TOWARD A SUSTAINABLE AGGREGATE MINERALS SUPPLY IN INDONESIA

(Lesson learned from the Netherlands)

THESIS

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ABSTRACT

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The sustainability of aggregate minerals supply always becomes the question for recent and future development. Aggregate minerals are the most important construction materials in which their role can not be changed for long years for infrastructure development. Indonesia has huge potencies of aggregate minerals, but it does not guarantee the supply for construction materials. In other hand, the Netherlands with limited aggregate minerals resources tries hard to ensure the sustainability of aggregate minerals supply. This research explores the sustainability concept of aggregate minerals supply and intends to recognize its implementation both in the Netherlands and Indonesia. Moreover, the research attempts to find out what positive lessons can be learned from the Dutch experiences to Indonesia for a better aggregate mineral resources management. This research is conducted by using literature followed with comparison analysis between two countries that focus mainly on mineral planning policy, task and government authority. Three main criteria are being used to assess the implementation of the sustainability aggregate minerals supply, those are, basic sustainable development principles, environmental sustainable development principles and socio-political sustainable development principles. The result of this research concludes that the Netherlands is more advance in implementing the sustainability concept of aggregate minerals supply than Indonesia. Furthermore, this research identify some lesson learned from the Dutch country that can be adopted in Indonesia, namely, public involvement in managing aggregate mineral resources, promoting the sustainable use of aggregate minerals and combining aggregate mineral extraction with other function.

Keywords: *sustainability, aggregate minerals, mineral planning policy, the Netherlands, Indonesia*

PREFACE

Aggregate minerals have an important role in supporting infrastructure development. They are used in large scale and their function as construction material can not be changed for long years. Indonesia has enormous potencies of aggregate minerals, but the rapid of aggregate minerals resources depletion, environmental degradation, conflict of interest with other sectors, safety job of mining workers and community resistance will threaten the sustainability of aggregate minerals supply.

This thesis is concerning the implementation of a sustainability concept on aggregate minerals supply. Learned from the Dutch government that has been tried more than three decades how to ensure the aggregate minerals supply because of the limited of its resources, to minimize the community resistance and environmental issues, and to enhance spatial quality of aggregate minerals extraction areas. Hopefully this thesis would be useful and give a new perspective on how to manage aggregate minerals resources and can be implemented in Indonesia

After completing my thesis, first of all, I would like to thank to Allah SWT for giving me an opportunity to study in the Netherlands and blessing me to finish my thesis right on time. Secondly, I would like to thank to my supervisors Dr. Ir. Paul Ike (RUG) and Arief Rosyidie, M.Arch; PhD (ITB) for giving comments, criticisms, suggestions, and feedback during my research. Thirdly, I would also like to thank to the National Planning Board (Bappenas), the Netherlands Education Support Office (NESO) and the StuNed for institutional and financial support. Furthermore, respectively I would like to thank to all my lecturers and staff members of RUG, SAPPK ITB, and UPT Bahasa ITB, to all my colleagues and all Indonesian students in Groningen. Finally, my special thanks is dedicated to my lovely wife Mumun Munawwaroh who always support and stand by me in hard time, and my lovely children Luthfi and Hani for your patience and spirit during my study in Bandung and Groningen.

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INTRODUCTION

1.1 Background

In line with the growth of infrastructure development for housing, commercial, industrial and road, the demand of construction materials is increasing every year. One of the most important materials to fulfill the need of construction materials is aggregate minerals. Aggregate minerals, such as sand, rock, and gravel are used in large scale and the role of their function as construction material can not be changed for long years. According to de Lespinay (1998), the average production of aggregate from all around Europe is approximately 2 billion tons per year, and based on the Euroconstruct Conferences in Europe, the need of aggregate is predicted growing annually more than 2 % (Schulz, 1999).

The sources of aggregate minerals mainly come from natural resources extraction. In Europe, based on geological information, the reserve of primary raw material deposits are abundant and they are enough to supply the need of construction materials for 600 years, but they spread unevenly throughout the European countries (Schulz, 1999). However, the huge potencies of aggregate minerals do not guarantee the supply of construction materials. Scarcity of aggregate minerals supply and the issues of achieving sustainability in extraction of mineral always become the question for recent and future development in almost all countries.

To ensure the sustainability supply of aggregate minerals for construction development with considering societal and environmental aspects, most of European countries internalized a sustainability concept into their mineral planning policy. The Netherlands, the densely populated country in Europe need a lot of construction materials to support its development. The limited resources of aggregate minerals resources as construction materials especially coarse sand and gravel enforce the government of the Netherlands to create policies to ensure the availability of aggregate minerals.

More than three decades the Dutch country has been trying to reach the sustainability on aggregate minerals supply. To achieve these national objectives, the Dutch government formulate national mineral policy with several aims, such as:(1) to promote the economical use of natural construction materials; (2) to recycle as much as possible; (3) promotion of greater use of renewable materials (wood); (4) to ensure a sufficient supply of construction materials for building purposes; and (5) to achieve a more systematic and coordinated approach regarding the excavation policy (Van der Plas, 1998).

In contrary, Indonesia as a country with the enormous potencies of aggregate minerals in almost all of regions face different problem. The rapid resources depletion, environmental degradation, conflict interest with other sectors, safety job of mining workers, and community resistance are the main issues regard to aggregate minerals extraction in Indonesia. These conditions will threaten the sustainability of aggregate mineral supply in the future.

Although the sustainability concept is broadly accepted in many countries to manage natural resources, in fact the sustainability concept is still a confused and a fuzzy concept (Redclift, 1997; de Roo and Porter, 2004). The sustainability concept is a utopian concept. This concept is a holistic and complex concept considering socio-economy and environmental aspects and interaction among them. There are many considerations regarding the implementation of this concept. It is difficult to be implemented due to operational questions.

Therefore, this study chooses the implementation of the sustainability concept for aggregate minerals supply (comparison study between the Netherlands and Indonesia) as a basis of this research. In addition, the study of the significance of a sustainability concept in managing aggregate minerals resources is still rare in an Indonesian context. The study of this issue is important to know deeply the concept of sustainability in ensuring aggregate minerals supply and how to implement this concept. This research will study the theoretical requirement of a sustainability concept in mineral planning and the implementation of sustainability aggregate minerals supply policy in the Netherlands and Indonesian context.

To make clear the direction and format of this thesis, the next chapter will describe the research objectives, research questions, scope of study, methodology, and the report structure of the thesis.

1.2 Research Objectives

This study is conducted to explore and to find appropriate solutions to manage natural resources especially aggregate minerals in ensuring the supply of aggregate minerals for present and future needs. The sustainability concept concerning not only economical aspect but also social and ecological aspects that internalized into planning policy is the main issue to manage the resources. Because of there is no fixed theory in implementing the sustainability concept, this study tries to explore the theoretical requirement of sustainability and learns the empirical practices of planning policy in managing aggregate minerals supply both in the Netherlands and Indonesia. Moreover, this study tries to find the possibility transfer of the implementation of sustainability concept that can be adopted in Indonesia. Based on the explanation above, the objectives of this research are:

1. To acquire theoretical knowledge of the sustainability concept in managing aggregate minerals supply.
2. To understand the implementation of the sustainability concept in aggregate minerals supply.
3. To learn from experienced countries in ensuring a sustainable supply of aggregate minerals in Indonesia to serve present and future demand.

1.3 Research Questions

Based on the explanation and the research objectives above, five research questions have been elaborated as the basic of this research. These research questions are:

1. What is sustainability?
2. What is a sustainability concept in managing aggregate minerals supply?
3. What are the criteria of sustainability in managing aggregate minerals supply?

4. To what extent is the sustainability concept in managing aggregate minerals supply in the Netherlands and Indonesia implemented?
5. What are the positive aspects that can be learned and contributed in ensuring aggregate minerals supply in Indonesia?

1.4 Scope of Study

The scope of study describes the sustainability of aggregate minerals supply, especially construction materials. According to the Dutch Road and Hydraulic Engineering Institute (2003), aggregate minerals can be defined as minerals that are used in construction and the building materials industry for its granularity, such as sand, gravel, crushed rock and secondary material. In the Indonesian context, aggregate minerals are part of *Bahan Galian Golongan C* (Class C Mining, based on Act No.11/1967 and GR No. 27/1980). This study will elaborate mainly the government policy to ensure sustainability aggregate minerals supply.

1.5 Methodology

This research is conducted by using literature to compare the government policy in managing aggregate minerals resources in the Netherlands and Indonesia. The study will explore the theory of the sustainability concept of aggregate minerals supply. It will not elaborate all aspects of sustainability requirement but focus on the policy, task and authority of each government in dealing with managing mineral resources to ensure the sustainability of the aggregate minerals supply. Furthermore, this research will use secondary data related to the topic of research from policy documents and plan, books, journals, and internet articles.

According to Babbie (2001), the social science research is divided into three main purposes; exploration, description and explanation. The research will take description purpose with the use of comparative analysis to describe scientifically the implementation of the sustainability concept in mineral policy.

1.6 Report Structure

Research report will be divided into six chapters. The structure of research can be described as follows:

Chapter 1 : Introduction

This chapter consists of background, research objectives, research questions, methodology, scope of study, and report structure.

Chapter 2 : Sustainability concept for aggregate minerals supply

This chapter provides theoretical framework of the sustainability concept, the concept of sustainability in aggregate minerals supply

Chapter 3 : Aggregate minerals supply in the Netherlands

This chapter focuses on mineral planning and policy, the role of each stakeholders, and current condition of mineral extraction in the Netherlands.

Chapter 4 : Aggregate minerals supply in the Netherlands

This chapter focuses on mineral planning and policy, the role of each government levels, and current condition of mineral extraction in Indonesia.

Chapter 5 : Comparison Analysis

This chapter explains the differences and similarities of mineral planning and policy in implementing sustainability concept from both countries and to answer the possibility of lesson learn that can be transferred to gain the better solution in ensuring the sustainability of aggregate supply.

Chapter 6 : Conclusion and Recommendation

This chapter consists of research findings and recommendation.

The research framework of this thesis can be seen in picture 1, below:

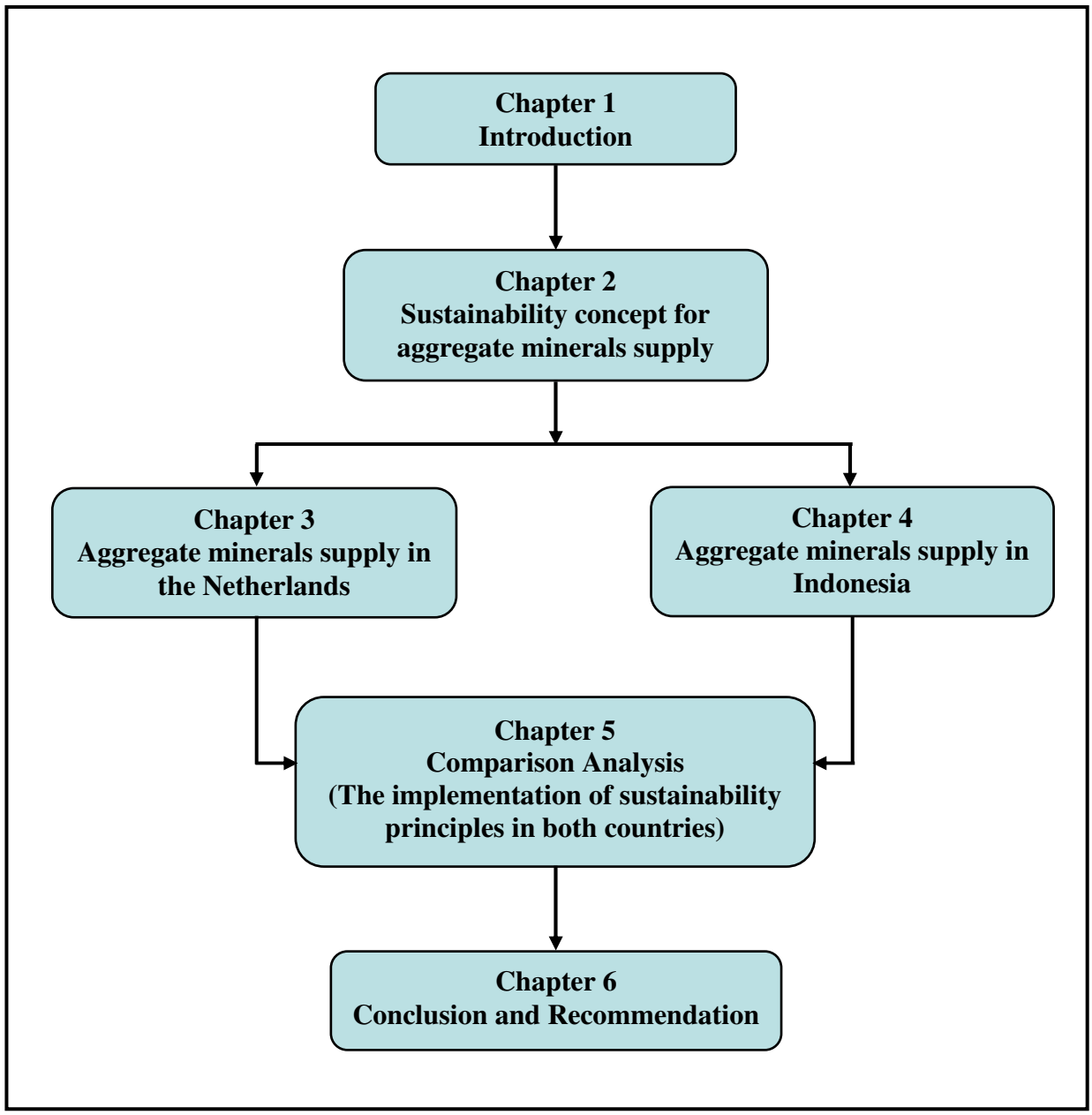

Figure 1. Research Framework

CHAPTER 2

SUSTAINABILITY CONCEPT OF AGGREGATE MINERAL SUPPLY

This chapter will explain several theories regard to the sustainability of aggregate minerals supply. Start with the concept of sustainability, its principles and requirements, typology on sustainability of natural resources, sustainability of aggregate minerals supply, sustainability issues related to aggregate minerals extraction, and the role of stakeholders to achieve the sustainability objectives.

2.1 What is a sustainability concept?

Recently the concept of sustainability has been accepted broadly as a concept in development. The common definition of sustainability concept or sustainable development was adopted from the Brundtland report as *"development that meets the needs of the present without compromising the ability of the future generations to meet their own needs"* (WCED, 1987). This concept considers not only the economic aspects in the development, but also environmental aspects, and social aspects. More over, the sustainable development emphasizes on the need of integration among these aspects or well known as the integration of three pillars of the sustainability.

The objective of a sustainability concept is 'grounded in ethics' to make balance the environmental, social and economic aspects in decision making. It is concerning the equalizing of material resources and the quality of life between present generation and future generation (Bhattacharya, 2000; Counsell and Haughton, 2006, Pope, 2004). For instance, environmental gain should not be at the expense of economic growth, and vice versa.

In relation for achieving the sustainability objective, Van Pelt, *et al.* (1992) states that sustainability concept depends on three policy variables:

1. Attributes of the social welfare function, it means that the ability of environmental amenities with direct impact on human being should be considered as a social welfare attribute.

2. Weighting of social welfare of present and future generations, the need of optimal welfare distribution among successive generations. “The larger the weight assigned to future generations, the more resources should be at their avail, and the more stringent constraints should be on the present generations”.

3. Substitution and compensation in production functions, sustainability stated depend critically on the scare and indispensable of the resources in nature and to what extent man-made capital can substitute for these natural capitals. Substitution can enforce the stability of consumption goods when the stock of environmental capital is declining.

The application of sustainability concept is difficult and complex; there is no certain blue print concept to implement this concept. Every country has their own reason to implement sustainability concept based on their culture, socio-economic, politic, and the potency of natural resources. Therefore sustainability concept can be classified as a learning concept in the theory and implementation. Meppem and Gill (1998) stated that to define sustainability in practice some points have to be considered: (1) The objective of sustainability is not to win or lose and the intention is not to arrive at a particular point; (2) Planning for sustainability requires explicit accounting of perspective (world view or mindset) and must be involving of broadly representative stakeholder participation (through dialogue); (3) Success is determined retrospectively, so the emphasis in planning should be on process and collectively considered, context-related progress rather than on achieving remote targets. A key measure of progress is the maintenance of a creative learning framework for planning; (4) Institutional arrangements should be free to evolve in line with community learning; and (5) The new role for policy makers is to facilitate learning and seek leverage points with which to direct progress towards integrated economic, ecological and socio-cultural approaches for all human activity.

To make clear the concept of sustainability in managing natural resources, the next chapter will discuss the principles and requirements of sustainability concept, and the typology of sustainability.

2.1.1 Principles and requirements of a sustainability concept

In applying the sustainability concept in the use of natural resources and to achieve the objectives of this concept, equalizing of material resources and the quality of life between present and future generations, there are some basic principles as a consideration. Renn and Goble (1996) *in* Battacharya (2000), proposed five principles for applying the sustainability concept:

1. *Acknowledgement of absolute limits with respect to the carrying capacity of the earth*: the natural resources are limited and some of resources have reached critical condition, the use of natural resources need more efficiently. There is a need to find artificial capital as substitution of natural resources to reduce the depletion and over burden on those resources.

2. *Acknowledgement of the limits of substitution between natural and artificial capital:* Recognize the characteristic of natural and artificial capital, to what extent artificial capital can substitute natural resources, and vice versa.

3. *Focus on the resilience of anthropogenic ecosystems:* Considering the use of renewable resources due to they will regenerate themselves. Their regeneration capacity lasts, however, only as long as they remain invulnerable to changes in their natural and anthropogenic environments.

4. *Incorporation of social values in man's relationship to the environment and nature:* In addition to the ecological and economic consequences associated with human use of the environment, society link social and cultural values to nature and its inhabitants.

5. *Aversion of risk from ignorance and shock* Be aware of the differences of environment, economy and society interaction. Economic condition will not be the same in the different regions and also

environmental management can not be applied in all situations. There are some external factors that will influence the implementation of sustainability, such as market and political condition.

Another consideration to reach the objective of sustainability is some basic requirements of sustainability. According to Gibson, *et al.* (2005) there are eight minimum requirements as a basic assessment for sustainability, those are:

1. *Socio-ecological system integrity*: build human–ecological relations to establish and maintain the long-term integrity of socio-biophysical systems and protect the irreplaceable life support functions upon which human and ecological well-being depends;

2. *Livelihood sufficiency and opportunity*: ensure that everyone and every community has enough for a decent life and that everyone has opportunities to seek improvements in ways that do not compromise future generations' possibilities for sufficiency and opportunity;

3. *Intragenerational equity*: ensure that sufficiency and effective choices for all are pursued in ways that reduce dangerous gaps in sufficiency and opportunity (and health, security, social recognition, political influence, and so on) between the rich and the poor;

4. *Intergenerational equity*: favour present options and actions that are most likely to preserve or enhance the opportunities and capabilities of future generations to live sustainable;

5. *Resource maintenance and efficiency*: provide a larger base for ensuring sustainable livelihoods for all while reducing threats to the long-term integrity of socio-ecological systems by reducing extractive damage, avoiding waste and cutting overall material and energy use per unit of benefit;

6. *Socio-ecological civility and democratic governance*: build the capacity, motivation and habitual inclination of individuals, communities and other collective decision-

making bodies to apply sustainability requirements through more open and better informed deliberations, greater attention to fostering reciprocal awareness and collective responsibility, and more integrated use of administrative, market, customary and personal decision-making practices;

7. *Precaution and adaptation*: respect uncertainty, avoid even poorly understood risks of serious or irreversible damage to the foundations for sustainability, plan to learn, design for surprise, and manage for adaptation;

8. *Immediate and long term integration***:** apply all principles of sustainability at once, seeking mutually supportive benefits and multiple gains considerations:
   - integration is not the same as balancing;
   - because greater efficiency, equity, ecological integrity and civility are all necessary for sustainability, then positive gains in all areas must be achieved;
   - what happens in any one area affects what happens in all of the others;
   - it is reasonable to expect, but not safe to assume, that positive steps in different areas will be mutually reinforcing.

2.1.2 Typology of sustainability on natural resources

The typology of sustainability concept varies related to different approaches and target level of natural resources. Foy and Daly (1990) *in* Van Pelt, *et al.* (1992) divide sustainability into two major's typology, namely, strong sustainability and weak sustainability.

Strong sustainability is based on constancy of the natural stock, it means that there are no negative constraints on environmental capital or a non-declining natural capital stock is considered a necessary condition for sustainable development. Meanwhile weak sustainability is based on constancy of the total capital stock or total of man-made and natural capital, it means that keeping the total of natural and man-made capital intact.

Furthermore, strong sustainability is a more strict approach than weak sustainability, but both of these typologies aim at providing successive generations' similar welfare

opportunities, not only quality of life but also materials aspect. In addition, strong sustainability is appropriate when the environment has seriously been deteriorated, and weak sustainability emphasize on the possibility of substitution Weak sustainability allows that a loss of productive environmental capital is compensated for by building more man-made capital.

To classify the typology of sustainability, Pearce and Turner (1990) *in* Gibson, *et al.* (2005) mentions more detail the typology of sustainability based on the spectrum of sustainability from technocratic (weak sustainability) to ecocentric (strong sustainability). Each category is divided into two classes, namely, cornucopian and accommodating part of weak sustainability or technocratic, and communalist and deep ecology part of strong sustainability or ecocentric. The characteristic of each class can be seen in table 1 as follows:

Table 1. The Pearce and Turner's spectrum of sustainability

	Technocratic (weak sustainability)		**Ecocentric (strong sustainability)**	
	Cornucopian	**Accommodating**	**Communalist**	**Deep ecology**
Green labels	Resource exploitation; growth oriented	Resource conservationist; managerial	Resource preservationist	Extreme preservationist position
Type of economy	Unfettered free market	Green economy; environment economic instruments	Steady state economy; environmental protection prioritized	Heavily regulated economy; minimized resource use
Management strategies	Economic policy objectives; maximize gross national product (GNP) growth; trust the markets; full substitution between forms of capital	Modified economic growth; green accounting; reject substitutability; constant capital rule	Zero economic growth and population growth; systems perspective and ecosystem health important; small-scale, community level focus	Reduced economy and population; environmental ethics central
Ethics	Anthropocentric; instrumental value in nature	Wider notion of stewardship for nature; intergenerational equity considered	Extension on ethical responsibilities to non humans; strongly communitarian	Acceptance of bioethics; intrinsic value in nature; millennarial stand

Source: Gibson, *et al.* (2005)

As an addition, according to Turner (1997), there are some rules for the sustainable utilization of the natural capital stock that can be outlined from very weak sustainability to very strong sustainability progression, those are:

1. Market and intervention failures to resource pricing and property rights should be corrected;
2. The regenerative capacity of renewable natural capital should be maintained – i.e. harvesting rates should not exceed regeneration rates – and excessive pollution which could threaten waste assimilation capacities and life support system should be avoided;
3. Technological changes should be steered via an indicative planning system such that switches from non renewable natural capital to renewable natural capital are fostered; and efficiency-increasing technical progress should dominate throughput-increasing technology;
4. Renewable natural capital should be exploited, but at rate equal to the creation of renewable natural capital substitutes (including recycling);
5. The overall scale of economic activity must limited so that it remains within the carrying capacity of the remaining natural capita. Given the uncertainties present, a precautionary approach should be adopted with a built-in safety margin.

As mentioned above, there are some basic principles and requirements to define and to find the keys of sustainability. In the next chapter, the definition of sustainability of aggregate mineral supply, the three pillars aspects of sustainability of sustainability minerals concept and its principles will be elaborated.

2.2 Sustainability of aggregate minerals supply

2.2.1 Definition of sustainability of aggregate minerals supply

The definition of sustainability of aggregate mineral more or less is the same with other sectors as states in the Brudtland definition of sustainability. Sustainability of aggregate mineral supply can be defined as “promoting activities that will not compromise the ability of future generations to meet their raw material needs” (Foster, 1999). As an addition, in the term of mining company perspective, Placer Dome *in* Kumah (2005), define that

‘‘sustainability means the design, construction, operation and closure of mines in a manner that respects and responds to the social, environmental and economic needs of the present generations and anticipates those of future generations in the communities and countries where it works’’

2.2.2 The three pillars aspects of sustainability minerals concept

Mining activities are closely related to the sustainability concept that have to considering the integration of three pillars sustainability, namely, economic, environmental and social aspects. The economic aspects relate to micro and macro economic for community, company and government income; environmental aspects considering the depletion of mineral resources, the degradation of environment quality, and the use of landscape; and social aspects relate to wealth distribution, health and safety job of workers and community around the mining.

Azapagic (2004) mentioned more detail of the three pillars issues of sustainability related to mineral and mining sector (see table 2). Because of limited data, not all of these issues will be elaborated in this thesis.

Table 2. The sustainability issues related to mining and mineral sector

Economic issues	Environmental issues	Social issues
- Contribution to GDP and wealth creation - Costs, sales and profits - Distribution of revenues and wealth - Investments (capital, employees, communities, pollution prevention and mine closure) - Shareholder value - Value added	- Biodiversity loss - Emissions to air - Energy use - Global warming and other environmental impacts - Land use, management and rehabilitation - Nuisance - Resource use and availability - Solid waste	- Creation of employment - Employee education and skill development - Equal opportunities and non discrimination - Health and safety - Human rights and business ethics - Labour/management relationship - Relationship with local communities - Stakeholder involvement - Wealth distribution

Source: Azapagic (2004)

2.2.3 Principles and requirements of sustainable development of mineral resources

To implement the sustainability concept in mining and mineral resources, according to Shields and Solar (2000), there are some principles of sustainability that have to be noticed, not only basic sustainable development principles but also regard to environmental and socio-political sustainable development principles. The detail of sustainable development principles relate to mining activity can be seen in table 3 as follows:

Table 3. The sustainable development principles relevant to mining and mineral resources.

Basic SD Principles	Environmental SD Principles	Socio-political SD Principles
- Human needs paramount/ satisfaction of basic human needs - Integration of environment and development - Inter-generational equity and justice - Intra-generational equity and justice	- Keep within the Earth's carrying capacity - Non-exhaustion of natural resources - Minimize the depletion of non-renewable resources - The precautionary principles - The polluter pays principle - Eco-efficiency - Full costing - Environmental Impact Assessment	- Public participation in governance/cooperation - Multi-stakeholder approach/partnership - Communication and education - Consensus building process - Increased regulation - Institutional capacity - Democratic self-determination - Sovereignty over resources

Source: Shields and Solar, 2000

These principles above will be used as the implementation criteria of the sustainability in managing aggregate minerals resources in the Netherlands and Indonesia.

As addition to these sustainable principles, to ensure the achievement of sustainability goals of mineral supply, Van der Moolen (1999) proposes seven elements that have to be considered by policy makers as follows:

1). Legitimacy: is a certain way of thinking about the world with its own logic. A policy aiming at sustainability will have to merit and acquire legitimacy through good results and by various democratic processes;
2). Steering capacity: means sufficient political power to give society a certain route;

3). Policy-relevant information: means that there should be agreement, by subject, on what information needed on mineral aggregates;
4). Recycling;
5). Renewable minerals;
6). Synergy between various goal in society should be given high priority;
7). Restoration process.

In term of mineral industry, Bhattacharya (2000) argues that to reach the sustainability objectives in mineral industry, mining companies in conducting their activities have to considering several strategies as the basic framework such as industrial ethics; maintenance and growth of natural capital; environmental capacity; market behaviour; technological options; extraction standards; alliance with government, NGO and indigenous peoples; and sustaining mining and minerals business.

2.2.4 The relation of stakeholders on sustainability of aggregate minerals supply

Another important aspect to reach the sustainability of mineral aggregate supply is the role of stakeholders. The stakeholders relate to mineral aggregate supply are governments as the policy makers, mineral industry associations, research organizations, environmental organizations, and community around the mining area. To ensure the objectives of sustainability is need the harmonization, cooperation and involvement of all stakeholders. As it mentioned by Basu and Kumar (2002) *in* Hilson and Basu, (2003), all of stakeholders have to support the goal of sustainable development on mineral resources that has defined among all stakeholders through governance.

The relationship of all stakeholders for achieving sustainability goals on mineral supply can be seen in figure 2 below:

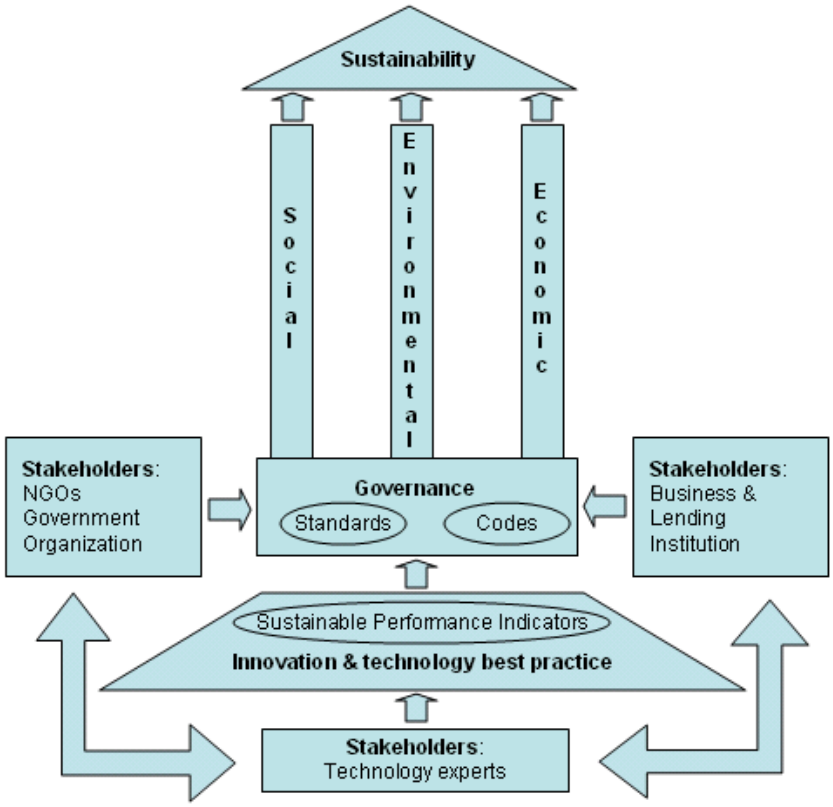

Figure 2. Framework the role of stakeholders for achieving a sustainable development after Basu and Kumar, (2002) *in* Hilson and Basu (2003)

CHAPTER 3

AGREGATE MINERALS SUPPLY IN THE NETHERLANDS

Fulfilling aggregate minerals for construction materials are the main issues of the development in the Netherlands due to the limited resources and community resistance. To understand the aggregate minerals condition in the Netherlands, this chapter will elaborate the resources of aggregate minerals, supply and demand mechanism, the policy of the Dutch government regarding aggregate minerals, some issues relate to aggregate mineral extraction and stakeholders that involve in aggregate mineral extraction.

3.1 Aggregate minerals resources in the Netherlands

In the Netherlands, the resources of aggregate minerals are located along several rivers. As a consequence, the Netherlands become a country with relatively large natural resources of gravel and sand, but has no hard rock reserves. Most of the Netherlands (99%) consists of young, quaternary unconsolidated sediments (younger that 1.8 million years), formed in the delta of several main rivers (river Rhine, Meuse, the Scheldt and the Eems) that run from the south and east to the North Sea. The sediments mainly consist of sand and clay. During the quaternary these rivers transported large quantities of sediments from the Ardennes and the Alps (see Figure 3). Because of its process, the resources for fine sand materials are huge and can be assumed unlimited. Coarse sand occurs roughly in southeastern part half of the country. Meanwhile gravel resources are limited to the extreme south of the country. Based on these conditions, the Netherlands is dependent on mineral import for coarse aggregates supply from neighbouring countries to fulfill the national demand of construction material, and become an exporting country for fine sand materials.

Figure 3. Simplified geological map of the Netherlands
Source: Road and Hydraulic Engineering Institute (2003).

An overview of aggregate minerals reserves with planning permission which aggregate extraction may even taking place in January 2000 and January 2001 is given in table 4.

Table 4. Known reserves for aggregate raw materials in the Netherlands for 1 January 2000 and 2001

Raw material	**Reserves per 1-1-2000**	**Reserves per 1-1-2001**
coarse sand	119.5 Mt	73.9 Mt
gravel	15.0 Mt	22.4 Mt
crushed rock	nil	nil
filling material (fine sand)	unknown	unknown

Source: Road and Hydraulic Engineering Institute (2003).

To make clear the supply and demand of aggregate minerals as construction materials in the Netherlands, in the next chapter will elaborate the description of aggregate minerals export and import related to the Dutch neighboring countries.

3.2 Description of aggregate minerals supply and demand

Supply and demand of mineral aggregates in the Netherlands relates with European countries. Although exported some part of aggregates, the dependency of this country on aggregate import from neighboring countries especially crushed rock is relatively high.

Based on Road and Hydraulic Engineering Institute (2003) data, in the year of 2000, the Netherlands produced about 115.7 Mt of aggregates consisting of : 88 Mt of (fine) filling sand (36 Mt of which marine dredged), 21 Mt of coarse sand, and 6.6 Mt of gravel. It is recorded that about 15 Mt of aggregates were exported and 34 Mt were imported.

The Netherlands mainly exports fine sand that extracted from Dutch areas to Belgium. Meanwhile, aggregate minerals supply by import for coarse sand and gravel comes from Germany, UK and Belgium. Then, import of crushed rock comes from Germany, Belgium, Scotland, Norway and France.

The description of aggregate minerals supply and demand in the Netherlands, including export and import of aggregate minerals between the Netherlands and its neighboring countries in the year of 2000 can be seen in table 5 below:

Table 5. Supply and demand of aggregate in the Netherlands (2000)

No	Description	Aggregates (in Mt)				
		FS	**CS**	**Gr**	**CR**	**Total**
1	Yearly demand	84.03	22.50	19.40	9.60	135.5
2	Exported (to Belgium only)	3.63	8.70	2.60	0.00	14.90
3	Supply by import	0.00	11.00	13.10	9.60	33.70
	- Germany - The UK - Belgium - Scotland - Norway - France	0 0 0 0 0 0	8.47 1.50 0.99 0 0 0	8.60 2.30 2.20 0 0 0	2.00 0 5.70 1.00 0.31 0.50	
4	Total annual production	87.66	21.45	6.60	0.00	115.7
5	Extraction from small scale, regional site	29.89	7.52	1.23	0.00	38.60
6	Extraction from large scale, regional site	21.67	13.16	5.37	0.00	40.20
7	Marine dredged Dutch part and continental shelf	36.10	0.77	0.00	0.00	36.90

Note: FS=Fine sand, CS = coarse sand, Gr=Gravel, CR=Crushed rock
Source: Road and Hydraulic Engineering Institute (2003).

To get insight of mineral planning in the Netherlands, in the next chapter will be elaborated the history of mineral policy, recent mineral policy development, national issue regarding aggregate minerals extraction, and the role and contribution of stakeholders in mineral planning policies

3.3 Mineral planning policy in the Netherlands

Before 2004, mineral planning policy at national level in the Netherlands was the responsibility of the Ministry of Public Works and Water Management. The Ministry of Public Works and Water Management has an obligatory to make and to publish the Structure Plan on Surface Raw Materials ('Structuurschema Oppervlaktedelfstoffen') and revise it every five year. The Structure Plan on Surface Raw Materials consisted of four parts (Part 1: intended content; Part 2: reactions; Part 3: final governmental decision; Part 4: approval by both Chambers of Parliament). The first National Structure Plan on Surface Raw Materials was approved by parliament in 1996.

In June 2001, the first part of the second Structure Plan on Surface Raw Materials was published, and the second part of the second Structure Plan on Surface Raw Materials was published in July 2002. However, in May 2003, the Secretary of State of Public Works and Water Management announced the withdrawal of the government's role in mineral planning and raw materials supply. As a consequence, Part 3 of the second National Structure Plan will not be published and effectuated. The main reasons for the reduction of governmental role are financial cutbacks, and the encouragement of a more market oriented extraction sector.

Since April 2004, the national policy on surface raw materials has been integrated in the National Spatial Plan (Ministries van VROM, LNV, VenW en EZ, 2004). In the National Plan it is stated that the governmental role steering demand and supply will be reduced. The extraction of surface raw materials will be left to the market.

There are some guidelines for mineral policy in the National Spatial Plan. The aim of the policy with respect to raw building materials is to stimulate the extraction of these materials in a socially responsible way. The first basic principle is that raw materials should be used economically and for high-grade applications as much as possible. The maximum use of secondary raw materials and renewable raw materials such as timbers is also a basic principle. The national and local authorities should set a good example to others. As far as possible the extraction of raw materials should be multifunctional in order to grade up spatial quality. This means that a socially desirable function should be develop associated with the extraction such as recreation facilities, housing on a waterfront, water management, nature conservation, etc.

In recent years the Dutch provinces developed Regional Mineral Extraction Plans. The provinces are free to make such plans; these plans are not compulsory. The Ministry of Transport, Public Works and Water Management is responsible for the State Waters and the North Sea. For these waters also Regional Mineral Extraction Plans have been developed. In the National Spatial Plan it is announced that the extraction of sand from the North Sea is of national interest. Deep extraction of coarse sand will be allowed.

A completely new component in the National Spatial Plan is so called surface raw material assessment. For intended new spatial outside the built-up area the initiator has to comply with the following basic principles:

- The effects on the provision of surface raw material have to be taken into consideration.
- The geological occurrences of scarce surface raw materials such as concrete and masonry sand (coarse sand), gravel, limestone, clay for bricks and silica sand also have to be taken into consideration. In this way the excavation possibilities will not be obstructed for future generations.
- The possibility of combinations of raw material excavations and other functions must also be taken into consideration. Under particular circumstances, in such cases more raw materials may be extracted than strictly necessary.

3.4 The implementation of mineral policy in the Netherlands

As mentioned in the last chapter, the main objectives of national policy on aggregate minerals resources with respect to construction materials are promoting the economical use of raw materials, the use of alternative materials and combining mineral extraction with others function to enhance the spatial quality.

The achievement of these programs in the Netherlands can be described as follows:

Promoting the economical use of raw materials

The economically use of raw materials is quite success in the Netherlands. Although the consumption of raw materials per capita (t/capita) has increased about 17% from 1980 to 2000, but in the same time the use of raw materials per unit of economic activity (t/M€) has decreased about 25%. (Van der Meulen, 2005).

Promoting the maximal use of secondary materials

The promotion of secondary materials and recycled materials for construction has been successful in the Netherlands. Road and Hydraulic Engineering Institute (2003) stated that the Dutch government has a quantitative target for re-use of construction and demolition

waste as recycling materials from 60% in 1990 to 90% in 2000. The target has already achieved in 1997.

The recycling materials and the secondary materials that are derived from sieve sand, asphalt waste, dredged material, cleaned soil, MSWI bottom ash, MSWI fly ash, coal bottom ash, coal fly ash, blast furnace slag, colliery spoil, phosphorous slag, and flue gas desulphurization gypsum are widely used as fill or foundation material in road and hydraulic engineering. More over, some of secondary materials are also being used as building materials. This condition has also supported by a good example from the national government that using about 20% of total infrastructure works with secondary materials. The promotion of secondary materials is also adopted by most of sub-national authority. The use of secondary materials has increased from 7 Mt in early 1980s to 33 Mt in 2000s (Van der Meulen, 2005).

The description of supply and demand of secondary and recycled materials in the Netherlands in the year of 2000 can be seen in table 6.

Table 6. Figures for secondary and recycled raw materials in the Netherlands 2000

(all numbers in 10^3 ton/year unless otherwise stated)

No	The Netherlands Year: 2000	Production	Usage	Land filled	Storage/ Supplies	Import	Export
1	Construction and demolition waste	17.55 Mt	15.81 Mt	1.54 Mt	-	-	-
2	Asphalt waste	4.45 Mt	3.11 Mt	-	1.35 Mt	-	-
3	A Cleaned soil	1,990	1,800	-	little	-	-
	B Uncleaned slightly polluted soil	8 Mt	8 Mt	-	-	-	-
	C Soil tare	1 Mt	1 Mt	-	-	-	-
4	MSWI bottom ash	1,030	821	-	209	-	-
5	MSWI fly ash	81	57	24	-	-	-
6	Coal bottom ash	153	125	-	28	-	-
7	Coal fly ash	961	622	-	little	-	0.33 Mt
8	Blast furnace slag	1.2 Mt	2.5 Mt	-	nil	1.3 Mt	-
9	Steel slag	500	690	-	-190	-	-
10	Colliery spoil	-	0.2 Mt	-	-	0.2 Mt	-
11	A Phosphorous slag	550	380	-	-30	-	0.2 Mt
	B Flue gas desulphurisation gypsum	380	383	-	-3	-	-
	C Sieve sand (sorting sand and breaker sand)	330	200	-	-	-	-
Total		36.85 Mt	35.10 Mt	0.91 Mt	1.39 Mt	1.5 Mt	0.53 Mt

Source: Road and Hydraulic Engineering Institute (2003).

Promoting the renewable materials

For renewable materials, the Dutch government set a target to use more timber in the construction sector. To achieve this ambition, government has working together with designers and construction companies to make a plan for the implementation of timber in building and construction projects. The achievement of timber utilization for housing in the Netherlands in the year of 1980 and 2000 is shown in table 7.

Table 7. Number of newly built houses and timber framed houses in the Netherlands in 1980 and 2000.

Year	Number of houses	Number of timber framed houses	Percentage of timber framed houses
1980	100,000	5,000	5 %
2000	65,000	5,000	8 %

Source: Road and Hydraulic Engineering Institute (2003).

Another renewable material that has important role and is usually being used in the Netherlands is shells. Shells are extracted from the Wadden Sea and the Wester Scheldt. According to the Dutch National Policy Document on Shells Extraction of October 1998, the maximum quantity of shells extraction until 2010 is determined on 290,000 m3 per year (Road and Hydraulic Engineering Institute, 2003).

To ensure the continuity of these programs the Dutch government issued some important policies such as:

- a research programmed, focusing on economizing the use of materials, on secondary and renewable materials and on methods to produce primary materials with less societal resistance;
- implementation of the results of this research by communication with the building business and by adapting building regulations;
- taxation;
- the banning of land filling with, or the disposing of recyclable materials.

In addition, to sustain the promotion of these programs, the Dutch government has already been allocating national budget and conducting several researches, among others:

- A research program for primary raw materials and related topics (€ 225,890 period 2000-2005);
- A research program for re-use of secondary and recycled raw materials (€ 900,000 period 2000-2005);
- Sustainable building (sustainable building technologies) (€ 635,000 period 2000-2005);
- Timber research (€ 225,000 period 2000-2003);
- Raw material general (€ 860,000 period 2000-2005); and
- Research project on the implementation of alternatives for extraction of concrete and masonry sand (€ 3,600,000 period 2000-2007).

Combining aggregate minerals extraction with other function

In order to reach a better spatial quality in mineral extraction areas and to reduce community resistance, the Dutch government has been carrying out some multifunctional programs in these areas, for example:

- Relate to water management, the best projects in the Netherlands are the combination of aggregate mineral extraction with river engineering, such as widening and lowering the Meuse and Rhine River. Due to the tremendous flooding of the rivers Rhine and Meuse in 1993 and 1995, the Ministry of Transport, Public Work and Water Management decided to upgrade the discharge capacities with widening these rivers. With create more space for the rivers, huge amounts of aggregate minerals potential can be excavated. The revenues of aggregate minerals production would be used to finance river widening and nature development (Van der Meulen, *et al*, 2006).

- The combination of aggregate mineral extraction with recreation facilities has been conducted in the waters of IJsselmeer region. The Directorate IJssemeer Region was making limitation areas for sand extraction in channels and special areas for recreational boating that made some advantages, among others, cutting the expenditure for construction and maintenance the channels, increasing the navigable areas for recreational boating, and deepening the channels for shipping. From this program, it

was predicted that until 2008 about 25 million tonnes of coarse sand can be extracted (Van Breukelen and Nagel, 1999)

- Another example is the positive relationship between excavation and nature development that can be exemplified with the sand extraction in combination with nature restoration in the municipality of Neerijnen, and Westelilijke Drutense Waard in Gelderland Province (Van der Moolen, 1999).

3.4 Main issues in aggregate minerals extraction

The Netherlands, as a prosperous and industrialized country with high population density, needs huge aggregate minerals supply for the development, maintenance, and reconstruction of its infrastructure. The main sources of aggregate minerals as construction materials are lay on along the rivers. The coarse sands and gravels that suitable for concrete production only occur in several regions in the southern and eastern part of the Netherlands. The intense extraction of aggregate minerals has changing the face of the landscape permanently. Every year, since 1970 more than 500 ha of land area that has already extracted turn over become water area. More over, the extraction areas are mostly site on nature development and recreation areas, so that the quality of these areas become worse, even they lost their function (Van der Moolen, 1999). Pressure on nature conservation is getting more attention. As consequence to this condition, in the Netherlands, since 1970s growing public awareness and society resistance on aggregate mineral extraction led by the environmental organizations and local communities. The slogan NYMBY (not in my backyard) issue emerged to stop aggregate minerals extraction in their areas. Society resistance often obstructs aggregate mineral extraction permit and extraction areas that will threaten the sustainability supply of aggregate minerals.

In addition, the unevenly distributed of aggregate minerals resources over the country also has caused that most provinces aim at avoiding mineral extraction in their area. This condition also threatens the supply of construction materials in the future in the Netherlands.

3.4 Stakeholders in mineral planning policy

There are many stakeholders involve in determining mineral planning policy in the Netherlands, among others, the governments in each level, study groups in aggregate minerals, environmental organization and local groups, and industrial organization and associations.

The role of all stakeholders and their contribution to mineral planning in the Netherlands (Road and Hydraulic Engineering Institute, 2003) will be elaborated in the next chapter.

3.5.1 Government

a. National level

As it mentioned before, previously the Ministry of Transport, Public Works and Water Management has responsible and main actor for mineral planning policy at national level, beside other ministries that involved in mineral extraction. However in the year of 2004, the Dutch national government made a decision to reduce its role in mineral planning. Recently, the national policy of surface raw materials is integrated in National Spatial Plan (Ministries van VROM, LNV. VenW en EZ, 2004). As a consequence, the authority of the Ministry of Transport, Public Works and Water Management on mineral policy is decrease. Currently the national policy emphasizes on the sustainable use of raw materials and it is mainly become the responsibility of the Ministry of Housing, Spatial Planning and the Environment.

In national level the responsibility of each ministry regard to mineral planning policy can be described as follows:

- the Ministry of Housing, Spatial Planning and the Environment is responsible for all spatial planning aspects of extractions, the supply of raw materials for house-building activities and for all environmental aspects of raw materials policy.
- the Ministry of Agriculture, Nature Management and Fisheries is responsible for landscape and nature concerns related to excavations. Furthermore the Ministry is concerned with forestry (related to the production of Dutch wood as a renewable building raw material).

- the Ministry of Economic Affairs is responsible for the economical performance of both the building and construction industry and the raw materials industry.
- the Ministry of Finance is responsible for all financial aspects of excavations, like the domain fees for extraction from State waters, the possible tax on surface minerals, and for the financial aspects of all constructional public works.
- the Ministry of Transport, Public Works and Water Management, the Directorate General of Public Work and Water Management is responsible for issuing Regional Mineral Extraction Plan and aggregate mineral extraction permit that located in water states.

b. Regional level

In the Netherlands, the provincial authority (with respect to the provincial area) and the regional directorates of the Directorate General of Public Work and Water Management (with respect to the state water) are responsible for mineral planning in regional level. These two regional tiers usually arrange mineral policy in Regional Mineral Extraction Plans as part of Regional Spatial Plan. Regional Spatial Plans have to be consistent with the National Spatial Plan. In Regional Mineral Extraction Plans, it indicate where mineral extraction will be acceptable based on the location of geological reserves, environmental aspects, proposals for future developments, prognoses for future demands and opportunities for investment and employment. For extraction mineral permit, Extraction Company has to apply for it to the province government or the regional directorates of the Directorate General of Public Work and Water Management. The extraction permit will be issued if the request area is in accordance with the Regional Spatial Plan or Regional Mineral Extraction Plan, and fulfilling the requirement standard based on environmental regulations.

c. Local level

Local governments (municipality) are also responsible to mineral policy at local level. They have an obligatory to arrange the Local Land Use Plan. The Local Land Use Plan has to be consistent with the Regional Spatial Plans and must be approved by the provincial government. In case of an extraction zone in a Regional Spatial Plan is not consistent with the Local Land Use Plan, the local government can make an objection

to the provincial council or to the Council of State. However, when the extraction zone has been incorporated in the Local Land Use Plan, the provincial government can protect these areas against developments which might obstruct mineral extraction in the future.

3.5.2 Study groups for surface raw materials

Study groups for surface raw materials have important role to support mineral policy in the Netherlands. There are several study groups, among others:

- Steering committee and Project team on the implementation plan for alternative extraction methods for concrete and masonry sand ('Stuurgroep en Projectgroep Implementatie Alternatieven voor de winning van beton en metselzand uit landlocaties');
- Society of the Civil Engineering Centre for Construction, Research and Regulation ('Stichting Civieltechnisch Centrum Uitvoering, Research en Regelgeving', CUR).

3.5.3 Environmental organization (NGOs, local group)

The awareness of community on environment in the Netherlands is relatively high. More than 4 million people (total population is about 16 million people) were members of environmental organization in 2001. Environmental organizations respect to mineral planning especially when extraction plans are attached with nature development. In contrast, mineral planning is often obstructed by local groups of inhabitants or local political groups as a community resistance. The community resistance will slow down the permission process of extraction area.

3.5.4 Industrial organizations and associations

There are some industrial organizations and associations that have different respects to the national mineral policy, such as respect to mineral planning and extraction, recycling and secondary material, and renewable materials.

a. The organizations with respect to the mineral planning and extraction are:
   - Federation of Surface Mineral Extracting Industries (FODI) is an umbrella organization for the producers of minerals for the building material industry and as the main counterpart of the government for general mineral extraction policy.
   - Netherlands Association of Regional Industrial Sand and Gravel Producers (NEVRIP): unites the small-scale sand/gravel producers who deliver most of their product by truck in the region of operation.
   - Sand Foundation ('Stichting Zand'), an organisation of large-scale producers of industrial sand (i.e. sand for the concrete and mortar industries).
   - Gravel Foundation ('Stichting Grind'), an organisation of large-scale producers of gravel.
   - Industry organisation of the Wholesale in Building Raw Materials (BGB) as an umbrella organisation for Dutch Sand Dredgers' Organisation (NVZ): unites the producers who produce filling sand from the North sea; Dutch Gravel and Sand Traders' Association (NVGZ): unites the traders of coarse sand and gravel who import, export and market most of the sand; and Association of Producers and Importers (VPI): unites the producers and traders in building materials for road and hydraulic engineering, including crushed rock and secondary materials (slags).

b. Industrial organizations with respect to recycling and secondary material are:
   - Branch Organization for Recycling, Crushing and Sorting (BRBS). Interest group for the crushers and sorters of building and demolition waste.
   - Interest Association of Mobile Recycling (BMR). Specific interest group for on site crushing.
   - Fly Ash Union ('Vliegasunie'). Manages the marketing of electricity by products, fly ash, bottom ash and FGD gypsum.
   - Dutch Waste Processing Association (VVAV). Interest group for among other things, waste incineration and the marketing of its by-products, MSWI bottom ash and fly ash.

c. Industrial organizations with respect to renewable materials are:
   - Timber Industry: Timber Information Centre ('Centrum Hout'). It passes on information to the consumer/trade and carries out research in order to expand on this knowledge.
   - Netherlands Association of Timber Agents (NATA). NATA timber agents provide a wide range of services both to suppliers from all around the world and to customers in Europe which include the leading importers for timber, timber products, plywood and sheet material.
   - General Association Inland Wood (AVIH). Interest group for forestry, wood production, trade and use of Dutch timber.
   - Netherlands Timber Trade Association (VVNH). Interest group for the wholesale of timber. Organization of Constructors of Timber Framed Buildings (VHSB), a branch organization for companies that build timber framed houses and other buildings or are active in the construction of elements for timber framed buildings.
   - Netherlands Association of Woodwork Manufacturers. This organization looks after the interests of employers in the woodwork manufacturing branch, on general, social-legal, economical en technical issues.
   - Dutch Federation of Thatchers ('Vakfederatie Rietdekkers'). Professional organisation of thatchers in the Netherlands.
   - Timber Certificate Institute ('Stichting Keuringsbureau Hout', SKH), a certifying body, issuing quality declarations for the timber sector.

d. Shells industry:
   - Association of Dutch Shell-extractors ('Vereniging van Nederlandse Schelpenwinners', VNS).

3.6 Laws and regulations related to mining policy

In the Netherlands, there are several relevant laws and regulations for securing aggregate minerals production and as consideration for issuing mining permits, among others:

- Spatial Planning Act
- Spatial Planning Decree
- The Mineral Planning Act (Revised Excavation Act 1996)
- The Environmental Protection Act
- Building Material Decree
- Building Decree
- Noise Abatement Act
- Air Pollution Act
- Soil Protection Act
- Administrative Law Act

CHAPTER 4

AGGREGATE MINERALS SUPPLY IN INDONESIA

Indonesia has different condition on aggregate mineral resources with the Netherlands. Although Indonesia has big aggregate minerals resources to fulfill the construction materials for the development, several issues regarding economic, environmental and social issues emerge around aggregate minerals extraction activity. This condition will threaten the sustainability of aggregate minerals supply in Indonesia. To make clear the aggregate minerals condition in Indonesia, this chapter will elaborate the resources of aggregate minerals, supply and demand mechanism, the highlight of national planning in Indonesia, mineral policy, and some issues relate to aggregate mineral extraction.

4.1 Aggregate resources in Indonesia

Indonesia has huge natural resources potencies, including mineral resources. Based on Carlile and Mitchell (1994) research, the potency of minerals is identified with a total on land extent of over 15,000 km2. Mineralization in Indonesia is formed in andesitic arcs which were active for intervals from the Cretaceous to Pliocene (see figure 4).

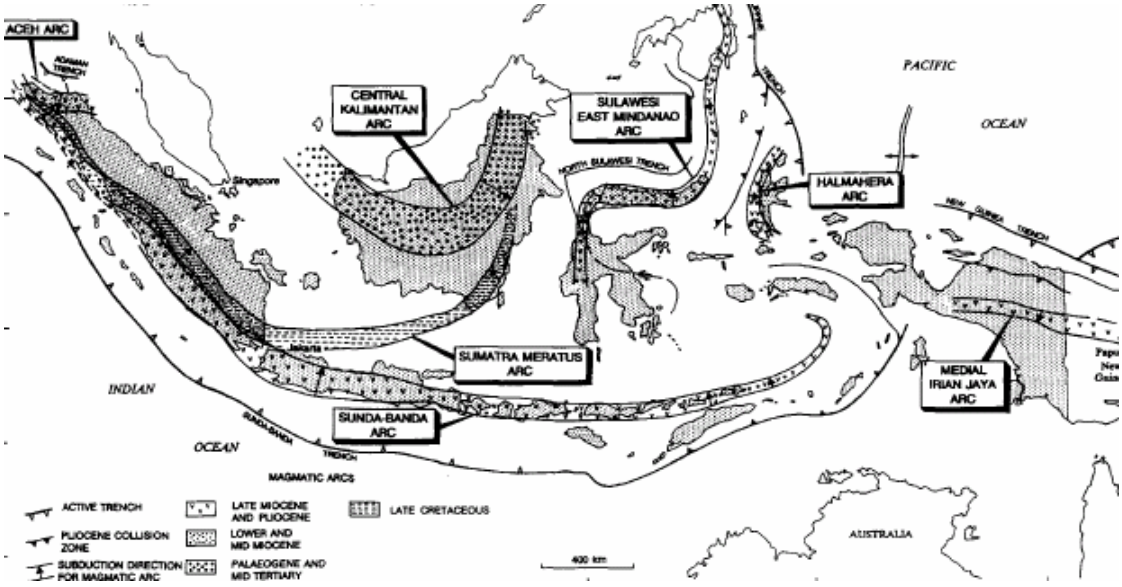

Figure 4. Distribution and polarity of mineralized Late Cretaceous to Pliocene magmatic arcs in Indonesia (Carlile and Mitchell, 1994).

The classification of minerals in Indonesia is divided into three categories (Act No. 11/1967 and GR No. 27/1980):

a. Class A Mining or Strategic Class, includes among others crude oil, natural gas, asphalt, coal, uranium, and others radioactive minerals.
b. Class B Mining or Vital Class, includes among others iron, manganese, bauxite, gold, copper, and zinc.
c. Class C Mining (does not include in Class A and B mining materials), includes among others sand, gravel, rock, nitrate, phosphate, and marble mining.

Minerals for construction materials included aggregate minerals in Indonesia are included in Class C Mining. Even though Indonesia has abundant potencies of these resources, but they are unevenly distributed among regions. Based on Pusat Data dan Informasi Energi dan Sumber Daya Mineral (Pusdatin) (*Centre of data and information of Energy and Mineral Resources*), the Ministry of Energy and Mineral Resources in 2005, the reserves and resources of construction mineral in Indonesia can be seen in table 8.

Table 8. Construction Materials resources in Indonesia (in ton)

Commodity	Resources Hypothetic	Resources Inferred	Resources Indicated	Resources Measured
Andesite	44.785.472.000,00	19.164.267.000,00	2.875.220.000,00	287.946.700,00
Basalt	0,00	2.393.900.000,00	0,00	0,00
Dacite	506.310.000,00	2.026.125.000,00	0,00	0,00
Diorite	426.653.000,00	520.000.000,00	0,00	0,00
Gabro/Peridotite	19.111.197.000,00	25.000.000,00	0,00	0,00
Granite	626.765.688.000,00	2.172.271.000,00	592.708.000,00	0,00
Marble	231.426.903.000,00	1.787.887.000,00	205.420.000,00	428.526.200,00
Onyx	70.265.000,00	0,00	0,00	0,00
Purnice	510.857.250,00	47.965.000,00	283.000,00	419.000.000,00
Sand	19.550.723.000,00	6.168.000,00	1.453.000,00	0,00
Sandstone	3.048.705.000,00	3.066.141.000,00	37.726.000,00	75.072.300,00
Splite	16.375.000,00	0,00	0,00	0,00
Trass	6.617.807.000,00	174.415.000,00	20.012.000,00	16.312.000,00
TOTAL	952.836.955.250,00	31.384.139.000,00	3.732.822.000,00	1.226.857.200,00

Source: Centre of data and information of Energy and Mineral Resources, the Ministry of Energy and Mineral Resources[1]

[1] (see: http://dtwh.esdm.go.id/index.php?page=mi_cadangan)

The potency of andesite as main sources for aggregate minerals such as crushed rock in each province in Indonesia can be seen in table 9 below:

Table 9. The reserves and resources of Andesite in Indonesia (x ton).

No	Province	Total Mining Location	Resources Hypothetic	Resources Inferred	Resources Indicated	Resources Measured
1	Bali	1	0,00	403.000,00	0,00	0,00
2	Banten	10	154.172.000,00	714.643.000,00	460.631.000,00	0,00
3	Bengkulu	1	26.000.000,00	0,00	0,00	0,00
4	Gorontalo	22	0,00	2.506.000.000,00	0,00	0,00
5	Jambi	2	484.339.000,00	0,00	0,00	0,00
6	Jawa Barat	111	301.911.000,00	63.395.000,00	258.586.000,00	39.765.000,00
7	Jawa Tengah	57	1.370.765.000,00	78.000.000,00	284.644.000,00	0,00
8	Jawa Timur	41	1.378.142.000,00	3.000.000,00	0,00	0,00
9	Kalimantan Barat	21	12.131.625.000,00	7.137.100.000,00	0,00	0,00
10	Kalimantan Selatan	22	9.375.560.000,00	100.000.000,00	0,00	0,00
11	Kalimantan Tengah	6	156.300.000,00	68.300.000,00	0,00	0,00
12	Kalimantan Timur	3	1.064.295.000,00	0,00	0,00	0,00
13	Lampung	7	1.885.800.000,00	0,00	13.650.000,00	13.125.000,00
14	Maluku Utara	1	260.000.000,00	0,00	0,00	0,00
15	Nangroe Aceh Darussalam	2	23.520.000,00	0,00	0,00	0,00
16	Nusa Tenggara Barat	26	218.142.000,00	3.490.000,00	999.309.000,00	235.051.000,00
17	Nusa Tenggara Timur	27	15.075.032.000,00	8.489.936.000,00	0,00	0,00
18	Papua	1	13.000.000,00	0,00	0,00	0,00
19	Riau	3	134.000.000,00	0,00	858.400.000,00	0,00
20	Sulawesi Tengah	1	1.050.000,00	0,00	0,00	0,00
21	Sulawesi Utara	12	280.434.000,00	0,00	0,00	0,00
22	Sulawesi Utara	1	10.000.000,00	0,00	0,00	0,00
23	Sumatera Barat	11	333.760.000,00	0,00	0,00	0,00
24	Sumatera Selatan	6	13.375.000,00	0,00	0,00	5.700,00
25	Sumatera Utara	3	94.250.000,00	0,00	0,00	0,00
26	TOTAL	398	44.785.472.000,00	19.164.267.000,00	2.875.220.000,00	287.946.700,00

Source: Centre of data and information of Energy and Mineral Resources, the Ministry of Energy and Mineral Resources[2]

[2] (see: http://dtwh.esdm.go.id/index.php?page=mi_cadangan)

4.2 Description of aggregate minerals supply and demand

In Indonesia, the need of aggregate materials for construction material is fulfilled with raw materials. Aggregate minerals is extracted by local people and mineral industry, with various scale from traditional and small scale mining (SSM) with area less than 5 hectare to medium scale mining (MSM) with area between 5 hectare to 25 hectare, and from improper traditional mining to processing methods. SSM and traditional mining are usually excavating sand and gravel along the river and mountainous areas, and MSM mineral industry is producing aggregate minerals with machinery processes such as crushed rock in many sizes.

As mentioned above almost all of region in Indonesia has aggregate minerals potency, the products of mining activity is marketed for domestic need and surrounded areas. Mechanism of supply and demand is released to the market system. There is no government intervention to aggregate minerals market. The role of government is mainly restricted on regulation and policy regarding mining areas, environment, and guideline for health and safety standards.

4.3 Highlight of national planning in Indonesia

The national planning system in Indonesia is arranged by Act No. 25/2004 Concerning System of National Development Plan. Indonesia's national planning system is mainly divided into three terms, those are, Long-Term National Development Plan (Rencana Pembangunan Jangka Panjang Nasional: RPJPN) prevail for 20 years, Medium-Term National Development Plan (Rencana Pembangunan Jangka Menengah Nasional: RPJMN)/Strategic Plan prevail for 5 years and Government Work Plan (Rencana Kerja Pemerintah: RKP) that revises annually as national program. This system is followed by regional government to create regional development plans in each level. The Long-Term National Development Plan is used as guidance for Medium-Term National Development Plan, Government Work Plan and others plan at lower level of government.

Nowadays, the Long-Term National Development Plan is stated in Act No. 17/2007 Concerning Long Term National Development Plan 2005-2025. This act explains the

visions and long term policy direction on the whole sectors of the development. Regard to the development of mineral resources as a part of natural resources and closely related to environment, in the national long term plan it is stated that the visions on natural resources and environment are directed towards the capacity development of the people in utilizing natural resources and protecting the environmental function in a sustainable, fair, and balanced manner for the optimal use in favor for the welfare of people. It also states that the long term policy direction for upgrading the quality of management of natural resources and sustainable environment with a support of fair and explicit law enforcement.

4.4 Mineral Planning Policy

Relate to management and utilization of mineral resources, the next chapter will describe the role of government in each level in Indonesia, regulation concerning mining activity and extraction aggregate minerals permit.

4.4.1 Government Authority

Development in regional autonomy era takes some consequences in many aspects, such as local governments have more responsibilities and rights in managing natural resources in their areas. Aggregate minerals resources are the natural resources that should be maintained in sustainable way for the community welfare and as income contribution to government for continuing the development.

As mentioned before that according to Act No.11/1967 concerning Basic Principles of Mining, classification of mining is divided into three classes, A, B, and C. Aggregate minerals mining as part of Class C Mining, firstly was belong to provincial government authority (section II, article 4, and clause 2 of Act No.11/1967).

In 1986, government enacted Government Regulation (GR) No.37/1986 concerning Partly Delegation of Government Authority in Mining to Provincial Government, stated that provincial government can transfer part of the authority in mining right to local government (section II, article 3) namely mining permit of Class C Mining.

After reformation era, in 1999, the regulation was change. Based on Decentralization and Regional Government Act (Act No. 22/1999 concerning Regional Government, revised by Act No. 32/2004), the authority of Class C Mining in local areas became the right of local government (regency and municipality) as a framework of regional autonomy with the supervision by provincial government.

In other Government Regulation, GR No.25/2000 concerning the Government Authority and the Provincial Authority as an Autonomous Region, it mentions about the governmental sectors and the specific authorities that belong to the central and the provincial governments. By implication, all governmental sectors and the associated authorities that not explicitly mentioned in Act No. 22/1999 or specified in GR No. 25/2000 as the authorities of the central government or of the provincial governments, are belong to the local governments.

The detail of the authority of each government level related to national policy and mining sector can be described as follow:

Central Government:

Central government (government) has the full authority in the sectors of foreign politics, defense and security, justice, monetary and fiscal, religion as well as authority in other sectors regard to national interests, among others, the authority on policies regarding national planning and macro national development control, fiscal balance funds, state administration systems and the state's economic institutions, cultivation and empowerment of human resources, the utilization of natural resources and the strategic high technology, conservation and national standardization.

Related to mining sector, government has the authority as follows:

1. to determine the standard of monitoring and investigating geological natural disasters.
2. to determine the standard of general investigation and the standard of processing mineral.
3. to determine the business work area criteria including distribution of electric power and mining.

4. to supervise geological basic surveys and groundwater on a smaller scale or equal to 1:250,000, to compile a "thematic" map and inventory of energy and mineral sources and geological disaster mitigation.

Another sectors related to mining activity are space layout and environment; the authorities of government on these sectors are:

1. to determine the national space layout in accordance with the space layout of Regencies/ Municipalities and Provinces.
2. to facilitate cooperation of cross provincial space layout.
3. to determine the control guidelines of natural resources and preservation of environment function.
4. to determine the standard quality of living environment and to determine the guidelines concerning pollutions on the living environment.
5. to determine the guidelines concerning the conservation of natural resources.

Province:

The authorization of Provinces as Autonomy Regions cover authorization in the field of government of a cross Regencies/Municipalities nature as well as authorization in certain other governmental fields, as outlined in Acts or other government regulations. Province can also carry out the authorization of Regencies/Municipalities in certain sectors and certain parts of the obligatory authorization under mutual agreement between Regencies/Municipalities and Provinces.

Related to mining sectors province has the authority as follow:

1. to provide support for development and utilization of mineral.
2. to grant core business permits for general cross mining of Regencies/Municipalities that cover exploration and exploitation.
3. to train and to research the field of mining and energy in Provincial areas.

The authority of province on planning sector and environmental sector that related to mining sector can be described as follow:

1. to determine the planning of Provincial areas based on mutual agreement between Provinces and Regencies/Municipalities
2. to supervise implementation of planning.
3. to control cross environment of Regencies/Municipalities.
4. to organize management of the environment in utilization of maritime resources 4 (four) miles up to 12 (twelve) miles.
5. to evaluate and to analyze the environmental impact (AMDAL) on activities with potential negative impact to the public, which location covers more than one Regency/ Municipality.
6. to supervise implementation of cross conservation of Regencies/Municipalities.
7. to determine standard quality of the environment based on national standard quality.

Local Government:

As the realization of Act No 22/1999 and GR No. 25/2000, President of Republic Indonesia issued Presidential Decree No. 5/2001 concerning the Implementation of Acknowledgement of Authorities of Local Government and supported by Ministerial Decree of the Ministry of Home Affairs No. 130-67/2002 concerning Acknowledgement of Authorities of Local Governments. The Ministerial Decree No. 130-67/2002 is the lists of government authorities in local level based on the letters from related ministries. Regard to the authority of local government on mining and mineral resources, the Secretary General of the Ministry of Energy and Mineral Resources issued the letter No. 3301/06/SJN.H/2001 on 13 September 2001, mentioned that all classes of mining as stated on Act No.11/1967 concerning Basic Principles of Mining are the authority of local government, except crude oil, natural gas, and radioactive minerals. These three kinds of mineral resources are still belonging to national authority.

The relationship among the three tiers of governments related to mining sector can be described in figure 5 as follow:

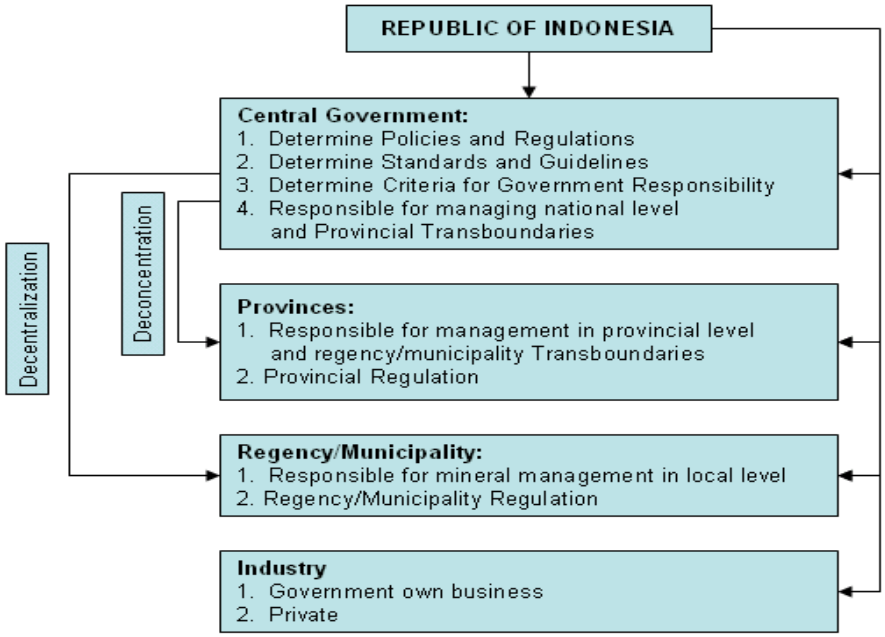

Figure 5. The Relationship among the three tiers of government in Indonesia

4.4.2 Others regulations related to mining policy

There are some regulations as prerequisites for conducting Class C mining industry in Indonesia. These regulations related to mining activity, environmental standard, health and safety job standard and permit process.

For mining activities and environmental standards, there are several principal regulations, those are:

- Act No. 23/1997 concerning Environmental Management
- Act No. 26/2007 concerning Spatial Planning
- GR No. 27/1999 concerning Analyses on Environmental Impact (EIA)
- Minister of the Environment Decree No. 17/2001 concerning the Types of Business/Activities Plans Which Must Be Accompanied with Analyses on Environmental Impact
- Ministry of Energy and Mineral Resources (MEMR) Decree No. 103.K/008/M.PE/1994 concerning the role of the Inspector from the Directorate General Mining in supervising Environment Management Plans (Rencana Pengelolaan

Lingkungan: RKL) and Environment Monitoring Plans (Rencana Pemantauan Lingkungan: RPL);

- Ministry of Energy and Mineral Resources (MEMR) Decree No. 1453.K/29/MEM/2000 concerning the Technical Guidance of Government Tasks on Mining Sector. This ministerial decree consist of 14 guidance that stated in the appendixes, such as requirement of mining permit, procedure for mining right, technical guidance for AMDAL/EIA, environment management proposal (Upaya Pengelolaan Lingkungan: UKL)/environment monitoring proposal (Upaya Pemantauan Lingkungan: UPL), reclamation fund, guidance on monitoring environment, health and safety job, guidance on monitoring exploration, exploitation and production of mining activities, forms of mining report, etc.

For safety and health standards, there are some standards for mining industry based on regulations as follows:

- GR No. 19/1973 concerning the Regulation and Supervision of Health and Safety Job in Mining
- MEMR Regulation No. 01/PM/Pertamb/1978 concerning the Supervision of Mine Dredging Work
- MEMR Decree No. 2555.K/201/MPE/1993 concerning the Implementation of Health and Safety Job and Mining Environment and Mines Inspection in General Mining
- Joint Decree of MEMR and the Minister of Manpower No. 1245.K/26/DDJP/1993 concerning the Supervision Implementation of Health and Safety Job and Mining Environment

Permit on Class C mining industry depends on the position of mining location; usually local government issued Local Mining Permit (Surat Ijin Pertambangan Daerah: SIPD) to the mining company. Based on Minister of the Environment Decree No. 17/2001 concerning the Types of Business/Activities Plans Which Must Be Accompanied with Analyses on Environmental Impact, Class C mining company that produces material more than 250.000 m3/year must prepare Environment Impact Assessment (EIA)/AMDAL documents consist of - Reference Outline, Environmental Impact Analysis (ANDAL), RKL and RPL. Mining company that produce raw material less than 250.000 m3/year has

an obligatory to arrange Environment Management Proposal (UKL) and Environment Monitoring Proposal (UPL).

AMDAL documents are open to the public. Review of EIA/AMDAL documents is carried out by a review team depends on the location of mining activity. AMDAL document consist of data collection and analysis of data on all physical aspects and issues, including climate, flora, fauna, soils, river flows, tides, waves, topography, and social studies on population, health, education, employment and religion.

Others regulations that must fulfilled by mining company are regulations related to local regulations and financial aspects, such as royalty, taxes, levy, and reclamation fund.

4.5 The development of alternative materials

Substitution of primary aggregate minerals with alternative materials for construction materials has been developed in Indonesia. Even though alternative materials development program is not explicitly stated in National Policy, some research institutions and some universities has already conducting researches on alternative materials. The achievements of alternative materials are:

- The use of tailings from PT. Freeport Indonesia for mortar concrete on bridge and road constructions. This program was held between PT. Freeport Indonesia and Institut Teknologi Bandung (ITB) in 1997. The tailings waste production (270.000 m3 or 90.000 ton/day) now become the usable construction materials to support the development in Papua Province[3]. In addition, Indonesia Mining Association reported that in 2001, tailings from PT Freeport Indonesia mining in Tembagapura was used as a basic material for concrete in the construction of the Mimika Regency Government Office Buildings[4].

- Indonesia has huge resources of waste material from natural or industrial sources. If it is not fully utilized, it will become bad impact to environment. Several universities in

[3] (see: Intisari on the net, http://www.indomedia.com/ intisari/2001/Mei/beton.htm).
[4] (see: http://ima-api.com/news.php?pid=910&act=detail).

Indonesia, such as: University of Diponegoro, University of Udayana, and University of Hasanudin, have been conducted researches on waste materials for pavement construction. The sources of waste materials for these researches are: fly ash, scrapped tire rubber (STR) and latex, coconut shell ash and coconut fiber, sugar mill residue ash, oil palm shell ash, marble ash, resin, rice hull, steel slag, and nickel slag. The results of these researches show that almost all of waste materials can be used for pavement constructions (Setiadji, B.H., 2005).

4.6 Main issues related to mineral extraction

In Indonesia, issues related to aggregate minerals extraction cover broad spectrum of aspects including culture, poverty, environment, safety, land use, and governance. In the next chapter, the description of issues around aggregate minerals extraction site will be elaborated.

4.6.1 Environmental degradation and the safety job of worker.

As mentioned before, there are three main types of mining in exploiting aggregate minerals in Indonesia, namely, traditional mining, small scale mining (SSM) and medium scale mining (MSM). The disorderly exploitation of aggregate minerals resources, such as sand and gravel resulting nature disaster like landslides along rivers and mountainous area that occur every year and take large numbers of life and damage properties.

National daily newspaper, Media Indonesia[5], reported that on May 2006, 11 sand miners with 3 excavators and 2 trucks belong to PT. Nyalindung in Bandung Regency was buried when excavating sand. In other newspaper, Republika daily[6], reported on February 2006, 4 sand miners of PT. Hasta Pasir died because of landslide in Sukabumi Regency, West Java Province and on March 2007, Republika daily[7] reported that one traditional sand miner died and buried under landslide when extracting sand in Cirebon Regency, West Java Province.

[5] (see: http://www.media-indonesia.com/berita.asp?id=99635).
[6] (see: http://www.republika.co.id/koran_detail.asp?id=283209&kat_id=89).
[7] (see: http://www.republika.co.id/koran_detail.asp?id=286573&kat_id=89).

4.6.2 Community resistance.

Mining industry is closely related to community around the extraction sites. The major issue that faced by the mining industry is community resistance. Community resistance at this moment and in the future will influence the activity of mining industry in Indonesia. One reason of community resistance is the feeling of local communities that they have sacrificed a great deal of their environmental amenities but received less from the development of mineral extraction in their areas. For example, on April 2007 Radar Banten Regional Daily[8] reported that in rock mining in Bojonegara and Puloampel District, Serang Regency, Banten Province, local communities and supported by NGO Rekonvasi Bumi asked for local government to stop mining activity in their areas. Even though the mining companies have legal permit, in practice they were ignoring environmental and socio-economic aspects related to community, such as pollution, infrastructure damage because of mining activity, and there was no community development implementation.

Another cases, mining activity related to land use issue, Media Indonesia[9] reported in Sumbersari and Mayang Districts, Jember Regency, East Java, hundreds of farmer were threatening to stop illegal sand mining that harm their paddy field. On July 2006, Kompas daily[10] newspaper reported that thousands of communities around Mount Merapi in Cepogo District, West Java, asked for the Regent of Boyolali Regency to close sand mining activity in their location because of the mining negative impact to their environment and threaten their water sources.

4.6.3 Government regulation and policy

The role of government in managing mineral resources related to policy and regulation on mining activity. Most of government policy emphasizes on environment, health and safety job, and government income, but less attention gives to social aspect. Social aspect in

[8](see: http://www.radarbanten.com/mod.php?mod=publisher &op=printarticle&artid=10768&PHPSESSID=6a4760454f8f6ce6a02eeda6c74a1eea,)
[9] (see: http://www.media-indonesia.com/,).
[10](see: http://www.kompas.com/kompas-cetak/0607/07/daerah/2791299.htm,)

policy framework is only in AMDAL/EIA study. Moreover, there is no obligation of mining company to employ local community and to implement community development.

In autonomy era the highest authority and responsibility is given to local government to manage mineral resources. The policy of local authorities is implemented through mining permit and financial aspects, such as tariff regulation on taxes and levies. Most of local governments emphasize on taxes and levies to enhance local revenues for their development. Furthermore the local governments have the right to supervise mining activity and make coordination with upper level, but they weak in the implementation (Setiawan and Hadi, 2007).

4.7 Relevant laws and regulation related to mining activity in Indonesia

Act:

1. Act No.11/1967 concerning Basic Principles of Mining
2. Act No. 5/1990 concerning the conservation of Natural Resources and its Ecosystem
3. Act No. 23/1997 concerning Environmental Management
4. Act No. 34/2000 Amendment to the Act No. 18/1997 on Regional Taxes and Regional Levies
5. Act No. 32/2004 concerning Regional Governments
6. Act No. 33/2004 concerning Financial Balance Between the Central and Regional Government
7. Act No. 17/2007 concerning Long Term National Development Plan 2005-2025.
8. Act No. 26/2007 concerning Spatial Planning

Government Regulation (GR):

1. GR No. 19/1973 concerning the Regulation and Supervision of Health and Safety Job in Mining
2. GR No. 27 /1980 concerning the Classification of Mining Substances
3. GR No.37/1986 concerning the Partly Delegation of Government Authority In Mining to Local Government
4. GR No. 27/1999 concerning Analyses on Environmental Impact

5. GR No.13/2000 Amendment of GR No. 58/1998 concerning Fee for non-Taxes State Income in Department of Energy and Mineral Resources.
6. GR No.25/2000 concerning the Government Authority and the Provincial Authority as an Autonomous Region
7. GR No.65/ 2001 concerning Regional Taxes
8. GR No. 75/2001 concerning Second Amendment on GR No. 32/1969 concerning the Implementation of Act No.11/1967 concerning Basic Principles of Mining

Presidential Decree

1. Presidential Decree No. 32/1990 concerning Conservation Areas Management
2. Presidential Decree No. 62/2000 concerning National Spatial Planning Coordination
3. Presidential Decree No. 5/2001 concerning the Implementation of Acknowledgement of Authorities of Local Governments
4. Presidential Decree No. 41/2004 concerning the Permit and Agreement of Mining in Forestry Areas.

Ministerial Decree

1. Minister of Energy and Mineral Resources (MEMR) Decree No. 2555.K/201/MPE/1993 concerning the Implementation of Health and Safety Job, and Mining Environment Mines Inspection in General Mining
2. MEMR Decree: 388.K/008/M.PE/1995 concerning the Guidelines of Arrangement on Environment Management Proposal and Environment Monitoring Proposal for Mineral Type C Mining Activity.
3. MEMR Decree No. 1211.K/008/M.PE/1995 concerning the Prevention and Remediation of the Impact and Environment Pollution from General Mining Activity.
4. MEMR Decree No. 1261.K/25/M.PE/1999 concerning the Supervision on General Mining Production.
5. MEMR Decree No. 1453.K/29/MEM/2000 concerning the Technical Guidance of Government Tasks in General Mining.

6. Minister of the Environment Decree No. 17/2001 concerning the Types of Business/Activities Plans Which Must Be Accompanied with Analyses on Environmental Impact

CHAPTER 5

COMPARISON ANALYSYS

This chapter will analyze the condition of aggregate mineral in the Netherlands and compare with Indonesian context to understand the characteristic of both countries. The result will be used for assessing the implementation of sustainability of aggregate minerals supply and the typology of sustainability. In the last part of this chapter, several lesson learned and possibilities policy transfer will be elaborated.

5.1 Comparing aggregate minerals condition

5.1.1 Aggregate minerals resources

Aggregates mineralization in the Netherlands are formed in the delta of several main rivers, while in Indonesia they are formed both on mountainous and rivers area due to magmatic arcs formation. Because of its process, the Netherlands provides mainly sand and gravel while Indonesia has all types of aggregate minerals.

Supply and demand of aggregate minerals in the Netherlands is carried out through the distribution of aggregate minerals intra and inter-province and their export-import within European countries. The distribution intra and inter province occurs due to limited and unevenly distributed of coarse sand and gravel rock resources within the province itself and among provinces. Although the unlimited resources of fine sand in the Netherlands give it chance to export the surplus, in the same time, this country should import its limited crushed rock and coarse sand from neighboring countries. Production restricted that applied by the provincial only for their own needed thus increasing total import of those minerals as well.

When export-import of aggregate mineral in the Netherlands is unavoidable, Indonesia can fulfill the total needed in national level by its own resources. Since the aggregate minerals are unevenly distributed among region, the distribution of those materials only occur inter and intra region.

Regard to aggregate minerals and alternatives materials data, the Dutch government has compiled all data about national aggregate minerals supply and demand. Actual data and trends of aggregate minerals supply and demand are recorded to predict the future need and as consideration for mineral policy

Meanwhile, the availability of aggregate minerals data in Indonesia is limited only for data production due to its requirement for determining tax production at local government. In fact that supply and demand data are very important to anticipate the diminishing of aggregate mineral reserve and to face the increasing of social resistance and environmental degradation in extraction areas, Indonesia needs to pile up the data at all level of government. Without relevant, realistic and acceptable aggregate minerals data, it is hard to identify presents conditions and to develop integrated mineral policies and mineral guidelines.

5.1.2 Aggregate mineral policy and implementation

Since the Dutch government policy of aggregate minerals is integrated in National Spatial Plan in 2004, the role of government on aggregate mineral was reduced then the supply and demand of those materials has been released to the market. This plan provides guidelines for the sustainability use of raw materials and multifunctional of extraction areas with considering some basic principles: the effects on the provision of surface raw material, geological occurrences, and combinations of raw material excavations with other functions. The guideline only consists of general policy of aggregate minerals. As consequence, provincial and municipalities could have different interpretation on this policy.

The sustainability use of raw materials that has been implemented till 2000s are: increasing economical use of raw materials as it shown by degrading the use raw of material per unit economic activity about 25%, increasing of recycled demolition waste up to 90%, the use of secondary materials and recycled materials reach to 20% from total infrastructure works, and promoting the use of renewable materials. The achievement of these policies has been supported by: some research programs, finance regulation,

communication with other stakeholders, and the banning regulation on recyclable materials.

The best practices of multifunctional extraction areas that have already implemented are combining extraction areas with: widening Meuse and Rhine rivers, recreation facilities in IJsselmeer region, and nature restoration in the municipality of Neerijnen, and Westelilijke Drutense Waard in Gelderland Province. The policies above can generate aggregate minerals production and also minimizing the society resistance.

Because of the massive aggregate minerals resources in Indonesia, the use of construction materials can be fulfilled by primary raw materials and no serious problem for the availability until nowadays. So, there is no government intervention on supply and demand mechanism in Indonesia. The central government through related ministries just provides some guidelines in term of national law and regulation. Since the autonomy era implemented in 2001, local government has a full authority on mining and mineral resources include aggregate minerals. As consequence, local government determines mining extraction zone, tax and levy, and so on based on those guidelines. The sustainability use of raw materials is stated implicitly on national guidelines and local government regulation, though the implementation is still rare. Therefore, Indonesian government can take several advantages from the Netherlands experiences regarding the sustainability use of aggregate minerals that might be applied in Indonesia.

5.1.3 Issues related to aggregate minerals extraction

The issues related to aggregate mineral extraction that might disturb the sustainability of aggregate minerals supply in the Netherlands are the reluctance of provincial government to issued extraction permit, community resistance and environmental issues regard to nature conservation areas. Because of limited resources of aggregate minerals especially gravel and sand, the provincial government restricts mineral extraction permit and aggregate minerals production based on its own region need. The high awareness of community disallow the extraction areas due to pollution and noise that annoying their amenities. Besides that, most of the environmental organizations refuse the mineral extraction sites on nature conservation areas.

Different from the Netherlands, the intense of aggregate mineral extraction in Indonesia has emerging several issues. The uncontrollable aggregate minerals extraction has causing the fast depletion of aggregate minerals resources, environmental degradation and high risk mining on safety job. Community resistance and conflict of interest with other sectors usually occur around the aggregate minerals extraction areas. These conditions are the main issues that can threaten the sustainability of aggregate minerals in Indonesia.

5.1.4 Stakeholders and its roles in aggregate mineral extraction

Stakeholders concerning aggregate mineral resources, consist of government and non governmental stakeholders, such as industrial association, environmental organization formed as NGO and local groups. Both Indonesia and the Netherlands almost have the same stakeholders as it mentioned above, though they have different role and responsibility in determining mineral policy.

At national level, the government institutions that have responsible on aggregate minerals policy in the Netherlands are the Ministry of Housing Spatial Planning and the Environment, the Ministry of Transport, Public Works and Water Management, the Ministry of Agriculture, Nature Management and Fisheries, the Ministry of Economic Affairs and the Ministry of Finance. They create national policies as a guideline for aggregate mineral development.

In Indonesia, the Ministry of Energy and Mineral Resources has main responsibility for mineral planning policy. The other ministries that involve in mineral extraction are the Ministry of Forestry regarding mineral extraction in conservation area and the Ministry of Environment regarding the guideline of environmental policy in mineral extraction such as AMDAL/EIA.

At regional and local level, the role of governments in mineral policy between the Netherlands and Indonesia are slightly different. In the Netherlands, regional level that consist of provincial government and Regional Directorates of the Directorate General of Public Work and Water Management have the authority on determining Regional Spatial Plan, including Regional Mineral Extraction Plans and mineral extraction permit. Local

government can make an objection to the provincial council or to the Council of State when the extraction areas are not consistent with Local Land use Plan. On the contrary, when the extraction zone has been incorporated in the Local Land Use Plan, the provincial government can protect these areas against developments which might obstruct mineral extraction in the future.

Meanwhile in Indonesia, local government (regency/municipality) has the authority in issuing extraction permit and in determining aggregate minerals extraction zones on its Local Land Use Plan. In case that extraction area lies on two or more regencies/municipalities, or the regencies/municipalities release their authority to the province due to the lack of capability, the province has an authorization in that extraction area

EIA/AMDAL is required for getting extraction permit both in the Netherlands and Indonesia. The differences are about tax and other financial aspects regard to extraction permit. In the Netherlands, the Ministry of Finance has an authority to determine tax on surface mineral raw and fee to state water due to mining in river areas. Meanwhile, in Indonesia, the authorization of tax and levy regarding mineral extraction belongs to local government.

The existence of non governmental stakeholders relates to aggregate minerals is important in the Netherlands. They play as a partner or an opponent face to the government policies. Part of stakeholders supports government policies by research cooperation and the implementation, while the others can make an objection to the court due to unsatisfied policies.

Non governmental stakeholders in the Netherlands consist of: study groups, environmental organization, local community and industrial association. Study groups that consist of universities and research centre, have contribution to research development, its implementation plan and the regulation of aggregate minerals. Industrial association provides aggregate minerals include secondary materials and renewable materials. Meanwhile environmental organizations often criticize the government extraction plan when the extraction site is in the nature conservation, and local communities and local

political groups impede the mineral extraction plan in their area as a community resistance (NIMBY=not in my backyard issue). The community resistance usually slows down the extraction permit.

In Indonesia, the non governmental stakeholders on aggregate minerals supply consist of mining companies, local miners, universities as research institution, environmental organization and local community. Mining companies and local miners have a role as the supplier of aggregate minerals. Universities are conducting researches on alternative materials including secondary materials and renewable materials. Environmental organization and local community usually relate to social and environmental issues in the extraction areas.

5.1.5 The summary of aggregate minerals condition

From the comparing analysis above, the summary of aggregate minerals condition in both countries can be seen in table 10 below.

Table 10. The summary of differences and similarities of aggregate minerals

Description	The Netherlands	Indonesia
Mineral resources	• fine sand : unlimited • coarse sand and gravel: limited • no crushed rocks • Not all regions have mineral resources	• Almost all province have aggregate minerals resources but unevenly distributed in local level
Supply and Demand	• Distribution intra and inter province and export- import of aggregate mineral with European countries, • Exported fine sand • Imported crushed rocks and coarse sand	• Aggregate minerals supply aims to fulfill the need of their own region and neighboring region
Data of aggregate minerals	• Actual data and trends of aggregate minerals supply and demand are recorded	• Lack of supply and demand aggregate minerals data (needs to invent)
Governmental level of mineral extraction permit authority	• Provinces and Regional Directorates of the Directorate General of Public Work and Water Management	• Regency/Municipality
Governmental level of planning guidance	• National level	• National level
Mineral Policy	• National Regulation • National Spatial Plan: ➢ Economical use of raw materials ➢ The use of secondary and recycled materials ➢ The use of renewable materials ➢ Multifunction of extraction areas • EIA	• National Regulation • Extraction permit • EIA
Main Issue	• Provincial and community resistance (Nimby issue) • Environmental issue	• Environmental issue • Safety and social issue • Conflict of interest • Community resistance
Stakeholders	• Government (all level) • Industrial association • Research institution • environmental organization (NGO) • Local groups	• Government (all level) • Mining companies • Local miner • Research institution • Environmental organization (NGO) • Local groups
The role of Stakeholders	• All stakeholders have contribution to mineral policy	• Government has the full authority on mineral policy

5.2 Comparing the sustainability on aggregate mineral supply

5.2.1 The implementation of sustainability principles on aggregate minerals supply

The implementation of sustainability principles on aggregate minerals supply closely related to the integration and the balancing among economic, environmental and social aspects. To ensure the achievement of sustainability objectives on aggregate minerals supply is needed a strong political will from the government and legitimacy through democratic process. In other word, the government should guarantee a good climate on mining activity that supported by mining company and other stake holders.

To measure the implementation of sustainability principles on aggregate minerals supply in the Netherlands and Indonesia, this thesis using the criteria from Shields and Solar (2000), concerning the sustainable development principles relevant to mining and mineral resources (see table 3).

Aggregate minerals are non renewable resources where their functions are unchangeable by others for construction materials. Achieving the sustainability on aggregates minerals supply means it take environmental concerns into account. A full costing principle of sustainability concepts is applied in the Netherlands where the extraction consider all aspects when making a decision, not only economic but also social and environmental aspects. It is implemented in National Spatial Plan regarding surface raw material. Furthermore, the implementation of environmental regulation, monitoring and evaluation on mining site in the Netherlands is applying the precautionary principles for achieving sustainability in the Dutch country.

Prudent way in extraction aggregate minerals without harming the environment (eco-efficiency) and keep it within its carrying capacity is very essential for ensuring the sustainability. It has already implemented in the Netherlands by protection aggregate mineral zones, controlling the production and the extraction area of aggregate minerals. Others policy are multifunctional use of mineral extraction with other sectors and implementing Environmental Impact Assessment (EIA) on mining site before extracted and extended the extraction area.

The sustainable use of aggregate minerals is another choice to minimize the depletion of aggregate mineral in general. In the Netherlands, the sustainable use of aggregate minerals policy is applied through increasing the economical use of aggregate minerals, and the use of secondary materials, recycled materials; renewable materials and using high quality aggregate minerals for lengthen the use of building. In the same time, the regulation of tax for demolishing and construction waste, as an implementation of 'the polluter pay principles' produce more recycled materials. The implementation of these policies can reduce the use of primary aggregate minerals. Indirectly, it ensure the availability of those resources for next generation to achieve inter generational equity and justice.

The implementation of sustainability principles needs the support of all stakeholders to put it into practice. Therefore, the role of stakeholders is very important to realize those principles. In the Netherlands, public participation in aggregate minerals is very advance that involves all stakeholders to participate actively and build the consensus in determining mineral policy. The stakeholders come from environmental and industrial associations, local groups, and study groups of surface raw materials. Education regard to the sustainability use of aggregate mineral is provided through the implementation of alternative materials by research and construction projects. It has communicated among stakeholders; furthermore it will build good institutional capacity with or without coordination by the government. Lesser the governmental role in supply and demand but still emphasizing on the development of alternative materials and researches for product innovation through some regulation is support sustainability ways in the Netherlands as well. Finally, the independency of this country to manage its own resources without the intervention from others country, followed by good political will from all stakeholders and legitimacy of the governance is a whole framework of sustaining aggregate mineral in the Netherlands.

In Indonesia, the implementation of sustainability on aggregate minerals supply is not aside from the role of the government as policy makers. The efforts formed by the implementation of environmental regulation, such as the obligatory of mining companies to conduct Environmental Impact Assessment (EIA) before they start the aggregate

mineral extractions. This is the implementation of the precautionary principles in managing aggregate mineral resources and shows the integration between environment and development. In addition, tax and levy from aggregate mineral productions are implemented as 'the polluter pay principles' (White, 2007), hence it is expected resulting the more efficient resources exploitation and can minimize the pollution. There is no government regulation on aggregate distribution to fulfill the intra generational need of aggregate mineral. However, it is not become a problem until nowadays due to massive deposit of aggregate minerals in Indonesia.

Although some principles of sustainability are applied in the regulation in Indonesia, several problems occur in mining activity concerning environmental degradation, safety job and pollutions. Abrasion along riversides due to gravel extraction, deepen and broaden river due to sand extraction, silting up in the lower river area, and increasing turbidity, all situation affect to alteration of waterscape and damaging river ecosystems. In mountainous areas, landslides, buried mining workers, and conflict of interest are the main problem in managing the resources. Moreover, local community resistance increases in surrounding extraction areas due to the negative impact of mining activity through the environmental degradation and damaging infrastructure. These problems above happen because of the not fully implemented of eco-efficiency and full costing principles in Indonesia.

The conditions on aggregate minerals extraction are worsen by several mining industries that do not apply standard operation of mineral extraction, safety jobs and EIA procedure stated by the government. Moreover, illegal mining by local people without considering the environmental aspect and the standard of safety job add many environmental problems in aggregate mineral extraction in Indonesia. Furthermore, the weaknesses on controlling the production, monitoring and evaluating the extraction area, and low of law enforcement cause the environmental damage still continuing until present time. As a consequence, decreasing carrying capacity and exhausting of the natural resources occur as the contrary of sustainability principles. Then continuity of aggregate minerals supply in the future will be threatening.

Some restorations of previous aggregate extraction in Indonesia still not in proper way too. As a result, abandon opened big hole and remain steeply slope threatening local people

life. No cover vegetation decreases water reservation as well. All problem above show no implementation on inter generational equity and justice principle in aggregate mineral management in Indonesia

Public participation in governance and cooperation is one of the most important principles of sustainability development in socio-political view. Relate to aggregate mineral extraction, government has dominant authority in determining the regulation and socialize it to other stakeholders. Beside the government, there is no multi stakeholder approach in determining mineral policy. Public participation is very low and limited only in monitoring aggregate mineral. Low of community participation is added by no consensus building mechanism, and reluctance of local community on aggregate mineral extraction tends to increase.

5.2.2 The summary of the implementation of sustainability principles on aggregate mineral resources

According to Van Pelt, *et al* (1992), the implementation of sustainability can be measured by assessing the difference between normative and actual condition, or in simple approach, sustainability can be determined by a binary scale. The binary scale is only considering two possible outcome, that is, first: "the sustainability condition is complied that marked by (+)"; or second: "the sustainability is not complied that marked by (-)". Combined with sustainable development principles relevant to mining and mineral resources by Scholar and Shields (2000), the implementation of sustainability of aggregate mineral supply in the Netherlands and Indonesia can be summarized in table 11 and 12 as follows:

Table 11. The implementation of sustainability aggregate minerals in the Netherlands

Criteria	Implementation (+/-)	Description
Basic SD Principles		
- Human needs paramount/ satisfaction of basic human needs	+	Supply and demand of aggregate minerals is released to market, the shortage of aggregate material is fulfilled by import mechanism
- Integration of environment and development	+	The requirement to fulfill EIA study in aggregate mineral extraction permit
- Inter-generational equity and justice	+	Restriction on the aggregate extraction only for their own region and Protection on Aggregate minerals zone
- Intra-generational equity and justice	-	There is no government regulation on aggregate distribution. The mineral extraction policy depend on provincial policy, and most of province only fulfill their aggregate mineral own need.
Environmental SD Principles		
- Keep within the Earth's carrying capacity	+	Controlling on the limited resources such as gravel and coarse sand
- Non-exhaustion of natural resources	+	Controlling on the limited resources such as gravel and coarse sand
- Minimize the depletion of non-renewable resources	+	The implementation of national policy on aggregate mineral : The economical use of aggregate mineral, the use of secondary and recycle material, and renewable resources (wood)
- The precautionary principles	+	Implementation on environmental regulation, monitoring and evaluation on mining site
- The polluter pays principle	+	Taxation on waste construction material
- Eco-efficiency	+	Prudent way in extraction of aggregate minerals without harming the environment, multifunctional of aggregate minerals extraction
- Full costing	+	Considering all benefit and cost of direct and indirect aspect, not only economic aspect, but also environmental and social aspect when making decision.
- Environmental Impact Assessment	+	The implementation of EIA on mining site before aggregate mineral extraction and extended the area of mineral extraction.
Socio-political SD Principles		
- Public participation in governance/cooperation	+	All of stakeholders has a right to involve in determining mineral policy and monitoring aggregate mineral extraction activity
- Multi-stakeholder approach/partnership	+	Stakeholders that involve in determining mineral policy : Environmental associations, local groups, industrial associations and organizations, and study groups on surface raw materials.
- Communication and education	+	Communicating and implementing the result of alternative material research in building and construction projects
- Consensus building process	+	All of stakeholders has a right to involve in determining mineral policy
- Increased regulation	+	Lesser governmental role in aggregate mineral market, but emphasize on development of alternative materials such as secondary/recycle and renewable material, and research for product innovation.
- Institutional capacity	+	Good coordination among government institution and others stakeholders
- Sovereignty over resources	+	There is no intervention from others country or organization on managing mineral resources

Table 12. The implementation of sustainability aggregate minerals in Indonesia

Criteria	Implementation (+/-)	Description
Basic SD Principles		
- Human needs paramount/ satisfaction of basic human needs	+	Supply and demand of aggregate minerals is released to market mechanism
- Integration of environment and development	+	The requirement to fulfill EIA study in mineral extraction permit
- Inter-generational equity and justice	-	Weaknesses on controlling aggregate mineral extraction
- Intra-generational equity and justice	- (*)	There is no government regulation on aggregate distribution. The mineral extraction policy depends on local level policy.
Environmental SD Principles		
- Keep within the Earth's carrying capacity	-	Weaknesses on controlling aggregate mineral extraction
- Non-exhaustion of natural resources	-	Weaknesses on controlling production of aggregate mineral
- Minimize the depletion of non-renewable resources	-	There is no policy on alternative materials construction
- The precautionary principles	+ (**)	Implementation on environmental regulation, monitoring and evaluation on mining site
- The polluter pays principle	+	Taxation, levy
- Eco-efficiency	-	There is no policy
- Full costing	-	There is no policy
- Environmental Impact Assessment	+(**)	The implementation of EIA on mining site before aggregate mineral extraction and extended the area of mineral extraction.
Socio-political SD Principles		
- Public participation in governance/cooperation	-	public participation limited on monitoring aggregate mineral extraction
- Multi-stakeholder approach/partnership	-	Lack of multi stakeholder approach in determining mineral policy
- Communication and education	+(**)	Socialization regarding mineral policy and regulation from government to stakeholders
- Consensus building process	-	There is no consensus building mechanism
- Increased regulation	+	Decentralization authority on mineral policy
- Institutional capacity	-	Government has dominant authority, lack of coordination among government institution
- Sovereignty over resources	+	There is no intervention from others country or organization on managing mineral resources

Source: compiled by author

Note: (*) : not essential at this time/need for future development

(**) : partly implemented

5.2.3 Typology of sustainability

As it mentioned in chapter 2, the application of the sustainability of mineral resources can be determined by the changing of capital utilization. The use of primary aggregate minerals for construction material can not be avoided due to the need of these materials in huge amount and unchangeable for the development. Hence, the extraction of aggregate minerals both in the Netherlands and Indonesia can be classified as weak sustainability. However, based on Turner's spectrum typology of sustainability, there are the difference degree of weak sustainability between the Netherlands and Indonesia. In the Netherlands the implementation of sustainability on aggregate minerals can be classified and tend to accommodating weak sustainability, meanwhile in Indonesia it can be classified and belong to cornucopian weak sustainability.

Government policy on aggregate mineral mining in Indonesia tends to the growth oriented model. In line with decentralization authority, local governments try to enhance total revenue from all sectors, including tax and levy from mineral sector. The more taxes and levies can be achieved, the more money can be provided for development. It is pictured by mining permit that only considering the total area of mining without considering the ability of mining company to manage extraction site. As it shown in Chapter 4, there are unbalancing between environmental, socio, and economic aspects regarding aggregate minerals development. The economical aspects put in the first priority without ensuring the impacts of mining to the environment and assuring the safety job of labors in the aggregate minerals extraction. In addition, releasing supply and demand of aggregate mineral to market mechanism thus no government involvement to ensure the sustainability aggregate minerals supply, put aggregate minerals management in Indonesia on cornucopian type of weak sustainability.

In the Netherlands, mining permit and determining extraction sites are mainly an authority of provincial government and the Directorate General of Public Work and Water Management. However, objections can be made by local government (municipality) when the extraction site is unsuitable with local land use plan. Otherwise, provincial governments will determine the areas as extraction zones and they can protect those areas

against the development to ensure mineral extraction in the future. Another difference is that the extraction areas should be multifunctional that combine with other development activity in order to grade up spatial quality. The present situation of aggregate mineral development shows the integration among economic, social and environmental functions. Beside produce aggregate minerals, the extraction areas are functioned as recreation areas and housing on water front. As environmental function, the extraction also regard with natural conservation and water management. These examples show that aggregate mineral management in the Netherlands can be classified as accommodating weak sustainability.

5.3 Lesson learned and possibilities of policy transfer

Basically, there are many differences of aggregate minerals extraction condition between the Netherlands and Indonesia, among others, regard to the availability of resources, government policies and stakeholders involvement in managing aggregate minerals.

Although Indonesia and the Netherlands have different problem regarding aggregate minerals condition, some positive aspects of the Dutch's policies and experiences in managing aggregate mineral resources can be learned and adopted in Indonesia to enhance the performance in managing aggregate mineral resources and to ensure the sustainability of aggregate mineral supply in the future. The positive aspects that can be learned from The Dutch policies and experiences are:

1. Management of aggregate mineral resources.

The fundamental aspect that distinguishes management aggregate mineral resources between the Netherlands and Indonesia is public involvement in aggregate mineral development.

Involving local community on regional land use plan and aggregate mineral zoning can minimize community resistance during and after extraction in the Netherlands. On the contrary, the lack of socialization on land use plan causes low community involvement happen in Indonesia. The extraction activity merely involves government and mining company without considering the objection of local community. In fact, Indonesian

government has issued the regulation on public involvement in determining local land use plan. In the newest regulation, Act No. 26/2007 concerning Spatial Planning, the community has the right and responsibility regard to spatial planning (section VIII, article 60-66). Thus, community involvement in spatial planning is guaranteed by law. The problem is the lack of community involvement from the beginning of program includes determining the aggregate mineral zone. Consequently, it could enhance the chance of community resistance in extraction area. This evidence suggests that community involvement is very important for determining land use plan hence Indonesia can take this experience from the Netherlands.

Another lesson from community involvement in the Netherlands is related to extraction mining permit. Indonesia can adopt the Dutch experience in case of stakeholder involvement start from the beginning of extraction plan. This case could lengthen the processing permit; but it can minimize conflict of interest among mining company, local community and the environmental organization. As a consideration, high awareness of Dutch community regard to environment, including mineral extraction, had been emerge since 1970s and almost 25% of citizen have participated in environmental organizations.

In the Netherlands, once the extraction zone has been incorporated in the Local land Use Plan, the provincial government can protect these areas against developments which might obstruct mineral extraction in the future. This regulation also stated in Indonesian Spatial Planning Act (Act No 26/2007). In case government officer issued development permit inconsistent with local land use plan or the community built in protection areas, they could be punished and fined based on this regulation. In fact, development by the community in extraction area still continues without adequate law enforcement. Therefore, it is need consistency on implementing the regulation from the government, communicated it to the stakeholders and law enforcement to the lawbreaker relate to land use plan.

Beside that, it is important for each region in Indonesia to provide data on aggregate mineral including potency, supply and demand, and alternative material used. Recognizing the potency of aggregate minerals is important to determine aggregate mineral zoning as part of local land use plan. Meanwhile supply and demand data is

needed for determining aggregate mineral production and predicting the trend of aggregate mineral consumption in the future.

2. Promoting the sustainable use of aggregate mineral

Due to the limited resources of aggregate minerals, high community resistance and the reluctance of provincial governments to issuing mineral extraction permit in their areas, the Dutch government creates several policies to ensure the sustainability of aggregate minerals supply. The policies emphasize on the use of primary aggregate minerals in efficient way and on the use of alternative materials as construction materials for infrastructure works. As stated in the Dutch National Spatial Plan, these policies are promoting the economical use of raw materials, promoting the maximal use of secondary materials and recycled materials, and promoting the use of renewable materials. Several programs have been conducted to support those policies, among other: research programs on the economical use of materials, alternative materials, and methods to produce primary materials with less societal resistance; communicating the results of researches to all stakeholders, implementing the program on infrastructure works and; create regulation for the banning of land filling with recyclable materials; and waste material taxation.

Although Indonesia has huge of aggregate mineral resources, it is important for Indonesia to manage its resources to guarantee the sustainability of aggregate minerals supply for the rapid development. The intense of aggregate mineral extraction without considering economic, environmental and social aspects threaten the sustainability of aggregate minerals supply in the future.

The policy and experience of the Dutch government, relate to the sustainable use of aggregate mineral, can be adopted as a national program in Indonesia. It intends to guarantee aggregate mineral supply for the development as well as to reduce the depletion on aggregate mineral resources. Although the sustainability use of aggregate mineral is not stated in national policy yet, the possibilities of using alternative material should take into consideration. It has been anticipated by several universities through some researches on secondary and waste materials. Due to the reason above, Indonesian government needs to cooperate with research institutions and mining industry associations conducting the

research about alternative material and its implementation based on potencies in each region. To support the use of recycled material, the government can create taxation and banning regulation on recyclable demolition and construction waste materials. Besides, the government has to encouraging people to use renewable materials based on their local knowledge such as the use of bamboo, wood and coconut tree as construction materials. The research institutions can support it through some research about the utility, the strength and the design construction of those materials. Those researches will change the paradigm of community that depends on concrete building to the use more of renewable materials in their building. In the same time, the government should create policies to guarantee the availability of those renewable materials and publicize the result of research above to the community.

The availability, accuracy and relevant data about alternative materials based on local potencies are very important to achieve the sustainable use objective above. It is the government's duty to provide it.

3. Combining aggregate mineral extraction with other function.

Following sustainability principle, the Netherlands has carried out upgrading spatial quality on aggregate mineral extraction area through combining it with other functions such as river engineering, recreation and nature conservation. Besides producing aggregate mineral, this program also can decrease community resistance in extraction area.

Comparing to Indonesia, aggregate mineral resources in the Netherlands form along the downstream of the rivers while aggregate in Indonesia mainly lie on mountainous area or the upstream area. Due to the differences, it is difficult for Indonesia to adopt its multifunctional program directly from the Netherlands. Some possibilities programs that can be applied are restoration after used extraction area. Actually, the restoration program should be stated in Environmental Impact Assessment (EIA) before operating the extraction. In the reality, some industrial mining ignore it although reclamation funds had been stated. If the restoration did consistently, thus environmental impact relates to aggregate minerals extraction such as landslide and big hole can be minimize. The restoration can be implemented with return the landscape after extraction activity to its former state or better condition.

CHAPTER 6

CONCLUSION AND RECOMMENDATION

6.1 Conclusion

Aggregate mineral resources are non renewable material where their existences are unchangeable for construction materials until nowadays. The exploitation on those minerals has been continuing thus the sustainability on aggregate mineral belongs to weak sustainability. Consequently, the utilization of those materials should be managed in prudent way to retain the availability in the future.

Both the Netherlands and Indonesia have been implementing some aspects of sustainability in the different ways, not only the resources itself but also policy and implementation, issues surrounding aggregate minerals till public participation on those resources. However, the Netherlands has implemented the aspects of sustainability more advance than Indonesia; hence Indonesia can take some positive aspects from the Dutch country.

The limited resources of some aggregate minerals face to rapid development on this country enforce the Netherlands exploring alternative materials as substitution relate to aggregate minerals. The policy on the sustainable use of aggregate materials has been implemented and supported by all stakeholders. In additions, the efforts to extract the aggregate minerals simultaneously with upgrading spatial quality, it has been applied also by the Netherlands through multifunction of extraction area. All above put the Netherlands in accommodating weak sustainability based on typology of sustainability by Pearce and Turner.

To fulfill construction materials for development, Indonesia still emphasizes on exploitation of aggregate minerals. The economical aspects still put in the first priority and it is worsened by lacking the consideration of mining impacts to the environment. Meanwhile, the used of alternative materials as substitution is not implemented yet, although the direction towards its sustainability has been anticipated by research

institutions. Those evidences suggest that Indonesia just belongs to cornucopian weak sustainability.

Based on implementation analysis on aggregate mineral, some weaknesses that happened in Indonesia that could be the strength aspects of the Netherlands are public involvement, increasing the sustainable use of aggregate minerals and upgrading spatial quality. Indonesia can enhance public involvement start from determining land use plan, mining permit and monitoring mining activity. It can reduce community resistance faced to continuing production activity and in the same time, it can control mining activity to minimize environmental degradation that could obstruct the sustainability of aggregate minerals supply.

Regard to the sustainable use of aggregate minerals that have been implemented in the Netherlands through promoting the economical use of aggregate minerals and using alternative materials, Indonesia can adopt this policy as a national program. It preserves through intensified research and the implementation about the efficient use of aggregate mineral and the use of alternative materials (secondary, recycled and renewable materials) based on local potencies. It is the government's duty to ensure the implementation by community throughout the country.

Upgrading spatial quality through multifunction of extraction area in the Netherland is hardly implemented in Indonesia due to different condition. However, Indonesia could enhance spatial quality in extraction areas through restoration.

All in all, the implementation of on sustainability concept from the Netherlands that can be adopted in Indonesia is expected able to enhance the sustainability use of aggregate mineral and ensure the aggregate supply for the next generation.

6.2 Recommendation

From the previous discussions in chapter five, there are some lesson learns from the Netherlands policies and experiences that might be useful to be adopted in Indonesia in order to maintain the aggregate mineral resources. In the end part of this thesis, three main recommendations are identified that suitable with Indonesian context and can be implemented to support the national policy and to achieve the sustainability of aggregate minerals supply:

1. Aggregate mineral resources management

Regard to aggregate mineral resources management, central government and/or local governments should conduct the geological research to identify the types and reserves of aggregate mineral in each region. This research is useful to know the carrying capacity of the resources and to determine the mineral aggregate zones in local land use plan. The local land use plan has to be communicated clearly before and after legalization process to the communities. More over, community's involvement from the beginning of program/project can enhance their responsibilities and minimize the community resistance on aggregate mineral extraction.

Aggregate mineral extraction permits that are issued by local government must be consistent with local land use plan and other environmental regulations. Socialization of mining regulation and best practice of mining management to mining companies and local miner can reduce accident risk on mining and lessen environmental degradation. Besides that, local governments have to pile the supply and demand of aggregate minerals data, not only on primary aggregate mineral but also on alternative materials to ensure the availability of aggregate mineral for the development and to predict the need of aggregate mineral in the future.

2. Promoting the sustainable use of aggregate mineral

The sustainable use of aggregate mineral can be adopted as a national program and has to be supported by local government. The regions in Indonesia have a big diversity regard to

the aggregate mineral resources and its alternative materials. The use of aggregate minerals as construction materials should considering the resources in their region. The optimal use of their own resources can reduce the economic cost and minimize the external effect of its transportation. This concept will support the sustainable use of aggregate mineral.

The other concept of the sustainable use of aggregate mineral is the economical use of aggregate minerals, and the use of the alternative materials for construction works such as secondary materials, recycled materials and renewable material. These concepts need several government policies, among others:

- Data collection of the types and the quantity of potential sources that can be used for secondary materials and recycled materials in each region.
- The intensive research on the use of alternative materials and on the economical use of primary aggregate minerals that suitable for each region without ignoring the strength and the durability of the construction. The research can be conducted by government research institution or joint cooperation with other research centers.
- Socialization and implementing the results of research on the use of alternative materials and the economical use of primary aggregate minerals for infrastructure works.
- Empowering and supporting local people to use their local knowledge on renewable materials, such as wood, bamboo and coconut tree for construction materials. Changing the paradigm of community that depends on concrete building to the use more of renewable materials in their building.
- Taxation and banning regulation on recyclable demolition and construction waste materials as land filling materials especially in big cities such as Jakarta, Bandung, Surabaya, and Medan.

3. Upgrading the spatial quality on aggregate mineral areas

The worse image of environmental quality is embedded on aggregate minerals extraction. The environmental degradation inherently occurs during the extraction activity and after use of mining activity. In the Netherlands, to up grade the spatial quality, the combination

between extraction aggregate minerals and other functions is implemented. However, in Indonesia context, this policy is hard to be implemented. To minimize the bad impact on environment and to enhance the spatial quality on after use extraction sites, several alternatives that suitable in Indonesia:

- The strict implementation and law enforcement of the environment and mining regulations including restoration on after use of mining activity. The application of restoration based on the landscape condition, such as restoration to agriculture, restoration to fisheries, restoration to forestry, and restoration to urban development.
- After use aggregate minerals site for nature conservation, for research and education on geological study as well as for geological training sites.

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