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Green Growth in Mining – the Trends of Southeast Asia and Lessons For Viet Nam

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Abstract: Against the serious consequences of climate change, a new growth model has been established. The green growth or low carbon growth focuses on the efficient use of natural resources, it also enhances the use of renewable energy and environmentally-friendly technologies. Therefore, the green growth is now a trend with new global rules being shaped. This paper presents the trend of Southeast Asian countries on green growth in mineral mining, one of the economic growth activities which has a negative impact on the environment so that draw lessons for Viet Nam.

1. Setting the scene

In theory, minerals mining contributes to economic growth, job creation and infrastructure improvements. These factors are the driving forces for poverty reduction. However, through a lot of research, scientists have pointed out that: Beside the positive impacts, the mineral mining activities in Southeast Asia countries also have many negative impacts on the socio-economic life, especially the environmental pollution. Up to now there have been no statistic data of all the waste rocks from mines and mines which are being exploited or processed in Southeast Asian countries. Among them there are countries with large scale mining activities such as Indonesia, the Philippines, Myanmar, and Viet Nam. Mining activities destroy the environment because of the accumulation of soil, dust and wastewater in large quantities, causing pollution of air and water. Dust from the ilmenite, rutile and zircon sand extraction which is processed from sand has made many workers in the titanium industry suffer from respiratory diseases, and been under dangers of radioactive. Suspended solids not only contaminate the surface water quality in the mine but also contain heavy metals, mercury and other toxic chemicals which can affect adjacent and downstream rivers. Therefore, the trend of green growth in mining activities of Southeast Asian countries is the goal and the requisites for sustainable development as well.

2. The status of green growth in mineral activities of Southeast Asian countries

The global economic and social fluctuation and natural disasters in recent years have had negative impacts on the economic growth of Southeast Asian countries. Consequently, in order to response to the Green Growth and Green Economy initiative proposed by the United Nations Environment Programme (UNEP) in 2008 and the desire to achieve sustainable development in the long run, the Association of South East Asian Nations (ASEAN) have started to pursue a green growth strategy towards a sustainable growth economy. The essence

of the strategy is the development with low emissions and resource consumption which also ensures sustainability of ecosystems and biodiversity, conserves natural resources and protects the environment, aims to ensure social security, poverty reduction, improve living conditions in all aspects for inhabitants.

Southeast Asia is bordered by three major tectonic plates of Asia-Europe, the Pacific and the Indian Ocean. Geologically, Southeast Asia includes rocks from Precambrian to Quaternary, which develops many different age-related magmatic activities; especially Mesozoic and Cenozoic magma, where there are many subduction zones and volcanic islands. The favorable geological conditions have made Southeast Asian countries become rich and diversified mineral resources. Although each Southeast Asian country has its advantages in some minerals, generally, Indonesia, the Philippines and Myanmar have the greatest potential. [6]

Minerals in Southeast Asia have contributed significantly to the growth of each country's economy, in some countries they are major contributors to the Gross Domestic Product (GDP). However, in recent years, the effects of climate change have partly influenced the growth of mining industry in Southeast Asia. Southeast Asia is considered one of the most serious affected regions from both the global economic crisis and the climate change. Disadvantages of these countries are inadequate economic structure, low actual production value, high input consumption of products that are causing problems for the increase sustainable development. The global economic, social fluctuation and natural disasters in recent years have had negative impacts on the economic growth of Southeast Asian countries. Consequently, the greening of mineral exploitation along with the solutions to adapt climate changes are important policies for mining industry in Southeast Asia in recent years.

2.1. Green growth in the Philippines mineral activities [6][5][7]

The Philippines has a long history of mining and has favorable geological conditions for the creation of a variety of mineral deposits, here is one of the riches minerals in Southeast Asia. Its mineral resources are mainly Cu, Au, Ni, Cr, Fe.

Iron ore mines are closely related to the Tertiary diorite rock, typically the Larap mine. Iron ore reserves are approximately 77 million tons. There are three important copper mineralization zones. The north is associated with the subduction zone to the east of the East Sea of Viet Nam, with the middle Miocene age to late Miocene. The middle zone is associated with the subduction zone of Sulu Sea, with late Paleocene age. The eastern part is associated with the subduction zone of Pacific Ocean, with the Pliocene age. There are 15 Cu and Cu-Au with Porphyry type mines, of which the large mines such as the Atlas Biga mine in Sebu with a reserve of about 5 million tons of Cu. There are four Au-Ag, Au-Cu and Au-Te hydrothermal circuits in Luzon and Mindanao.

Low-temperature gold-silver mineralization is higher than that of porphyrite; gold-silver, telur and copper can coexist as in Baguio. Placer mine in Mindanao contains 54 tons of Au, the remaining mines occupy about 21 to 23 tons of Au. There are 7 mines of laterite weathering on super-mafic rocks, of which Rio Tuba in Palawan has 220 thousand tons of Ni and Nonoc 1 mine in Dinagat has 930 thousand tons of Ni. These mines are large-sized, while the other mines are medium-sized with reserves of about 100 to 200 thousand tons of Ni. The largest source of chromite is from the ophiolite complex in Zabarez province. There are two large-scale chromite mines in Zambarez province, which original came from magma, associated with super-mafic rocks, they are Acoje mine with 640 thousand tons of Cr_2O_3 and Coto/Masinloc mine with about 1,7 million tons of Cr_2O_3.

Currently, the mining industry in the Philippines has shown a trend of green growth, those mine that affect the environment are at risk of being closed. The Philippines is exerting themselves to improve the mining operations in order to limit impacts on the environment

and the local community. President Rodrigo Duterte has expressed a tough stance on the mining industry when claiming that the Philippines will be able to survive without this industry.

Those environmental disasters happened in the past, including the leakage of waste at a copper mine in the central Marinduque province in 1996 has made the rivers contaminated, causing the Philippines mining industry to be strongly opposed.

The Philippines is currently the largest nickel ore supplier in China. By 2016, the Philippines had exported 24 million tons of nickel to China, but the number of nickel ore is exported in the first seven months of 2017 decrease 27%.

On 9th February 2007, the Philippines closed 23 of 41 mines in this country. This was due to their damage to river basins, sedimentation in coastal waters and farmland, suspension of 5 other mines because of environmental concerns, 8 of the closed mines are nickel ore mines – the reason for the sharp rise in nickel prices in the world market. The Philippines Environment Minister – Regina Lopez released the cancellation of 75 mining contracts on 14th February 2007 to promote a campaign to stop the exploitation of resources in sensitive areas. Among the canceled contracts on 14th Feb there was the $5.9 billion Tampakan gold-silver mining project in Nam Cotabato province on Mindanao Island.

2.2. Green growth in Indonesia mineral activity [6]

Indonesia is one of the richest minerals in Southeast Asia. Minerals of Indonesia are mainly Au, Cu, Ni, Sn.

All porphyry in Indonesia are associated with the Miocene-Pilocene volcanic arc. The main mines are Tapada and Sasaki in Sulawesi. There are 6 Cu-Au porphyry mines, of which Batu Hijau mine in Lesser Sunda has about 2.6 million tons of Cu and 233 tons of Au, Grasberg mine has more than 9 million tons Cu and 1262 tons of Au. The Au-Ag, hydrothermal Au-Ag, medium-sized, including the two largest Au-Ag mines: the Kelian mine in Kalimantan with 105 tons of Au and the Gunung Pongkor mine in Java has about 102 tons of Au and 972 tons of Ag. The Au-type thermal mines are Gunung Panti with a capacity of 40 tons of Au and the Awak Masmindo mine in Sulawesi with a capacity of 26 tons Au. Laterite nickel was exploited in Pomalaa and Soroako in eastern Sulawesi. Soroako mine has about 3 million tons of Ni, Pomalaa mine has about 1.9 million tons of Ni and Gagu has 3.9 million tons of Ni. There are about 10 pewter tin and weathering mines with capacity of 750 thousand tons of tin, of which Benlinju and Pemali are large-sized. Apart from these metal minerals, there are also industrial minerals such as limestone, feldspar, clay, sulfur, quartz sand and phosphate.

Among the countries in Southeast Asia, Indonesia is now taking relatively large consequence of environmental pollution. The rising of the sea level and erosion in coastal areas, the increase of the frequency and intensity of severe weather and extreme weather, which causing the extinction of species and the spread of infectious diseases through animals. Facing this situation, the administration of former President Yudhoyono is paying close attention to environmental issues and the significant development of the environmental cooperation between the US and Indonesia, especially the green growth trend in mining activities through the improvement of environmental management in mining activities.

Indonesia's mineral management system is divided into 3 levels (ministerial, provincial, regional – equivalent to district level in Viet Nam). Regardless of the mine's size, the regional level is competent, where the mine is located in the whole region. For mines located between two regions, it is under the jurisdiction of the provincial licensing. The ministerial level licenses those mines located between two provinces to exploit. The ministerial level licenses to exploit and process coal and metal minerals; The provincial level licenses for non-metallic minerals; The regional level licenses for construction stones. This decentralization aims to

clarify the responsibilities, the management and monitoring obligations of each level; especially the interstate mines between two localities.

Green growth in Indonesia is also reflected in restricting the export of raw materials to minerals. The Indonesian government has detailed regulations on deep processing for each mineral group and domestic market regulations, which regulate the rate of domestic sales. The above-mentioned management levels, based on their competence, regulate mineral prices and the price bracket to build reference prices for management. On the other hand, Indonesia finds the resolution of land conflicts between its economic sectors by enaction of the Law on Spatial Planning. Besides, in Indonesia, mining companies are responsible for paying the land use obligations to the central government. Collected taxes on mineral mining are clearly stated in the Mineral Law of 4/2009, especially the division of revenue among the different levels: central levels: 20%; provincial level: 16%; district/regional level: 32%; local people: 32%. The specific taxation of mineral has helped the authorities take the initiative in using these revenues. Lower levels with higher entitlement will help them to have more funds to deal with adverse impacts from mining. [7]

Indonesia is a country with rich mineral resources, which is closely controlled by a unified organizational system from central to local. All mineral resources in this country are explored for reserve and zoning, detailed and specific planning. In management, there is a logical and clear, not overlapping; there is a synchronous assignment and coordination between branches and levels. Legal policies are institutionalized for the distribution of benefits in a public and evident way among the state (central, region and local government), businesses and people. Thus, there was no conflict among the parties that leads to mass appeals. Furthermore, there is EITI civil society organization that oversees the law enforcement of the parties, then make recommendations to correct the mistake when a party does not comply with the law. As a result, Indonesia's mineral management has been highly effective towards green growth.

2.3. Green growth in Myanmar mineral activity [6]

Myanmar is rich in mineral resources, the important minerals are copper, gold, lead, zinc, silver, tin, tungsten, antimony, chromite, nickel, gemstone. In terms of potentiality, Myanmar is classified as one of the richest minerals in Southeast Asia.

More than 50 copper occurrences are distributed along three major tectonic units of Myanmar, including three porphyrite copper mines near Chindwin. Letpadaung Taung mine has about 400 million tons of ore, with 0,5% Cu (2 million tons of Cu). These are reserves of world-class size. The iron ore deposits have reserves of about 100 million tons in Pengpet, southern Myanmar. Bawdwin mine is a multi-metal complex consisting of Pb-Zn-Ag, which is a large-scale thermoluminescent vessel with reserves of 9 million tons of Pb and 5.2 million tons of Zn. There are also 13,950 tons of Ag. This mine is considered as the world's richest silver. The gold mines are located in Play Aung Taung and Thayethkhone, Shwekyin and near Myitkyina, along the Ayeyawady River. In addition, the Kyaukpahto and gold potential nearby areas are being explored by domestic and foreign companies. The nickel deposits are found in China town, which is 30km northwest of Mandalay with estimated reserves of 30 million tons of ore, with an average content of 1.1% Ni, about 0.3 million tons of Ni. Potential reserve is 80 million tons, with 1% Ni, equivalent to 0.8 million tons of Ni. Coal deposits are mostly semi-bituminous coal with a reserve of about 200 million tons in the northern region, with Kalewa minerals being the only significant minerals deposit. There are also coal mines in Tanintharyi. Myanmar's main mining company is interested in exploring and exploiting this mineral. Rubi is mined in Mogok, northeastern Mandalay, sapphire and various colored gems including spine, grenadine, peridot, tourmaline, aquamarine, amethyst, citrine, zircon, and lunar rock, etc. which are exploited from Mogok. It can be said that the mining sector

plays an important role in the economy of Myanmar. However, environmental pollution and the consequences from the mining activities have no significant impact on the national economic growth in Myanmar. Aimed at green growth, the Environment Law of Myanmar was promulgated on March 30th, 2012. In the Environment Law, there are some special Provisions that are necessary for foreign investors, including environmental quality standards, the list of projects or activities that require preliminary environmental assessment or full implementation, the list of hazardous wastes in the production process, chemicals and other hazardous substances from industries and agriculture, especially the exploitation of minerals containing noxious substances that may affect strongly the environment at the present or in the long run. Additionally, to control excessive exploitation of jade and gems, the government of Myanmar has tightened the mineral extraction permit. Companies must meet the new environmental regulations to receive this permit.

3. Lessons for Viet Nam

With awareness that green growth is not only a motivation and global economic recovery but also a model and tool for sustainable development, Viet Nam has determined clearly that there is no other way than to promote green growth. Viet Nam has also showed determination to pursue an environmentally friendly development growth model. In 2012, the Vietnamese Government has issued the National Strategy for Green growth and has enacted the Green Growth Strategy Agenda 2014-2020 with 66 actions in 2014. [1]

Viet Nam's green growth strategy sets out three important tasks: 1) Reducing the intensity of greenhouse gas emissions and increasing the use of clean energy and renewable energy. 2) Greening production. 3) Greening the lifestyle and promoting sustainable consumption. In particular, the specific indexes are: Reducing greenhouse gas emissions in energy activities by 10-20% for the period 2011-2020 and 35-45% for the period 2020-2030. On the goal of greening production, the indicators will be approached are: The value of high-tech products in GDP is about 42-45% (2010-2020) and 80% (2020-2030); 100% of newly-established production and business establishments must apply the clean technologies or equipment in order to reduce pollution and waste treatment.

Viet Nam is rich in mineral resources with more than 60 kinds of minerals in more than 500 mines. Mineral mining (including oil and gas) contributes about 10-11% of GDP and contributes 28% to state budget revenues. [2] [3] However, the exploitation of mineral resources in Viet Nam in recent years is still inadequate and unreasonable, due to loss and waste of resources, polluted water in areas with mineral activities, low quality of environmental regarding ambient air and emissions, over limited dust especially in coal and quarries mines, etc. At a result, the mining industry of Viet Nam must also be driven by green growth. From the exploration of green growth in mineral mining in the world and from the reality of mineral exploitation in Viet Nam, there are the lesson learned, as follows:

First, green growth in mineral mining must be linked to the chain: from raw and deep processing to mining and support services. Avoiding the mining of raw minerals and export them. This will reduce the speed of resource extraction, avoid waste of resources and improve the quality of the environment. Also, it is necessary to add more processing conditions and commitments before the mineral extraction permit is issued. In fact, the investment capital for mining is not large, but the processing requires large capital, modern technology, thus, leading to widespread exploitation then cannot achieve the purpose of deep processing.

Secondly, reformation and adaption of green marketing tools (green taxation, green budget) is significant. The tax preference regime should be applied to the mineral exploitation enterprises to support environmental protection activities. In order to avoid the loss of resources and revenues for the state budget, the natural resource tax needs to be shifted from calculated mining output to the approved mineral reserve, depending on types of minerals.

The tax exemption and reduction of the extraction reserve will be decided depending on each case, so that enterprises can enhance the mining and mineral savings. On the other hand, higher tax rates should be applied to raw materials, lower tax rates for refined or processed resources.

Thirdly, the price of mineral products should be implemented in accordance with the market mechanism to achieve these objectives: Forcing business to strictly manage costs, output and product quality to improve efficiency; Overcoming the negative effects of differences in domestic and export prices, especially smuggling; Encouraging the process of mineral exploitation and processing to raise the coefficient of resource recovery; and Forcing consumption of mineral products must be used economically.

Finally, it is necessary to set up specific institutions to implement green growth in mineral exploitation activities, particularly, the public and evident distribution of benefits between the state (central, region and local authorities), enterprises and people.

4. Conclusions and recommendations

The goal is green growth in mining activities, which is based on the process of changing the growth model, restructuring the exploitation through the application of advanced technology, the development of infrastructure system for effective use of mineral resources, reducing greenhouse gas emissions, coping with climate changes, contributing to poverty reduction and driving the economic growth in a sustainable way.

Green growth in general and green growth in mining activities in particular have many opportunities, but also many challenges. This is a long-term process; therefore, all levels, sectors and enterprises need to be fully aware of challenges. Consequently, it will change the method of mining minerals; and consumption of minerals in the direction of efficiency to achieve the goals of the national green growth strategy.

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