Member Country Report of INDONESIA

Submitted by

Indonesian Delegation / Geological Agency

(For Agenda Item 3)
1. OUTREACH
The geology related programmes and activities during the period of 1 July 2018 – 30 June 2019 are classified into seven working groups: Geo-information, Environmental Geology, Geohazards, Groundwater, Energy, Minerals, and Coastal Programme.

GEO-INFORMATION PROGRAMME

1.1. Summary
During the period of July 2018 to June 2019, the Geological Agency continued to develop geoscience database, publish and service geological data and information. The Geological Agencies activities in relation to Geo-information were:

- Continued to update some thematic maps to 1:100,000 and 1:50,000 Scale based on the new edition of Indonesia Topographic Map (Peta Rupa Bumi Indonesia and support to the Government of Indonesia Economic Policy Package on Accelerating of One Map Policy
- Continued to support to the CCOP Geoinformation Sharing Infrastructure for East Asia and Southeast Asia (GSi) Project.
- Continued to develop of Multiplatform Application for Geohazard Mitigation and Assessment.
- Developing Geological Database of Indonesia

1.2. Annual Review of Individual Technical Activities
- The Geological Agency of Indonesia continued to support One Map Policy through 10 thematic GIS map among 85 totally until 2019. The One Map Policy was originally intended to achieve good spatial planning governance, a geospatial information for the Acceleration and Expansion of Indonesia Economic Development. The 10 thematic maps consisted of geological map, georesources (mineral, coal, geothermal) map, groundwater map, karst map, and geohazards (volcanoes, earthquake, tsunami, landslide) maps. Updating map was carried out for Sumatera, Sulawesi, Bali and Nusa Tenggara based on the new edition of Indonesian
Topographic Map (Peta Rupa Bumi Indonesia) on 2017, and also Jawa, Maluku and Papua on 2018.

- Support to annual meeting of the 3rd International Workshop on CCOP Geo-information Sharing Infrastructure for East and Southeast Asia (GSi) project that was held on 18 – 20 September 2018 at Langkawi, Malaysia
- Since 2017, Geological Agency develops the Multiplatform Application for Geo-hazard Mitigation and Assessment in Indonesia (MAGMA Indonesia) version 2, that first developed in 2015. MAGMA Indonesia is the first multiplatform (Web & Mobile) application in the world that contains integrated information and recommendations on geological disaster (volcanoes, earthquake, tsunami, and landslide) in Indonesia to be presented to the public.
Geological Agency of Indonesia as an information provider since 2017 develops the Geological Database of Indonesia. With the large number of existing geological information data and the increasingly rapid demands of the public in services, Geological Agency of Indonesia should always improve the service quality of presenting the work, even including data that existed long ago in a 'user-friendly' way. The wealth of geological information data needs to be summarized in an Indonesian geological data database system. In the case of geo-scientific data needs to be arranged so that it can be accessed easily by users both internal Geological Agency and users outside the institution of Geological Agency.

The Geological Agency has produced several publications and maps, such as:

1. Indonesian Journal on Geoscience (IJoG), international indexes, publish 3 issues per year
2. Bulletin of Geological Resources, publish 3 issues per year
3. Journal of Geology and Mineral Resources, publish 4 issues per year
4. Center for Geological Survey (CGS) - Geological Agency (GA) had been interpret the satellite image covering whole area of Indonesia to produce a systematic geological maps. This activity had been conducted for 6 (six) years during 2010-2016. The activities of interpretation have been produce 3774 sheets of Geologic Interpretation Maps scale 1 : 50,000. Since 2017, maps continue updated base on field data.

1.3. Proposed Future Activities

The Geological Agency through the Center for Geological Survey as the data guardian of the Geological Map in the One Map Policy program has proposed a new activity for the creation of the Active Fault Map of Indonesia on a 1: 100,000 scale which is scheduled to be completed in 5 years (2020-2025).

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ENVIRONMENTAL GEOLOGY PROGRAMME

1.1. Summary

During the period of July 2018 to June 2019, the Center for Groundwater Resources and Environmental Geology (CGREG), Geological Agency (GA) conducted several activities related to environmental geology for land use planning, geo-heritage inventory, karst inventory, research in Karst. In addition, the Geological Agency (GA) also has set up regulations related to Karst Conservation and Geology Conservation Area.

1.2. Annual Review of Individual Technical Activities

- The environmental geological mapping for land use planning and regional development activities were done in the urban areas and autonomy regions that have high priority in their development for geo-tourism. They include the national priority area that apply land use development and spatial planning with consideration of their geological phenomena. This activity has been carried out in regency/city of Pangandaran, Kalipucung, Segara Anakan, dan Nusa Kambangan.
- The integrated geological survey for land use planning in after Palu earthquake.
- Geo-heritage inventory was carried out in the Regency of Yogyakarta (Yogyakarta Special Province). Rinjani (West Nusa Tenggara). This activity resulted an identification of specific geo-diversity that has a high value for scientific and tourism purposes,
- Karst inventory was done in the Regency of Sukabumi (West Java), Kutai Timur (East Kutai) and Pangandaran (West Java),
- CCS (Carbon Capture Storage) research in Karst, a new subject of research that was done in Karst Gunung Sewu. This activity is research-based monitoring of carbon uptake, water discharge and infiltration in karst caves,
- Mud flow disaster monitoring was done in Sidoarjo (East Java). This activity aims to see the changes of mudflow disaster after year 2006 in series, including debit, crack, subsidence, and blow-out,

**Ministrial Regulation related Karst Conservation and Geo-heritage Area**

According Government Regulation No. 26/2008 on National Spatial Planning, mentioned that Geological Heritage Area should be protected. Based on Minister of Energy and Mineral Resources (MEMR) Regulation No. 17/2012 in Karst Conservation Area, Geological Agency (GA) evaluated some area that are important to be declare as Karst Conservation Area, that are:

b. MEMR Decree No. 1830 K/40/MEM/2018 in Citatah Karst Conservation Areas.
c. MEMR Decree No. 1830 K/40/MEM/2018 in Citatah Karst Conservation Areas.
e. MEMR Decree No, 2026 K/40/MEM/2018 in Jogjakarta Province Geo-heritage Areas.

1.3. Proposed Future Activities

Similar environmental geology programe will be carried out in other part of the country. Geological Agency has been conducting evaluation of Karst in Indonesia, as well as Geological Conservation.
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**GEOHAZARD PROGRAMME**

1.1. **Summary**

Geohazard (volcanic eruption, earthquake, tsunami, and landslide) mitigation program in Indonesia is mostly implemented by the Centre for Volcanology and Geological Hazard Mitigation (CVGHM), Geological Agency. The main task of CVGHM is to conduct research, investigation and services of volcanology and geological hazard mitigation. Based on Presidential Regulation of Republic of Indonesia No. 9 of 2016 on one-map policy, preparation of geological hazard maps becomes the authority and responsibility of the Ministry of Energy and Mineral Resources (MEMR), which is implemented by the Geological Agency (CVGHM). Therefore, in the period 2016 – 2019, geohazard program are prioritized to support the one-map policy.

One of the efforts in geohazard mitigation is to disseminate information and recommendations on geohazard to the community. Since 2015, CVGHM has created and developed MAGMA Indonesia (Multiplatform Application for Geohazard Mitigation and Assessment in Indonesia). This application contains integrated geological hazard information and recommendation presented to the community in a quasi-realtime and interactive manner. MAGMA Indonesia can be accessed online at [https://magma.vsi.esdm.go.id/](https://magma.vsi.esdm.go.id/).

1.2. **Annual Review of Individual Technical Activities**

1.2.1. **Volcano**

Indonesia hosts 127 active volcanoes and 69 of them are categorized as active and high risk volcanoes, which are monitored continuously by CVGHM. Twelve volcanoes have erupted during the period of July 2018 until June 2019 (Table 1). There were no casualties caused by those eruptions. Currently there are 20 volcanoes whose activities are in a state above normal (Figure 3), consisting of 4 volcano at alert level III (Sinabung, Agung, Karangetang and Soputan) and 16 volcanoes at alert level II (Merapi, Marapi, Kerinci, Semeru, Bromo, Rinjani, Sangeangapi, Rokatenda, Lokon, Gamalama, Gamkonora, Ibu, Dukono, Ili Lewotolok, Banda Api and Anak Krakatau).
<table>
<thead>
<tr>
<th>Volcano</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agung</td>
<td>Eruption with ash emissions and incandescent lava (ballistics) intermittently occurring up to now. Lava dome growth at the main crater has stalled since mid-July 2018 with a volume of about 28 Mm³. The eruption was stopped during end of July – end of December 2018. Intermittent explosions started again on December 30th 2019 with ash columns reached a maximum height of 3000 m above the summit.</td>
</tr>
<tr>
<td>Anak Krakatau</td>
<td>Strombolian eruption started from July 14th 2018 and is still continuing up to now. An intense eruption period accompanied by a sector collapse of the southwestern on December 22nd which was followed by tsunami.</td>
</tr>
<tr>
<td>Bromo</td>
<td>Eruption and ash emission was continuing from February 18th to April 2019 with ash columns reached 700 m above the crater.</td>
</tr>
<tr>
<td>Dukono</td>
<td>Eruption and ash emission is continuing, the ash columns have a maximum height of 1000 m above the summit.</td>
</tr>
<tr>
<td>Gamalama</td>
<td>An eruption occurred on October 4th 2018 with an ash column reached about 250 m above the summit.</td>
</tr>
<tr>
<td>Ibu</td>
<td>Eruption is continuing with ash columns reached a maximum height about 1200 m above the summit. The eruptive activity was also accompanied with lava dome formation.</td>
</tr>
<tr>
<td>Karangetang</td>
<td>Eruption with lava flow started from December 2018. Lava flowed to the north-northeast direction. The lava flow reached the seashore and cut of the only road connecting the northern villages to the city center. Evacuations were done for some villagers around the hazard zones around 2 months. Relocations of 5 homes near the path of lava flow were recommended</td>
</tr>
<tr>
<td>Kerinci</td>
<td>An eruption occurred on March 30th 2019 with ash column reached a maximum height of 1000 m above the summit.</td>
</tr>
<tr>
<td>Merapi</td>
<td>Following the explosive eruption on May 11th 2018, the following activity is characterized by lava avalanches and pyroclastic flows to the southeast sector (Gendol river) that reached a maximum distance of 2000 m.</td>
</tr>
<tr>
<td>Semeru</td>
<td>Intermittent explosion continuously since 2009 up to now with ash columns reached a maximum height of 700 m above the summit.</td>
</tr>
<tr>
<td>Sinabung</td>
<td>After 1 year of non-eruptive period, the volcano erupted again started from May 7th 2019 with ash column height reached 6000 m above the summit. Larger eruption occurred on June 9th 2019 with ash column height reached 7000 m above the summit.</td>
</tr>
<tr>
<td>Soputan</td>
<td>Eruption and ash emission occurred on October 3rd 2019 with ash column heights reached 5000 m above the summit. Larger explosion occurred on December 12th 2018 with ash column height reached 7000 m above the summit.</td>
</tr>
</tbody>
</table>
1.2.2. Earthquake

During period of July 2018 to June 2019 there are 28 destructive earthquakes occurred in Indonesia, as summarized in Table 2 and Figure 4. The earthquake events caused 4020 casualties, 5,713 people are injured and almost 170,000 of damaged building. There were two significant events occurred in the second semester of 2018, namely a series of earthquakes in northern Lombok Island in July-August 2018 and in Central Sulawesi (Palu, Sigi, and Donggala) on September 28, 2018. The Central Sulawesi earthquake triggered a tsunami and a rare phenomenon that is a combination of groundshakes, liquefaction and landslides occurred in large areas and densely settlements. On these two major events, Geological Agency has conducted a rapid assessment (quick response), detailed studies on selected areas and mapping of geological hazards mapping in order to assist local governments in the rehabilitation and reconstruction process as well as in determining regional spatial plans.

Table 2. Destructive earthquake period July 2018 – June 2019 in Indonesia
In the past year (July 2018 to June 2019), there were two destructive tsunami event occurring in Indonesia. The first tsunami occurred in the Palu Bay region of Central Sulawesi on September 28, 2018. This tsunami was probably caused by a combination of earthquake deformation and underwater landslides triggered by earthquake. The second tsunami occurred in the Sunda Strait region on 22 December 2018 and caused 446 fatalities, 7200 people were injured and almost two thousand damaged buildings. The Sunda Strait Tsunami was triggered by partial collapse of the Anak Krakatau Volcano edifice. Geological Agency (CVGHM) has conducted a rapid assessment (quick response) in impacted area several days after these two tsunami events. Previously, CVGHM had done modeling and had compiled a tsunami hazard map around impacted area (Palu bay and Sunda Strait). However, the source of the tsunami that occurred was different from the sources used in modeling.
1.2.4. Landslide

Landslide disasters in Indonesia mostly occur during the rainy season or between October to June for every year. During the period of July 2018 - June 2019, in total there were 1582 landslide events in Indonesia caused 265 casualties, 88 people injured and thousands of damaged houses and building. Java is the most vulnerable island to landslide disaster in Indonesia, where 36% of landslide event and 31% of casualties occurred in West Java Province (Figure 5 and 6). This is due to geological condition of Java Island coupled with high population density, and also because of high intensity rainfall. During this period, the most destructive landslide event occurred in Bogor, Sukabumi, Mandailing Natal, North Sumatera and Padang Pariaman West Sumatera, Gowa Regency, South Sulawesi. On 2018 Landslide induced earthquake occurred in Palu, Central Sulawesi and Lombok, West Nusa Tenggara. In Palu not only landslide but combination between liquefaction-landslide-ground shaking hit the densely populated Balaroa and Petobo settlement within the Palu urban area. One of these hit the state housing complex at Perumnas Balaroa, the other a kelurahan (urban village) called Petobo. Two more occurred some distance south of Palu, at Jono Oge and Sibalaya, in the district of Sigi. All four involved a geological process known as liquefaction, a term that soon became horribly familiar to city residents. Technical recommendations and coordination with other institutions (Ministry Agraria and Spatial Planning) to implemented or spatial plans that include specific strategies for disaster mitigation (Detailed spatial plan level (Rencana Detail Tata Ruang - RDTR) give to the local government to minimize the landslide risk during rainy season.
Figure 5. Landslide disaster event in Indonesia during the period July 2018 – June 2019

Figure 6. Casualties caused by landslide in Indonesia, July 2018 – June 2019 (This data not include liquifaction in Palu, Central Sulawesi and Flash Flood in Makasar, South Sulawesi Province, Bengkulu, and Sentani Papua)
Figure 7. Houses buried by landslide at Cisolok Village, Sukabumi Regency, West Java. This landslide caused 26 persons lost their life.

Figure 8. Houses buried by landslide at Gowa Regency, South Sulawesi Province.
Figure 9. landslide at Pattiro, Pattalikang Village, Manuju District Gowa Regency, South Sulawesi Province. This landslide cause 20 persons lost their live.

Figure 10. Landslide induced by Palu Earthquake and Potentially to Debris Flow at Poi, Dolo Selatan, Sigi, Central Sulawesi
1.2.5. Training activities

During period of July 2018 to June 2019, there were three geological agency staff who participated in three different geohazard-related CCOP technical activities, namely:

(1) Iqbal E. Putra participated in Malaysia Window to Cambridge at Universiti Kebangsaan Malaysia (MW2C@UKM) Workshop on Geohazards and Disaster Risk Reduction, that held in Penang, Malaysia on 18-20 September 2018.

(2) Arianne Pingkan Lewu participated BGR-CCOP International Training Course Risk-Sensitive Spatial Planning for CCOP Member Countries, held in Hanoi, Vietnam, on 12 to 22 November 2018.

(3) Pamela R participated in GSJ International Training Course on Practical Geological Survey Technical 2019- Application to Geological Disaster Mitigation on 4 June to 21
GROUNDWATER PROGRAMME

1.1. Summary

Referring to the main tasks of the Center of Groundwater and Environmental Geology (CGEG), Geological Agency (GA); as previous years, the activity on groundwater conducted by CGEG-GA during the period of year 2018 and 2019 (July 1, 2018 – June 30, 2019) can be divided into five groups as follows.

1. Development of Groundwater Management for Tourism Areas
2. Groundwater Exploration and Development in Area of Water Shortage in 27 provinces
3. Poor Quality Groundwater Chemistry Investigation of Drilling Wells
4. Groundwater Vulnerability Mapping in the Citarum Watershed (Upper Citarum Watershed)

The results of the above activities were disseminated to the stakeholders of groundwater by mean of workshop, seminar, and socialization.

1.2. Annual Review of Technical Programme/Activities

Detailed activities related to groundwater which were conducted by CGEG-GA during the period of July 1, 2018 to June 30, 2019 can be described as follows (see Table 1 and Table 2).

1.2.1. Development of Groundwater Management for Tourism Areas

The main objective of Development of Groundwater Management for Tourism Areas is to provide hydrogeological data as supporting data for the development of tourist areas. Especially those related to groundwater potentials and potential disasters caused by groundwater

Development of Groundwater Management for Tourism Areas which conducted on areas in this year consists 3 areas which distributed in 3 provinces, namely:
1. Development of Groundwater Management for the Labuhan Bajo Tourism Area, East Nusa Tenggara.
2. Development of Groundwater Management for the Mandalika Tourism Area, West Nusa Tenggara.
3. Development of Groundwater Management in Lake Toba and Around North Sumatra Tourism Area.

Table 3. Hydrogeological/Groundwater Activities Conducted by CGEG-GA in 2016/2017

<table>
<thead>
<tr>
<th>Nr</th>
<th>Description</th>
<th>Nr of Location (Year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Development of Groundwater Management for Tourism Areas</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.1 Development of Groundwater Management for the Labuhan Bajo Tourism Area, East Nusa Tenggara.</td>
<td>2019</td>
</tr>
<tr>
<td></td>
<td>1.2 Development of Groundwater Management for the Mandalika Tourism Area, West Nusa Tenggara.</td>
<td>2019</td>
</tr>
<tr>
<td></td>
<td>1.3 Development of Groundwater Management in Lake Toba and Around North Sumatra Tourism Area</td>
<td>2019</td>
</tr>
<tr>
<td>2</td>
<td>Groundwater Exploration and Development in Area of Water Shortage in 27 provinces</td>
<td>(2018)</td>
</tr>
<tr>
<td>3</td>
<td>Poor Quality Groundwater Chemistry Investigation of Drilling Wells</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3.1 Poor Quality Groundwater Chemistry Investigation in Gresik Regency</td>
<td>(2018)</td>
</tr>
<tr>
<td></td>
<td>3.2 Poor Quality Groundwater Chemistry Investigation in Nganjuk Regency</td>
<td>(2018)</td>
</tr>
<tr>
<td></td>
<td>3.3 Poor Quality Groundwater Chemistry Investigation in Banyumas Regency</td>
<td>(2018)</td>
</tr>
<tr>
<td></td>
<td>3.3 Poor Quality Groundwater Chemistry Investigation in Lamongan Regency</td>
<td>(2018)</td>
</tr>
</tbody>
</table>

1.2.2. Groundwater Exploration and Development in Area of Water Shortage in 27 provinces

Groundwater Exploration and Development in Area of Water Shortage were carried out in 27 provinces. Total number of exploration wells which were then developed to be production wells are 506 wells.

Table 4. Groundwater Exploration and Development in Area of Water Shortage, conducted by CGEG-GA in 2018

<table>
<thead>
<tr>
<th>Nr</th>
<th>Location (Province)</th>
<th>Number of Well</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>West Java</td>
<td>53</td>
</tr>
<tr>
<td>2</td>
<td>Central Java</td>
<td>59</td>
</tr>
<tr>
<td>3</td>
<td>Yogyakarta</td>
<td>13</td>
</tr>
<tr>
<td>4</td>
<td>East Java</td>
<td>77</td>
</tr>
<tr>
<td>5</td>
<td>Bali</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>West Nusa Tenggara</td>
<td>17</td>
</tr>
<tr>
<td>7</td>
<td>East Nusa Tenggara</td>
<td>11</td>
</tr>
<tr>
<td>8</td>
<td>Nanggroe Aceh Darussalam</td>
<td>10</td>
</tr>
<tr>
<td>9</td>
<td>North Sumatera</td>
<td>18</td>
</tr>
<tr>
<td>10</td>
<td>West Sumatera</td>
<td>9</td>
</tr>
<tr>
<td>11</td>
<td>South Sumatera</td>
<td>21</td>
</tr>
<tr>
<td>12</td>
<td>Riau</td>
<td>25</td>
</tr>
<tr>
<td>13</td>
<td>Bangka Belitung</td>
<td>4</td>
</tr>
<tr>
<td>14</td>
<td>Jambi</td>
<td>12</td>
</tr>
<tr>
<td>15</td>
<td>Lampung</td>
<td>5</td>
</tr>
<tr>
<td>16</td>
<td>Bengkulu</td>
<td>5</td>
</tr>
<tr>
<td>17</td>
<td>West Kalimantan</td>
<td>10</td>
</tr>
</tbody>
</table>
1.2.3. Poor Quality Groundwater Chemistry Investigation of Drilling Wells
The main objective of Poor Quality Groundwater Chemistry Investigation of Drilling Wells is to evaluate groundwater quality in the community bore wells and provide advice on groundwater use.

Poor Quality Groundwater Chemistry Investigation of Drilling Wells which conducted on areas in this year consists 4 areas which distributed in 4 regencies, namely:

1. Poor Quality Groundwater Chemistry Investigation in Gresik Regency
2. Poor Quality Groundwater Chemistry Investigation in Nganjuk Regency
3. Poor Quality Groundwater Chemistry Investigation in Banyumas Regency
4. Poor Quality Groundwater Chemistry Investigation in Lamongan Regency

1.2.4. Groundwater Vulnerability Mapping in the Citarum Watershed (Upper Citarum Watershed)
The main objective of Groundwater Vulnerability Mapping in the Citarum Watershed (Upper Citarum Watershed) is to provide data on hydrogeological conditions including the quality and quantity of groundwater around the Citarum watershed. Groundwater vulnerability mapping was carried out in the upstream watershed section of the Citarum River at West Java.

1.3. Proposed Future Activities
The activities related to groundwater which are now being conducted by CGEG-GA during the year 2019 (after June 30, 2019) can be described as follows:

a. Preparing Ministerial Regulation on Groundwater Management in Indonesia
b. Groundwater Exploration and Development in Area of Water Shortage
c. Investigation of hydrogeological conditions consisting of the quality and quality of groundwater in a new capital city candidate.
d. Socialization for disseminating the result of groundwater activities conducted by the CGER-GA

1.4. Assistance Required from CCOP/Other Member Countries in Support of Future Activities
Technical assistance from CCOP is required, mainly as follows.

1) Groundwater quantity and quality monitoring in urban groundwater basins (network design of groundwater monitoring wells, installation, expertise and budget).

2) Groundwater quantification and modeling in urban development groundwater basins (expertise, training, budget).

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ENERGY PROGRAMME

1.1. Summary

The activities of Energy Program related to oil and gas during the period of June 2018 to June 2019 has been conducted synergistically by LEMIGAS, Directorate General of Oil and Gas - Ministry of Energy and Mineral Resources (MEMR), Special Task Force for Upstream Oil and Gas (SKK Migas) and Geological Agency.

For exploration activities, the cooperation of LEMIGAS-Directorate General of Oil and Gas and Oil Companies conducted studies to search for new blocks, including onshore and offshore areas of West Timor and the deep water offshore areas of North Bali-Lombok Islands and onshore Central Sumatera. To understand the petroleum systems process, geohistory study are also being carried out in the Kangean area, East Java Basin. Tenders for four blocks in 2019 had been conducted by MEMR.

In exploitation activities, the study of Carbon Capture Utilization Storage (CCUS) for Enhance Oil Recovery (EOR) in Sukowati Field. While on the other hand, to assist oil companies in developing strategies for field development, reserve certification and re-certification have been carried out for Trembul, Randu Gunting, Abadi and Arung Nowera.

In 2019, MEMR has issued a new ministerial regulation on data management, where general and raw data can be freely accessed by the public, while processing and interpretation data can be accessed through membership. All oil companies (216 companies) are required to become members with an annual fee will be determined later. While to support the upstream oil and gas business management and to make a center of excellence and a center of knowledge of upstream oil and gas industry, the Special Task Force for Upstream Oil and Gas also established the Indonesia Oil and Gas Institution (IOGI).
1.2. Annual Review of Technical Programs/Activities

- The activities in oil and gas exploration have been performed by the cooperation of LEMIGAS-Directorate General of Oil and Gas and Oil Companies. Joint Studies are conducted to search new blocks in areas of onshore and offshore areas of West Timor, the deep water offshore areas of North Bali-Lombok Islands and onshore Central Sumatera. The scope of the study includes regional geology (tectonic, geological structures and stratigraphy), petroleum systems (petroleum systems and basin modeling elements and processes), play models, identification and mapping of leads and prospects, resource calculations and economic and risk analysis. The geohistory study are also being carried out in the Kangean area, East Java Basin. The study is conducted to understand petroleum processes includes generation, migration and accumulation of hydrocarbon into the traps and to look for upside potential of biogenic gas. In the exploitation side, with Asian Development Bank (ADB) funding, LEMIGAS has conducted the study of Carbon Capture Utilization Storage (CCUS) in Sukowati Field as an effort to increase production by Enhance Oil Recovery (EOR) using CO₂ and reducing pollution effect caused by CO₂ (Figure 13). In the other hand, as a basis for Plan of Development (POD) and Plan of Further Development (POFD), reserve certification and resertification of four fields have been carried out for Trembul, Randu Gunting, Abadi and Arung Nowera (Locations are confidential).

Figure 13. The locations of Joint Study for New Blocks and Geohistory Analysis

To stimulate exploration activity and sustainability of oil and gas resource and reserve in the future, Tenders for four (4) blocks in 2019 had been conducted by Ministry of Energy and Mineral Resources, includes two production blocks (West Kampar and Selat Panjang) and three exploration blocks (Anambas, West Ganal and West Kaimana) (Figure 14).
In 2019, MEMR has issued a new ministerial regulation No. 7/2019 on data management, where open general and raw data can be freely accessed by the public, while processing and interpretation data can be accessed through membership. All oil companies (216 companies) are required to become members with an annual fee will be determined later. All types of confidential data will be open if they have passed 4 years for raw data, 6 years for processed data, 8 years for interpretation data (Figure 15).

To support the upstream oil and gas business management and to make a center of excellence and a center of knowledge of upstream oil and gas industry, the Special Task
Force for Upstream Oil and Gas established the Indonesia Oil and Gas Institution (IOGI). IOGI has a short-term goal, which is to study oil and gas fields that have low recovery factor (RF) and to provide recommendation to the government in increasing production through the application of appropriate drainage technology and plan of field development with the right scenario. The medium goal is to search for new plays both in mature and frontier areas. The interesting fields for the new play studies in the mature areas are East Java, Central Sumatera and Natuna areas, while for the frontier is Papua area. For the long term, IOGI will focus on finding 9 giant fields by using the advance technology and methodology.

- According to the Special Task Force for Upstream Oil and Gas (SKK Migas), status in 2019 indicates that Indonesia has 19 producing basins, 126 proven plays, 832 fields/structures and 113 BBOE (Figure 16). Statistically, there are 6.6 Plays per Basin, 6.6 Fields (Structures) per Play, 43.8 Fields (Structures) per Basin, 135.8 MMBOE per Field (Structure) (Initial Hydrocarbon in Place/IHIP), 896.8 MMBOE per Play (IHIP), and 5947.4 MMBOE per Basin (IHIP)

Figure 16. Distribution and number of producing basin, proven play, fields/structures and discovered volume in place (SKK Migas, 2019)

1.3. Proposed Future Activities

- Cooperation in biogenic gas exploration study which resources in Indonesia is significant but only a few have been discovered and produced. More than 20% of hydrocarbon reserves in Indonesia is biogenic gas, however the reserves already discovered are only 4.7% (Figure 17).
The consortium research in the development of gas hydrate production technology which the resources is huge in Indonesia (Figure 18). Among the unconventional hydrocarbon resources in the world, gas hydrates bring promise for the greatest amount of hydrocarbon resources (53.26%).

Figure 17. Distribution of biogenic gas plays in Indonesia (KEN, 2015)

Figure 18. Distribution of gas hydrate in Indonesia (Panuju, 2017)
• Sharing best practices and lessons learnt in developing unconventional hydrocarbon resources, especially shale gas/oil reservoir. The problem in developing shale gas/oil in Indonesia is the methodology and technology for hydraulic fracturing, where shale in Indonesia has different characteristics from the proven regions, and the geomechanics of sedimentary rocks are also not well understood.

1.4. Assistance Required from CCOP/Other Member Countries in Support of Future Activities

Hypothetically, the potential of biogenic gas resources (shallow gas) is quite significant in Indonesia, however, a study of petroleum systems and identification of their potential areas has not been carried out comprehensively. Lately, Indonesia has limited budget to conduct research in the oil and gas sector. For member countries those have a budget and are interested in investing in biogenic gas exploration and production, LEMIGAS is ready to collaborate on the studies.

1.5. Assistance Offered to CCOP/Other Member Countries in Support of Future Activities

R&D Agency of Ministry of Energy and Mineral Resources (MEMR) Represented by PPPTMGB "LEMIGAS" has conducted internal communication on CCOP's request to be host UnCon-15 Meeting that will be held in Bali. The R&D Agency has provided its approval and will prepare for it.

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MINERALS PROGRAMME

1.1. Summary

Indonesia is one of the world's largest exporters of mining product raw materials such as copper, tin, aluminium, nickel, and cobalt. The Law No. 04/2009 regarding Mineral and Coal Mining contain two main issues i.e. the mining permit and the added value of mining products. The mining permits will offer by the government by bidding, which is the factor affecting the value of resources and reserves of some mineral commodities due to the slow-down of exploration activities (Figure 19). To increase the added value, the export of mineral is ban to promote domestic processing and refining. This situation causes a decrease in mining commodities production (Figure 20).

The government has planned to revise Law No. 4 2009 due to some provisions of this law can’t be implemented. The revision also to adjust with some aspects of Law No. 23/2014 regarding Local Government, the Constitutional Court Decision, and the government policy to simplify licensing and public services, including the mining permit of mineral sub-sector.

Figure 19. Resources and reserves charts of some mineral commodities of Indonesia 2014 to 2018
1.2. Annual Review of Individual Technical Activities

During 2018 – June 2019 period, Geological Agency conducted mineral exploration at several areas (Figure 21).

In the second semester of 2018, mineral exploration conducted at West Sulawesi, Riau and West Sulawesi Province. In the first semester of 2018, mineral exploration has been done at North Maluku, West Kalimantan, Southeast Sulawesi, Lampung, South Sulawesi and Central Java Province.
On the basis of MoU 2010 signed by Head of Geological Agency of Indonesia and Head of China Geological Survey, Center for Mineral, Coal and Geothermal and Wuhan Center followed up with Technical Agreement of *Cooperative Project on Geochemical Mapping and Mineral Resources Assessment* 2011-2014 and the result is a geochemical map and new mineral prospect area of 16 locations within an area of 18,000 km². As a continuation, the Technical Agreement was signed for 2016-2019 on September 8, 2016, in Nanning with semi-detailed geochemical mapping work of Sumatra 1: 1,000,000 (Figure 22, 23).

This geochemical mapping is the mission of the UNESCO International Center on Global-Scale Geochemistry (ICGG) in preparing Global-Scale Geochemical Mapping. ICGG stands in Paris France in 2013 operating under the support of the Chinese Government. CGS Wuhan Center is appointed to carry out activities. The mapping area will cover 16 countries: Brunei, Cambodia, China, Indonesia, Japan, South Korea, Laos, Malaysia, Mongolia, Myanmar, Papua New Guinea, Philippines, Singapore, Thailand, Timor Leste, Vietnam

![Figure 22. Location Map of Joint Study Geochemical Survey CGS- CMCGR](image-url)
To provide data as a reference for national policy and to inform to the public regarding the mineral resources, we have compiled the resources and reserves data and published as Indonesian minerals yearbooks. And we plan to publish it yearly.

On the basis of MoU 2016 signed by Energy and minerals resources Minister, Industrial Minister, and 4 other government institution, followed up with Minister decree of Cooperative Project on the Developing of rare earth elemen base Industry 2018-2021 and the result is rare element mineral prospect area of 9 locations within 62 point resources data. (Figure 25). To provide data as a reference for national policy and to inform to the public regarding the rare earth elements potency of Indonesia, we have also compiled rare earth elements potency including the resources and reserves data of Indonesia and published as The Book of Rare Earth Elements Potency of Indonesia (Figure 26).
We have also developed “GeoRIMA”, (Geological Resources of Indonesia Mobile Application), android base Mobile Application to inform to the public regarding the mineral resources (Figure 27).
1.3. Assistance Required from CCOP/Other Member Countries in Support of Future Activities

Capacity building program in exploration methodology aspects and also training program for integrated geophysical and geochemical data interpretation purposes especially for REE are needed in order to achieve expected exploration targets and to get more new prospect discoveries.

The exchange of various exploration experiences through establishment of special forum dealing with relevant and actual issues between CCOP member countries would be helpful to cope with exploration problems encountered in any exploration project plan.

1.4. Others Comments

Direct responses on reviews mentioned above for improvement of project outcomes and for perfecting any exploration plans would be kindly required from technical director of CCOP.

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**COASTAL PROGRAMME**

1.1 Summary

The Marine Geology Institute of Indonesia (MGI) or Research and Development Centre of Marine Geology (part of Agency of Research and Development for Energy and Mineral Resources) transform into Public Service Agency (Badan Layanan Umum in Bahasa) since 2018. This status make MGI can make direct employment contracts with 3rd parties to find budget in doing research.

1.2. Annual Review of Individual Technical Activities

Marine Geological Institute (MGI) of Indonesia has conducted mineral investigation in the offshore of Bangka Belitung dan Riau Islands Province. The investigation was held in Gaspar Strait, Belitung regency (Figure 28). It is aimed at collecting marine geological data and information by recording variations of the sedimentary layer / rock bottom of the sea and its mineral content types to verify the interpretation of seismic data. Some drilling activities has been carried out in 22.4 – 67.6 meters depth.
Another marine geological and geophysical survey in Riau island offshore (Picture 2) was done to determine the potential of tin placer, including distribution, thickness and quality. The aim is to inventory mineral resources for environmentally development.

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