

PARADIGM SHIFT TO OPTIMIZE PETROLEUM PRODUCTION FROM INDONESIA'S WATERS

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Introduction

Oil and gas (petroleum) are depleted and non-renewable assets and the distribution and reserves are limited. In view of their unique characteristics, each country which has petroleum resources would try to gain the benefit from the petroleum exploitation by among others relating the concept of State sovereignty over natural wealth with the economic activities. Such State sovereignty provides authority to the State to freely and independently organize the management and the use of the natural wealth.

Also, exploration activities to discover resources and its exploitation is capital and technology intensive and has high risk or full with uncertainty. This explained as to why the petroleum exploration and exploitation since the beginning of twentieth century have been dominated by the international petroleum companies.

In Indonesia, the oil and gas exploration, exploitation and refining activities have a long history and up and down trends. In addition to onshore, this natural resources are also found in sea, offshore and deep sea. Increases in exploration activities in the beginning of New Order Government has resulted in discoveries of new oil reserves and increased the oil production from about 600 thousands barrel per day in 1967 to 1,7 million barrels in 1977. In 1977 Indonesia also exported for the first time the liquified natural gas (*LNG*). Furthermore, since 1966 Indonesia has built new refineries and increased the refining daily capacity to 1.156 million barrels. This made oil and gas have become the main source for development funding. Such progress has been attributable to the conducive business climate created by the Government in cooperation with multinational companies, assisted by technology. These increasing trends, however, did not last long; oil production has been declining since the end of 1970, which later convert Indonesia to become net oil importer. Such a situation contributed to various notions, from those based on nationalism to more pragmatic approaches.

Given such background, this paper discusses two issues related to the oil and gas development in Indonesia, namely:

- 1) How is the Indonesia's oil and gas potential, including those in Indonesia waters, in relation to efforts for increasing its utilization to support the government's revenue and meeting the domestic needs?
- 2) How should the business environment be created to attract capital investment for oil and gas exploration and exploitation which have high risk?

In line with the theme of the Seminar (Ocean Resources Development) the discussion will focus on the oil and gas potential in Indonesia's deep waters.

Upstream Activities

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Figure 1 is statistical data on upstream petroleum activities. The data shows that reaching its peak in 1977, oil and gas upstream activities in Indonesia has a declining trend, which was triggered by changing the sharing formula to 85/15. Oil and gas activities began to increase when the Government provided incentives and revised the Production Sharing Contract's terms, which treated that part of the 85% of Pertamina and Government's share of oil as payment of the Contractor's taxes. The other contributing factors also included that newly discovered reserves tended to be lower than those discovered in 1970 and 1980's.

Also, the exploration since 1990 has been focused in producing areas which have a smaller risk. Also, the commercial success rate tended to decrease both in terms of the number of discoveries and size of reserves. In the not producing areas, commercial success rate (oil and gas) in the past 20 years was only 10%, as compared to 14.3% for the period 1981 – 1991. In the producing areas, the discovery rate was higher, but it tended to discover gas and overall it was still also below the previous years. A large part of discoveries in the 1990's contained reserves below 25 millions barrel.

Statistical data on gas discoveries might not reflect the actual conditions. Firstly, many wells were drilled for oil and would be classified as a discovery after finding gas. The increase in gas demand began in the end of 1980, for electricity generation that together with improved gas price for domestic created new interest to search for natural gas. Gas production continued to increase along with the increase in gas discoveries, although the first two developed gas fields (Arun dan Badak) began to decline.

In the investment, during the period 1996 and 2008 the oil companies' spending capital for exploration and production activities in real terms tended to stay. Comparing to investment world wide, the investment in Indonesia for exploration activities has a decline trend, i.e. Indonesia's share declined from about 5.5% in 1997 to become only 2.6% in 2003 of the total world-wide's investment. One of the constraints for the investment growth was attributable to the legal system that failed to create certainty and to balancing various conflicting interests to maintain stability and fairness.

Such a situation caused the continuing oil production decline. For example, between 1998 – 2001, oil production decline averaged 3.9 percent per year; the decline continued to become 5.7 percent for the subsequent years (2001 – 2004). The alarming cause may be seen from the facts that presently 80% of Indonesia's oil production came from fields that were discovered before 1975 or one-third of Indonesia's oil production come from oil fields that having reserves less than 50 million barrels, but they constitute 85 percent of the oil fields that are now still producing. Such reserves have relatively short producing life. The other concern is that 30% of the present production came from two giant fields that were discovered before Indonesia's independence (Duri and Minas).

Also, the gas production tends to be stagnant and declining, resulted that Indonesia is no longer the largest exporter of LNG anymore. The revenue contribution to the State Budget has also declined to 25 percent. Figure 1 (mid top) shows the estimated initial oil-in place in oil fields that have been discovered in Indonesia. One of the constraints in Indonesia was the relatively small initial oil place, as compared to those in the Middle East and Africa. Such constraint was reflected in oil production graph, which showed its high sensitivity to exploration activities (Figure 1 left top). Furthermore, the production follows the Peak Oil Theory that was introduced by King Hubbert (Figure 1 right top), stating that oil production from a number of fields in a certain area will increase and later decreases following the "bell shaped curve". For Indonesia, the oil production reached the top in the end of 1970. It is noted that the large part of Indonesia's oil production statistics

derives from the Western Indonesia, the area in which the exploration to date has been focused and has produced 75% of Indonesia oil production (23 billion barrels).

For comparison, Figure 1 right bottom shows oil production from various countries. The data shows that of the six countries, three countries show a decline in oil production (Indonesia, Venezuela and Nigeria), two countries (China and Brazil) show an increasing trend of oil production and one country (Malaysia) shows no change. The oil increase in China and Brazil was associated with the efforts by the Government in those two countries to maintain political stability and improve investment climate. Both China and Brazil and Malaysia also have utilized their State Owned Enterprise (SOE) to actively conduct exploration abroad, including in the deep sea.

Like Venezuela, the Indonesia's oil production decline was attributable to the decline in the investors' interests in upstream oil activities that according to the results of the PriceWaterhouseCoopers (2002 and 2005) was not attributable to the decline in the investors' perception on the Indonesia's resource potential, the decline in oil prices or political instability, but mainly was associated with the uncertainty in the contract execution. Factors affecting the investment in Indonesia is related to the new regulations that are imposed to the existing contracts, uncertainties in the tax and import duties regulations and delays in the restitution of VAT payment and other tax disputes, and the roles of local and central governments since the promulgation of Law on Regional Autonomy that the oil and gas contractors have to face with the new laws issued by the regional governments that are different or contradict with the agreements in the PSC.

Furthermore, in 2006 a new Law Number 17 of 2006 on Custom was promulgated, which did not extend the facilities for import duty and tax for oil and gas activities. Such new import duty (15%) and import tax (2,5%) changed the prevailing contractual terms. In response to the contractors' complain and in order to boost oil and gas production and also geothermal, in 2007 the Government decided to make tariff harmonization, in the form of setting up zero tariff for materials used in oil and gas and geothermal and releasing the Contractor for VAT and Import Tax payments. The zero tariff for VAT and import tax are to be effective as of 1 Januari 2008 by the Ministry of Finance's regulations.

The other issue was associated with the conflicting rights for land for mining (including oil and gas) in one hand and rights of forestry, community and others. Such conflicting issue might have to force an Oil Production Sharing Contractor to cease its operation in a certain area, as such area later was converted to become protected forest while the Contractor had spent considerable amount of expenditures for exploration or Contractor was forced to move the drilling location because part of its working area was located in the protected forest, or the changing land status was only known after the contract is signed.

Issues related to regional autonomy arose because there were differences in the substance of authority between the regional autonomy law and sector laws, besides there were no laws that can be used as reference to maintain the law system. Its implication is that the Regional Law often contradicts with the law issued by the Central Government, thereby affects the legal system in terms of legal substance and culture that would influence the business conduct and national economy.

Moreover, in addition to the external factor the problems in the execution of Production Sharing Contract have arisen due to the difference in contract's interpretation or there have been no consistencies in the interpretation of some contractual terms. Issues arisen from the difference in interpreting some terms in the PSC have not completely been

resolved, thereby there are potential constrains that inhibit the upstream oil and gas activities. For instance, the requirement to obtain commercial status for new discovery is not defined in the contract that may cause disagreement and resulting delays in the project execution. Also, in response to a Contractor's Plan of Development/POD, BPMIGAS has focused on the Government's revenue or what would the POD provide for the State, rather than overall development program based on the prudent reservoir management for maximizing the recoverable reserves or maintaining sustainability of the resources.

The recent controversy is associated with the repayment of costs that were claimed by the Contractor (cost recovery claim). The controversy was developed as the oil production continues to decline, the increase in prices of oil based fueled and the increase in the cost recovery claimed by the Contractor associated with increase in the operational costs both in terms of amount and types of expenditures. A number of notions were expressed, from plans to issue the Ministry Regulation/Government Regulation on cost recovery, changing in contract terms and declaring the marking up of cost as a criminal act as such appeared in the Law Nr. 25 of 2007 on Investment (26 April 2007).

In order to increase oil and gas production to satisfactory level, the exploration activities in Indonesia should be increased, particularly in the areas where no production has been established. Such areas are located in East Indonesia, in remote and difficult areas and deep sea, so new technologies are required to cope with difficult areas and deep sea. Subsequently, the development would require large fund and long time.

Furthermore, oil and gas discoveries in Indonesia in general have been associated with sediments in Tertiary Basins or basement of Tertiary volcanoes. Figure 2 shows the tertiary basin map in Indonesia that are located onshore and sea. Of the 60 basins, 38 basins have been drilled, 24 of which discovered oil and/or gas and 14 basins have not discovered oil/gas. Of the 24 basins containing oil/gas, 16 basins have been placed on production, while the remaining 8 basins would require exploration drilling for further evaluation. Exploration drilling is also required in the 14 basins that oil and gas have not been discovered. Moreover, of the 60 basins 31 are located in deep seas in Macassar Strait, South China Sea and Indian Ocean along the cost of Sumatra, Jawa, Bali and Nusa Tenggara and Arafura Sea which has a border with Australia, and Sulawesi Sea which has a border with Malaysia and Philippines.

It is noted that only a part of the basins contain oil and gas, nonetheless as the number of basins are quite significant, given advances in the exploration technology some new reserves would undoubtedly be discovered to replenish those that have been produced. Furthermore, during the past ten years exploration play concept has been developed which is aimed at deeper target, unconventional and reservoirs older than Tertiary (Pre-Tertiary). The new exploration concept has been successful in finding oil and gas reserves in the North Macassar basins, including Merah Besar, West Seno, Gendalo, Gandang, Gula, Gada, Ranggung, dan Gehem. Also, the discovery of oil in deeper zone in the Aster Field in Ambalat Block (Laut Sulawesi) has encouraged new exploration activities in Tarakan Island and the surrounding, one of the oldest oil and gas areas in Indonesia.

Also, given Indonesia's location at the melting point of tectonic plates of Australia, Pacific and South East Asia, the discovery of Tangguh Gas Field that is located in deep Bintuni basin and Abadi Field in Masela Block (Arafura Sea) provide hopes to discover oil and gas in a large quantity in the deep Pre-Tertiary, associated with the edge of Australia tectonic plates. The Abadi Field which is planned to use the Floating LNG Plant

is scheduled for production in 2015 with a production capacity of 500 – 800 million cubic feet gas per day (equivalent to 80 – 130 ribu barrel/day).

Note that the oil and gas production increases world wide cannot be separated from the new technology invention such as remote sensing, 3-D seismic and 4-D visualisation (including time) and various exploration technologies. Through advanced technology, the explorationist may aim the target to highly quality prospects so the success ratio may reach 50 percent. The use of advanced technology has been successful to reduce the number of wells to be drilled in certain area, while in some cases the production capacity of each well may be increased.

For example, the discovery of 3-D seismic technology in the beginning of 1970's has been successful in reactivating oil and gas explorations in the Gulf of Mexico; also the costs of discovering new reserves has declined from \$12 - \$16 in 1970 and 1980 to about \$4 - \$8 per barrel. Technological advances have also supported the increase in oil and gas exploration in North Sea, West Coast of Africa and South America.

The technological advances also include other activities, such as floating drill ships for drilling at deep sea and horizontal drilling technology and coil tubing for use at the sea and onshore and oil production in a thin reservoir. Such advances in drilling and production technology have discovered new resources in the very deep sea. Furthermore, by utilizing the information technologies (IT), Real Time Reservoir Management (RTRM) has been developed to monitor and control oil and gas wells at any time, which would assist in managing the reservoir for maximizing the oil and gas production. Technological advances will continue in the 21st century, which will change in the identification, development and production of oil and gas. The advances also include the technology for environmental preservation, so the oil and gas exploration and production (E&P) will continue to be friendly to environment.

In Indonesia, advanced technology has also been utilized. For instance, a 3-D seismic technology has widely been applied since the end of 1970 in production areas and has provided a better understanding on the geological frameworks related to the hydrocarbon accumulation in an effort to maximize recoverable reserves. In these areas that have been proven to be productive, the exploration efforts were directed to data evaluation for generating the secondary prospects generation. The target is more complex, more subtle and concealed, such as stratigraphic traps and faults and unconformities. Presently, exploration activities in Indonesia have utilized the 3-D seismic technology and has made the exploration risk is more measurable. Indonesia is also a pioneer for 4-D seismic technology development, which started in 1992 to monitor the movement of steam in the steamflood project in Duri Field. The target is to increase the recoverable oil and energy conservation.

The growth in oil production may also be expected from the secondary or Enhanced Oil Recovery (EOR). As of 1995, the EOR projects recorded in Indonesia amounted to more than 40, the majority are still active and some have been discontinued as they been failed or matured. In addition to Minas and Duri, the successful projects included gas and water injection in offshore fields (Arjuna, Rama, Krisna), water injection in fields operated by PT Chevron Pacific Indonesia in Riau and in Jene and Ramba Fields in South Sumatera and Handil in East Kalimantan. One of the spectacular EOR Projects is steam flooding in Duri Field.

Application of EOR technology requires innovation and field pilot test that may require long-time to complete. For example, the steam injection project in Duri, the

laboratory test and field pilot test started in 1967, yet only 13 years later it was declared complete; however it is still required 10 additional years to complete the formality, contractual requirements and construction of facilities before the project was officially declared by the President Suharto in the beginning of 1990. The project has been successful to increase oil production from 30 thousands barrel to 300 thousands barrel per day, while the oil recovery also increased from 600 million barrel to 3.0 billion barrel. Presently, Duri Field is producing 170 thousand barrel a day or about 20% of the total Indonesia's oil production.

Like exploration, the EOR process in Indonesia faces technical and contractual constraints. The technical constraints relate to the properties and characteristics of the reservoirs that tend to give high primary recovery factor if it manages well. Such good properties and characteristics include high porosity and permeability, strong water influx and relatively small oil-in-place so it fails to meet economic scale. The contractual constrain deals with the investment credit claim and the applicability of full oil market price for the incremental oil delivered to meet the Domestic Market Obligation (DMO). The same issue has also been experienced in newly discovered fields that are entitled for incentive. Specifically, it dealt with the issue as to what is meant by new field or what would be the criteria to be used in determining the field that is entitled for incentive.

From the preceding discussions, it can be concluded that by utilizing the technological advances, the prospect for discovering new oil and gas reserves in Indonesia are still great. A successful effort to discover oil and gas reserves in a highly risk activities requires business climate that are conducive to attract investment. Good oil and gas management means managing the resources that are capable to provide optimum results to the owner of natural resources (State), but also provides protection and legal certainty to the investor. Such legal certainty is an absolute necessity, in view of that the obvious characteristics of oil and gas upstream activities are that exploration and development of natural resources require a long time, so it would require considerable time to have the benefit from the development. The investment will grow if the legal system can provide predictability, stability and fairness. This means, that the law shall generate certainty, accommodate or balancing the conflicted interest to maintain the stability and fairness.

The urgency of all above will be more emphasized as we move to find oil and gas resources in Indonesia's waters, in which the resources are located far from land and/or in the deep sea. Activities in those areas have higher risk and require larger amount of fund and specialized technology and supported by dependable manpower. Given minimum data, the prospect of finding new oil and gas reserves in the frontier areas such as deep sea and remote areas could at best be estimated. For comparison, during the 45 years from 1965 to 2010, Indonesia has produced neraly 21 billion barrels oil, 60% or 12 billion barrel came from one province, namely Riau. Forthe same period, Indonesia also produced nearly 30 TCF (Trillion Cubic Feet) gas or equivalen to 5 Billion barrel oil. Seventy percent of gas production or 22 TCF has been exported and consumed domestically, 7 TCF is utilized in the operation for own use (for fuel) and the remaining is burned.

From the preceding data, there are optimism that the increases in oil exploration in Indonesia waters would discover new oil and gas reserves. This would require paradigm shift, among others seeing the facts that investment in a highly risk venture and oil and gas exploration would only occur in an investment climate that is conducive and provides legal certainty.

On the other aspect, the oil and gas exploration and exploitation in sea face disputes related to maritime boundary. For the past 50 years, such dispute has increased considerably as the national boundary has been extended in regards with maritime jurisdiction. Overlapping claims are found at territorial boundary of 12 miles, Exclusive Economic Zone/EEZ boundary of 200 miles and continental shelf of more than 200 miles. Therefore, the determination of boundary becomes important for archipelago states, such as Indonesia. In Indonesia waters, the areas of overlapping claims include South China Sea, Sulawesi Sea and Arafura Sea and Timor Sea.

The dispute on overlapping claim has been experienced by Indonesia with its neighbouring countries, such as with Viet Nam in South China Sea at Natuna Islands (1980) and Australia following the joining of East Timor with Indonesia. The dispute with Viet Nam in the end of 1970 has caused the Production Sharing Contract between Pertamina and Chevron-Texaco to be put in a moratorium, while the border dispute with Australia in the 1980's was settled by an agreement to manage the disputed areas jointly, later known as Timor Gap Treaty which now becomes an agreement between Timor Leste and Australia. The recent dispute is in North East Kalimantan in Sulawesi Sea between Indonesia and Malaysia nearby Tawau, Sabah, known in Indonesia as East Ambalat Block or in Malaysia as ND7 and ND6 Blocks. East Ambalat Block is estimated to contain 420 million barrels of oil and 3.3 TCF of gas.

There are number of ways to settle the dispute, including by means of International Court, agreement on state boundaries, and cooperation agreement for to develop jointly the disputed areas. The agreement on the boundary will provide positive benefit for the two countries; the economic activities may begin with legal certainty. At present, there are more than 20 bilateral agreement for joint development. The form of joint development varies; one of the form is that a country would develop and share the revenue to its neighbouring country. The other form is that the two countries work together in the disputed area. Such a form of joint development has been practiced by Indonesia together with Australia which produced Timor Gap Treaty.

Moreover, the Foreign Investment in oil and gas is 'resource seeking kind', which means that one of the reasons for overseas oil and gas companies to invest outside of its country is because of that oil and gas resources. Therefore, in order to meet domestic demand, the Indonesia Government should encourage its SOE and other national private companies to look for oil and gas abroad which has good potential and lower risk. Such strategy has been practiced by the Chinese Government with its four SOEs operate inside and outside the country, while the exploration in deep sea that has a higher risk be jointly operated with multi-national companies which have technology and fund that are dedicated for highly risk projects (risk capital). Note that the risk capital is movable, seeking the business that are conducive for providing good returns.

In order to develop the capability of oil and gas SOE, the Government should allocate the sufficient fund from the Indonesia's oil and gas revenue, for use in supporting and strengthening the financial capability of SOE, so the SOE can grow as world class company. This would allow the SOE to play significant roles in meeting the domestic needs for oil and gas from resources everywhere. Such strategy has been adopted by a number of countries, among others BRIC (Brazil, Rusia, India, China) and Malaysia.

As of today, the Indonesia's oil and gas revenues that are returned to develop national oil and gas industry has been small, the majority has been used to fund the development outside the oil and gas industry. On the other hand, oil and gas are non renewable and will be depleted for certain time, however oil and gas are required as

energy sources for public activities. The national oil and gas policies should be directed toward the sustainability of resources

The interpretation of ‘shall be used for the greatest welfare of the people’ in the Article 33 of 1945 Constitution should not be limited to the adequate supply of fuel based oil domestically, but it shall include the development of national competency that includes development of manpower resources and support industries. Including in national oil and gas industries are the oil and gas state owned and national private enterprises and national companies which provide goods and services that support oil and gas activities.

For Indonesia, strengthening the competitive position of national petroleum industry would place the country in a better situation to face the impact of globalization and the dooms day when its petroleum reserves are depleted and the country is no longer attractive for petroleum ventures. Such an effort is necessary to achieve fairness and justice for the next generation.

Conclusions and Recommendations

The present discussions may be summarized by the following conclusions and recommendations:

- 1) There are good prospect of discovering new oil and gas reserves, particularly in deep seas and remote areas in Eastern Indonesia (frontier areas). The upstream sector is capital and technology intensive and higher risk, thereby the successful endeavor would require investment climate which is conducive to attract risk capital by means of Oil and Gas Contract which is capable to provide optimum benefit to the Country, but also to provide protection and legal certainty to the investor. The investment will be made when the legal system can generate predictability, stability and fairness. Oil and gas policies shall be formulated with the principle of sustainability that preserves the environment and is capable to anticipate changes in implementing the function of the law as a facility for development.
- 2) Investment climate needs to be improved through the restructuring of legal substance, structure and culture in Oil and Gas Contract. The improved climate shall include efforts to eliminate the excess of bureucracy by increasing the professionalism, which emphasizes on leadership, legal right and obligation, and capable to promote conducive climate for investmen, thereby fund resource'd allocation may be made effectivey and efficiently. The restructuirng would require paradigm shift in determining oil and gas management policies, including amending the law (Law Nr 22/2001) with the implementing regulations, which would accommodate the current reality and provides clear vision for the future. The paradgm shift includes the following:
 - a) The upstream oil and gas activities include the management of oil and gas resources for state revenues, while the downstream sector is to supply for the public a ready-made energy from oil and gas resources. The upstream activity is extractive industry of natural resources, while the downstream sector is service and manufacturing industry for added value. Given their different characteristics, the regulation on downstream activities should be separated from the present Oil and Gas Law.

- b) The Oil and Gas Law that will be amended shall contain only provisions for upstream activities and be made as such to attract the investment in upstream activities.
- c) Oil and Gas Contract shall be made based on the public private partnership or equal partnership in carrying out its rights and obligations, which replaces the relationship between the employer and labor in order to eliminate the bureaucracy of institution that has caused the delay.

FIGURE 1

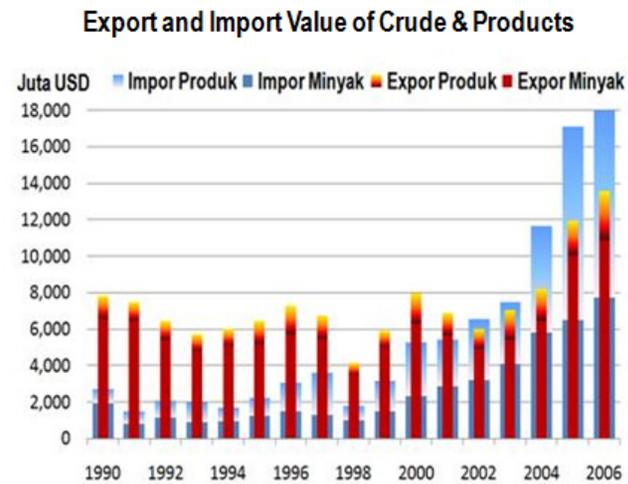
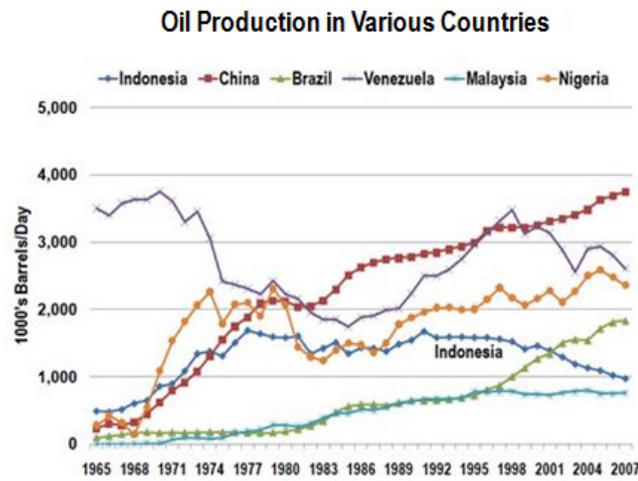
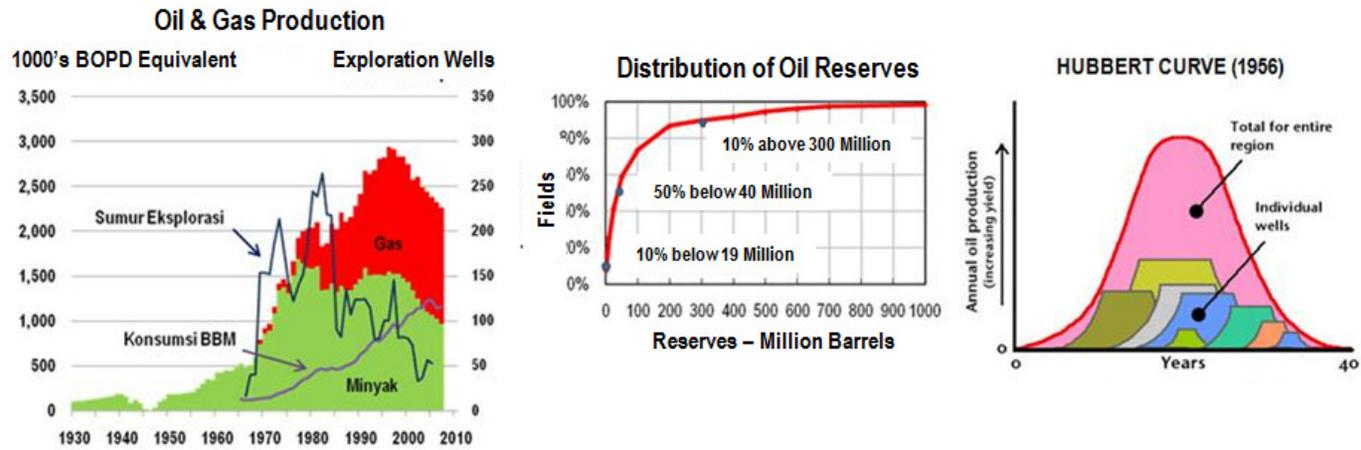
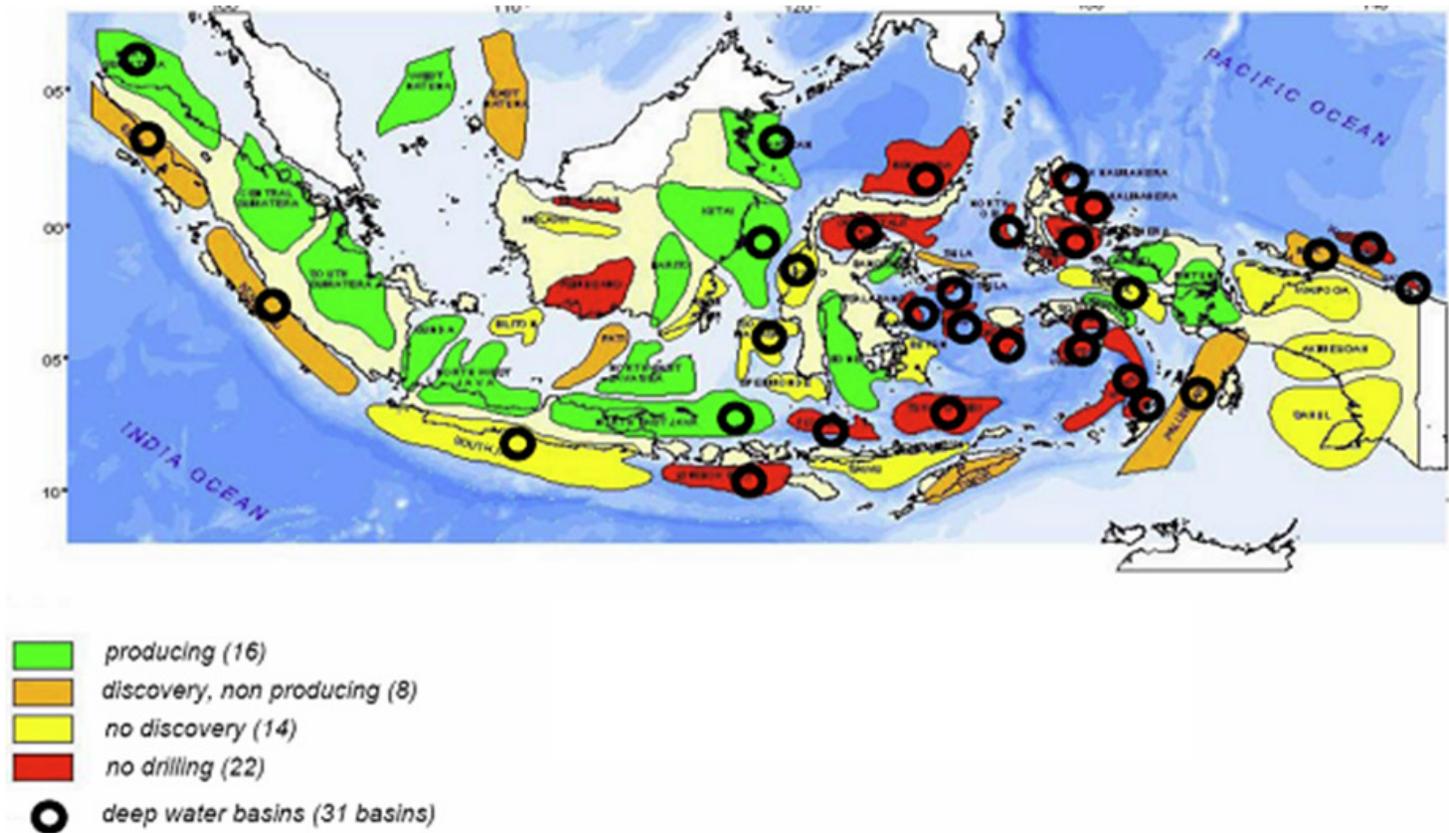


FIGURE 2
Tertiary Basins



Awang H. Satyana – frontier exploration (Dec. 2007)