gas fields, 39% from Peninsular Malaysia and another 6% from Sabah.

2.2.5 Reserves

As of January 2008, the oil and gas reserves in Malaysia are as follows:

i. Crude Oil : 4.5 Bstb
ii. Natural Gas : 88 Tscf

2.3 Activities carried out with CCOP and other organizations

2.3.1 CCOP-PETRAD Bilateral Seminars

The following seminars have been carried out in Malaysia in cooperation with CCOP-PETRAD during the period:

2.3.1.1 PETRONAS-PETRAD Visit to PETRONAS University and Research Centre

These visits were carried out in Bangi, Selangor and Tronoh, Perak on 14 – 15 January 2008 involving 14 participants.

2.3.1.2 PETRONAS-PETRAD Strategic E&P R&D Forum

This Forum was held in Kota Kinabalu, Sabah on 16-18 January 2008, attended by 93 participants from PETRONAS.

2.3.2 Enhancing Public Petroleum Management (EPPM) Project

The EPPM Seminar for the CCOP Member Countries was launched on 8-10 October 2008 in Bangkok. Malaysia was represented by Mr. Robert Wong, the National Coordinator for this project and Mrs. Rozita Musib. Malaysia will fully involve in this four year CCOP-Norway programme which aimed to enhance networking amongst the CCOP Member Countries to achieve the goal of creating the highest possible value from petroleum resources in order to improve the quality of life of the people in the CCOP Member Countries.

2.3.3 2009 Proposed Seminar / Workshop

Malaysia would like to propose three or four energy related Seminars / Workshops to be carried out in 2009. The titles of the Seminars / Workshops will be submitted for PETRAD’s consideration before the end of the year.
3. GROUNDWATER PROGRAMME

3.1 Summary

Groundwater investigations, development and monitoring were carried out in the states of Sarawak, Sabah, Johore, Pahang, Selangor, Perak, Negeri Sembilan, Malacca, Kedah, Penang and Terengganu.

3.2 Annual Review of Technical Programmes / Activities

In Sarawak, the main activities carried out were the development of tube wells in hard rock and the upgrading of the Simple Groundwater Filtration System.

In Sabah, evaluation of groundwater potential, both in hard rock and alluvium were carried out. The 5 tube wells developed in hard rock yielded a total of 180 m$^3$/day.

In Johore, geophysical surveys were carried out for groundwater exploration in 5 locations. The well constructed in 3 of the locations gave yields of 87, 218 and 20 m$^3$/day respectively.

In Pahang, hydrogeological studies to evaluate groundwater resource potential in hard rock were carried out in 2 locations. The tube wells constructed managed to produce yields of 96 and 216 m$^3$/day respectively.

In Selangor, 7 tube wells were constructed, 3 in hard rock and 4 in alluvium. The three tube wells constructed in hard rock with respective depths of 80, 98 and 85 m yielded 327, 850 and 163 m$^3$/day respectively. Three of the tube wells in alluvium were however able to yield 2400, 2800 and 80 m$^3$/day respectively.

In Perak, geophysical surveys using the transient electromagnetic (TEM) technique for groundwater studies were conducted over a total area of 3,500 sq. km. A number of tube wells were constructed both in alluvium and hard rock strata.

In Negeri Sembilan, drilling and construction of 2 tube wells were completed with one of the tube wells giving a yield of 423 m$^3$/day.

In Malacca, drilling and construction of 2 tube wells were carried out giving yields of 403 and 168 m$^3$/day respectively.

In Kedah, 2 tube wells were constructed with depths of 81 and 72 m, yielding 293 and 382 m$^3$/day respectively.

In Penang, drilling and construction of 2 tube wells in alluvium were carried out, with one of them encountering brackish water while the other one, drilled to a depth of 48 m, gave a yield of 1,238 m$^3$/day of fresh water.

In Terengganu, 3 tube wells capable of providing a total yield of 32 m$^3$/day were constructed.

3.3 Proposed Future Activities and Assistance Required from CCOP in Support of Future Activities.

Malaysia will continue with:
(i) Development of groundwater resources in various parts of the country with focus on management of groundwater resources in small islands off the coast of Peninsular Malaysia.

(ii) Modelling work and delineation of wellhead protection areas (WHPA) in critical areas.

Assistance from CCOP is required in groundwater resource assessment and monitoring.

3.4 Others
- None -

GEO-ENVIRONMENT SECTOR

4. COASTAL ZONE PROGRAMME

4.1 Summary

The sustainable management of the coastal zone in Malaysia is an integral part of coastal development and, therefore, continual efforts are made by the government in funding numerous projects on the coastal zone resources and its ecological habitats. A number of projects are being carried out under the Ninth Malaysia Plan (9-MP) programme during this five-year period (2006-2010).

4.2 Annual Review of Technical Programmes / Activities

4.2.1 National Integrated Coastal Zone Management Policy

The preparation of the National Integrated Coastal Zone Management (NICZM) Policy for the country is completed. The Economic Planning Unit (EPU) in the Prime Minister’s Department is implementing the policy to the coastal communities.

4.2.2 Integrated Shoreline Management Plan

The Department of Irrigation and Drainage (DID) is preparing the Integrated Shoreline Management Plan (ISMP) for the Malaysia’s coastal zones. The ISMP is to be carried out in stages and at present ISMPs for the states of Negeri Sembilan, Malacca, Penang Island and Labuan Island are underway.

4.2.3 Coastal Programmes undertaken by Minerals and Geoscience Department (MGD)

(i) Coastal Geology Mapping in Penang Island

A geohazard mapping of the coastal beaches around Penang Island especially with regards to the effects of tsunami, oil and waste pollution and cliff stabilities at the backshore areas has been undertaken. A nearshore sampling survey will be undertaken in mid-November 2008 and a multibeam survey early 2009.

(ii) Coastal Studies at One Fathom Bank, Straits of Malacca

A marine study is being undertaken at the One Fathom Bank (OFB) area in the Straits of Malacca, off Port Klang. The purpose of the study is to understand the coastal
processes and the formation of the sand banks in that area. This is to ensure proper management and sustainable mining of the offshore sand resources in that region.

An ADCP current meter will be deployed in this area for about 2 years from November 2008 to monitor the current and tides in this region. At least 5 profiles are planned to be run periodically, about 3 times per year for the 2-year period. The profiling is to monitor the seabed morphological and sediment changes in order to understand the dynamics of the sand banks.

(iii) National Offshore Sand Resource Study – Phase 2 (in Offshore Sarawak)

The Phase 2 of the National Offshore Sand Resource study will be carried out off the waters of Sarawak. The study will encompass the determination of the potential sand reserves and the impacts of the sand mining towards environment.

In 2008, 3 major surveys were completed: geophysical survey, sediment sampling survey and environmental survey. The geophysical survey comprised applications of single beam echosounder, side scan sonar, sub-bottom profiler, hydroacoustic data for habitat mapping and magnetic data. The sampling survey comprised samplings of surface grab sediments and 5-m core sediments. The environmental survey comprised collection of water samples, sediment samples for macrobentos and trawling samples for fish density. Current meters are being deployed in six locations for current and tide observations.

4.3 Proposed Future Activities and Assistance Required from CCOP in Support of Future Activities:

As offshore sand mining is becoming increasingly important in the developing coastal states, it is imperative for the relevant government agencies to gain knowledge and experience in order to be able to effectively regulate and monitor the sand mining activities. Towards establishing a more effective governance of the offshore sand resources, Malaysia proposes CCOP to organize a study tour for the officials from various related agencies to some well established countries like Japan and Korea where offshore sand is being used in the construction industry besides for reclamation projects.

4.4 Others

A workshop on Geological Coastal Mapping was successfully organized in Pulau Langkawi, Malaysia in November 2007. The workshop was a joint collaboration between the Department of Minerals and Geoscience Malaysia and Geological Survey of Canada (GSC). Participants were mainly from various local government agencies with a few from CCOP member countries.

5. GEO-HAZARDS PROGRAMME

5.1 Summary

Besides the routine geo-hazard investigations which were conducted on ad-hoc basis depending on when and where the geo-hazard incidents occurred, Malaysia through the Minerals and Geoscience Department (MGD) has also taken proactive measures in geo-hazard prevention and mitigation by embarking on geological terrain mapping, engineering geological mapping and soft soil studies. The Government of Malaysia has also initiated the Seismic and Tsunami Hazards and Risks Study.
5.2 Annual Review of Technical Programmes / Activities

5.2.1 Geo-hazard Investigations

During the period, MGD had carried out 17 landslide investigations and 15 general geo-hazard site investigations on ad-hoc basis. One of the investigations involved studies on the reported earthquake occurrence. Another investigation was on the risk zonation of a 3 km stretch area adjacent to limestone cliff.

<table>
<thead>
<tr>
<th>State</th>
<th>Landslides (no. of sites)</th>
<th>General Site Investigations (no. of sites)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Selangor</td>
<td>3</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Malacca</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N. Sembilan</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pahang</td>
<td>2</td>
<td>1</td>
<td>Earthquake</td>
</tr>
<tr>
<td>Sabah</td>
<td>8</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Sarawak</td>
<td>1</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Perak</td>
<td></td>
<td>1</td>
<td>Risk zoning from limestone cliff hazard</td>
</tr>
<tr>
<td>Total</td>
<td>17</td>
<td>15</td>
<td></td>
</tr>
</tbody>
</table>

5.2.2 Geological Terrain and Engineering Geological Mapping

During the period, geological terrain mapping covered a total area of 1835 sq. km whereas engineering geological mapping covered a total area of 265 sq. km. Both the mappings were mainly carried out by the staff of MGD. Relevant thematic maps were produced and some of these maps were sought by the local planning consultants as guidelines for the development planning design. Documentation of slope inventory, which formed part of the mapping exercises, was also carried out in some of the critical mapping areas.

<table>
<thead>
<tr>
<th>State</th>
<th>Geological Terrain Mapping (area coverage in km²)</th>
<th>Engineering Geological Mapping (area coverage in km²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Johore</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>Kedah</td>
<td>220</td>
<td>100</td>
</tr>
<tr>
<td>Penang</td>
<td></td>
<td>165</td>
</tr>
<tr>
<td>Kelantan</td>
<td>130</td>
<td></td>
</tr>
<tr>
<td>Selangor</td>
<td>850</td>
<td></td>
</tr>
<tr>
<td>N. Sembilan</td>
<td>200</td>
<td></td>
</tr>
<tr>
<td>Pahang</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>Sabah</td>
<td>200</td>
<td></td>
</tr>
<tr>
<td>Sarawak</td>
<td>75</td>
<td></td>
</tr>
<tr>
<td>Perak</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>Total Coverage:</td>
<td>1,835</td>
<td>265</td>
</tr>
</tbody>
</table>
5.2.3 Peat / Soft Soil Studies

During the period, Malaysia has commenced the peat / soft soil studies which involved shallow augering, Mackintosh probe test, shear vane test, on-site water quality analysis and peat and soft soil (clay) sampling.

A peat testing laboratory capable of testing eight parameters: organic matter determination, relative density, Attenberg limits, grain size analysis, moisture density relation, permeability/constant head method, consolidation and unconfined compression test was set up in Sarawak.

<table>
<thead>
<tr>
<th>State</th>
<th>Coverage (km²)</th>
<th>No. of Shallow Hole</th>
<th>No. of Mackintosh Probe Test</th>
<th>Shear Vane Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Johore</td>
<td>60</td>
<td>107</td>
<td>95</td>
<td>19</td>
</tr>
<tr>
<td>Selangor</td>
<td>80</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pahang</td>
<td>45</td>
<td>45</td>
<td>44</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>185</td>
<td>152</td>
<td>139</td>
<td>19</td>
</tr>
</tbody>
</table>

5.2.4 Seismic and Tsunami Hazards and Risks Study

The Government of Malaysia appointed the Academy of Sciences Malaysia (ASM) to coordinate, manage and monitor the implementation of the Seismic and Tsunami Hazards and Risks Study. The Study’s terms of reference are as follows:

(i) To assess the seismicity in Malaysia;
(ii) To evaluate the seismic risk in and tsunami risk towards Malaysia;
(iii) To develop macrozonation map of Malaysia;
(iv) To develop microzonation maps for several major cities in Malaysia;
(v) To assess and review the adequacy of existing monitoring/data collection system and need for any improvement;
(vi) To assess the need for seismic factors in planning and design of major structures in Malaysia involving ground acceleration map and design response spectrum; and
(vii) To identify areas in Malaysia vulnerable to earthquakes and tsunamis.

As part of the Study, an impact assessment was also undertaken on the natural marine and coastal systems in north-west Peninsular Malaysia as well as a tsunami public awareness and drill (entitled “Community Preparedness and Emergency Response Plan for Tsunami Disaster”) in Langkawi.

The Draft Final Report is expected to be submitted to the Government in early September 2008. The findings of the Study will be released after the Government accepts the Report.

5.3 Proposed Future Activities and Assistance Required from CCOP in support of Future Activities

5.3.1 Proposed Future Activities

Malaysia will continue with:
(i) Geological Terrain Mapping

Through geological terrain mapping, thematic maps such as Slope Map, Terrain Map, Erosion Map, Physical Constraints Map, Engineering Geology Map and Construction Suitability Map will continue to be generated. These maps have proven to be useful for development planning purposes.

(ii) Investigation of peat areas

Investigations will be conducted on peat land in Selangor, Pahang, Johor and Sarawak. The physical and engineering characteristics of these peat lands will be studied.

(iii) Stability of limestone hills

Investigations will be conducted on limestone hills in Ipoh, Perak and Alor Setar, Kedah to map the dangerous cliff faces and to demarcate the safe and danger zones at the base of the hills.

5.3.2 Assistance required from CCOP

An expert on peat and soft soil studies especially on the engineering aspects.

5.4 Others

Malaysia has acquired expertise on geological terrain mapping and is in a position to advise or transfer the knowledge to whichever neighbouring Southeast Asian countries interested in developing the mapping techniques.

6. ENVIRONMENTAL GEOLOGY PROGRAMME

6.1 Summary

The environmental geological programme carried out involved mainly groundwater monitoring and reviewing of EIA reports and development plans.

6.2 Annual Review of Technical Programme / Activities

6.2.1 Groundwater Monitoring

Routine groundwater monitoring with regards to quality and groundwater levels was carried out, mostly twice a year during critical months for both the production wells and the monitoring wells throughout Malaysia. The monitoring work was focused in areas where the groundwater resource is relatively important as a source of public water supply, especially the coastal areas. Some of the mineral water production wells especially those in Johore were monitored as well. Apart from the groundwater monitoring, the likelihood of ground subsidence in critical areas such as Kelantan was also closely monitored. In Sarawak and Sabah, groundwater was similarly monitored for salt water intrusion in the coastal areas where groundwater utilisation is significant.

6.2.2 EIA and Development Plan Review

During the period, a recorded total of 238 Environmental Impact Assessment (EIA) reports were reviewed to ensure the infrastructural development is sustainable. Numerous reviews of development plans for various growth centers as well as guidelines on the development of sensitive areas were also carried out to ensure that geological inputs are being considered in development projects.
6.3 Proposed Future Activities and Assistance Required from CCOP in Support of Future Activities

6.3.1 Proposed Future Activities
Malaysia will continue with:
(i) Groundwater monitoring;
(ii) Reviewing of physical development plan and EIA report.

6.3.2 Assistance Required from CCOP
Expertise in groundwater especially in the area of contamination monitoring and mitigation.

GEO-INFORMATION SECTOR

7. GEODATA AND INFORMATION MANAGEMENT PROGRAMME

7.1 Summary
During the review period, the activities carried out include participation in the SANGIS Project, editing of digitized geological maps, dissemination of geospatial data and development of integrated databases.

7.2 Annual Review of Technical Programmes / Activities

7.2.1 SANGIS Project
Data entry into the SANGIS database continued and to date, 1132 records have been input into the system at the main library of the MGD headquarters, Kuala Lumpur.

7.2.2 Geological Maps
Malaysia, through MGD has completed editing the geospatial and digital geology map of Peninsular Malaysia.

Geological maps for Gajah Terom, Gunung Tahan, Kuala Tembeling and Gubir areas are currently being edited.

The preparation of the 1: 1,000,000 scale geological map of Malaysia is on-going and is expected to be completed soon.

7.2.3 Dissemination of Geospatial Data
In cooperation with a few other governmental organizations, MGD as one of the lead agencies has contributed to the construction of the National Geospatial Data Centre (NGDC) hosted by Malaysia Centre for Geospatial Data Infrastructure (MaCGDI).

The MGD continued to upload and maintain geospatial data in the Malaysia Geospatial Data Infrastructure (MyGDI) application which is a federal government initiative. To date, geospatial data including geology, mineral resources (industrial mineral, metallic mineral) and geotechnical (hydrogeology, mine and quarry) data had already uploaded onto MyGDI.
7.2.4 Development of Database and Data Centre

Since the year 2000, MGD has embarked on developing an integrated geospatial database Geoscience Information System (GEOSIS) which was intended to store all the mineral and geoscience data collected in the country. To date, two database modules (HYDROdat and IMdat) were already completed and implemented. In 2007, MGD has started developing six other modules namely: GEOCHEMdat, MINEdat, QUARRYdat, COALdat, ENGEOdat and METALdat. All the modules are expected to be completely developed by 2010.

MGD is also committed in the development of internet GIS application for internal use and in the construction of a Data Centre to house the servers, applications and data.

7.3 Proposed Future Activities and Assistance Required from CCOP in Support of Future Activities

Malaysia is embarking on developing, upgrading and integrating its mineral and geoscience databases and GIS application. Subsequently, relevant applications will be developed.

In this respect, the assistance of CCOP is required in providing technical assistance in the following areas:

(i) Expert advice on developing applications.
(ii) On-the-job-training on various aspects of database development and management.
(iii) Study tour to other countries to study their information management set-up.