Spatial Environmental Quality in Restoration of Mineral Extraction Areas in Indonesia

(Lessons Learned from the Netherlands)

THESIS

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Abstract

The content of this research mainly talks about the restoration in mineral extraction areas. This research use the literatures review as methodology. It describes the condition of Mineral extraction Areas both in Indonesia and the Netherlands. Talking about the way of restoration of mineral extraction areas are working. The objectives are to understand spatial quality approaches in environmental context regarding restoration concept of mineral excavation areas and to learn experiences from other country in this case, The Netherlands. This study mainly discusses about environmental quality, spatial plans, and restoration. The integration of *environmental quality* and *spatial aspects* to conduct *restoration* is an important notion in this research. It illustrates to what extent Indonesia and the Netherlands have done restoration in mineral planning, the general condition, the practices, and the regulation. Based on criteria and indicators of those aspects an alternative concept for restoration proposes. Indonesia and the Netherlands have conduct several efforts for this matter, there are problems and challenges to make this program run in proper way.

Keywords: *restoration, mineral areas, spatial, environmental quality, criteria and indicators, Indonesia, Netherlands*

Preface

Minerals are crucial components of development; it supports activities of people in the world. On the other side the need to reserve the environmental quality becomes important issue which must be achieved. Due to that fact it is arguable that the effort for enhancing the quality of environment should be done. Restoration mineral extraction areas might become sort of solution for this problem. And one of the approaches is the integration of spatial aspect and environmental quality.

By this chance, firstly I would like to express my deep gratefulness to Allah SWT for blessing me with the health and opportunity to continue my study. Without His blessing, it is impossible to do everything.

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Chapter I

Introduction

1.1 Background

Mineral materials are essential thing in many countries in the world both developing countries such as Indonesia and also developed countries such as European Countries and USA. Certain sectors are mainly dependent to the existence of mineral materials. One of the sectors is construction and building industry. Rapid developments of this sector require availability of mineral material particularly gravel, clay, sand, and limestone. Almost all of construction and building industry development use those materials for structuring their infrastructure. The development of new infrastructure such as housing, road, hotel, market spread out in the areas. It absorbs a large amount of mineral materials. Beside that, the use of fuel for supporting daily activities also becomes one crucial use of mineral materials in development. Manufacture, transportation, and other industrial sectors are really dependent with this kind of minerals.

As the result of that growth development the demands for mineral material increase day to day. Areas with rapid development show high demands of mineral materials. This increasing significantly affects the condition of mineral excavation. Due to obtaining for these needs, the growth of mineral excavation or extraction raise to the high level. It stimulates the extension of excavation areas. Many extraction areas were opened; and mitigation for searching new mineral extraction sites is intensively conducted in order to supply those demands. It looks all countries or areas compete to seek the new areas for mineral excavation**.**

Big expansions in mineral excavation in one side stimulate the growth of development but at the same time it also brings several problems. One of the main problems is environmental degradation. Many areas where minerals excavation conducted suffer serious problems of the damage of their nature condition. Pollution is one of the environmental degradations which can be seen directly. It is including

water and air pollution, habitat degradation, and decreasing quality of soil. Meanwhile the indirect impacts are the decreasing certain spatial function of the land, it occurs in nature conservation, vegetation, green space, and residential site. Another impact is social unrest. Mineral excavation in certain areas sometimes stimulates illegal activity of mineral activities. Clive Aspinal (2001) said "*Illegal miners conduct their work without any care for the environment; they also make big problems to legal miners operator and government"*. Especially for the former areas of mineral excavation, the condition where mineral extraction was done is extremely worst. Many huge holes surrounding areas become new lakes with very bad condition. The lost of vegetation and sometimes for the quarry nearby sea is also make abrasion in coastal areas.

It is arguably that mineral excavation activities bring a dilemmatic situation for people. In one side it is very crucial for supporting the development. But, on the other side those activities lead to drop off the quality of environment. Facing this problem the important thing should be done by the people is to make a sort of approaches for balancing the condition. So, the mineral excavation activities can be run with minimum bad impacts to environment. Several efforts are necessary to perform in order to make the condition better in the future.

Case of Indonesia

The condition of mining activities in Indonesia is not really far to the condition which already explained previously. As a leading mining country in Asia especially in tin, nickel, copper-gold and coal mines (Clive Aspinal, 2001) Indonesia face problems of environmental degradation which influenced by mineral excavation activities. It stated in Government document *Penanggulangan Masalah Pertambangan Tanpa Ijin, (PETI)*. Ref: Research Task V and VIII. Clive Aspinal, (2001) explained the impact on the environment and health in Indonesia:

1. *destroy the living environment*
2. *destroy riverbanks, and pollutes river water*

3. *Tailings piles, pit, and quicksand*
4. *Mine Accidents*
5. *Waste Mineral Resources*
6. *Anarchy*
7. *Social Unrest*

One of examples of environmental disaster due to uncontrolled mining in Indonesia is the Areas of Bangka Belitung. The condition of soil turns until very bad condition. Big holes with standing turbid water, unproductive land, dirt resembling deforested can be seen everywhere. The destruction also spreads out to the sea. The impacts are abrasion in coastal area and the damage of coral reefs (Clive Aspinal, 2001). This condition happens in Bangka Belitung because there is inadequate treatment for reclamation or re-vegetation, in other word restoration plan for that area is not prepared properly. Now many people left this area in such a worst condition. It becomes unproductive land with desperately scenery.

Experiences in other countries

In the global context the problem of the impact of mineral excavation is not strange topic. This issue already becomes one of common issues in the world. The environmental degradation as the impact of mineral excavation activities also occur. Bert van der moolen and Rob Wolters (1999) said about the impacts of excavation in Europe. In some European Countries such as the Netherlands, UK, Belgium and Spain excavation activities have produced the changes of the landscape appearances. It occurs greatly and eternally in several regions. Many public facilities and nature conservations have vanished or situated in a scare condition. Moolen (1995) explained that for a quite long time (beginning in 1970) 1,000 ha areas in the Netherlands have been conquered by excavation activities. And about a half of those land altered into water areas eternally. Due to the lack of awareness of the people about restoration scheme, they left the areas without considering about treatment for nature conservation and environmental quality enhancement.

This general condition makes several countries try to solve these problems. Some of European countries conduct some restoration efforts for obtaining environmental quality. Van der moolen and wolters (1999) explained some cases in their article. One of good examples to shows endeavor for restoration is in Westerlijke Drutense Waard, an area in the province of Gelderland the Netherlands The amalgamation of two activities; mineral excavation (sand and clay extraction) and nature restoration can be carried out simultaneously. The relationships give positive impact to both interests, a mutual connection. The mixture of mineral extraction and nature restoration also conducted in the similar project which sited in the municipality of Neerjnen (also part of Gelderland Province). Another good example is in United Kingdom (the sevenoaks National wetland Reserve in Kent Wool Hampton (a gravel–extraction area which changed into waterfowl and wetland reserve) and river kennet in Berkshire and the Brecks in Cambridge and Suffolk (an ecological corridor for specific bird which predicted will be extinct) developed from former area of gravel pits.

United Kingdom also conducts some work for restoration of mineral excavation. This country have some experiences in changes mineral excavation areas into other spatial functions in several programs (SPA Savery in UK Quarrying industry-conservation and restoration, 1998), as mentioned below:

- *Restoration to agriculture*
- *Restoration to forestry*
- *Restoration to recreation and leisure*
- *Restoration to nature reserve wetlands*
- *Restoration to urban development*

In the Netherlands there are some areas which have mineral excavation activities spread out in Limburg, Friesland, Drenthe, Gelderland, and North Brabant. The study of B. van der Moolen (1995) describes that each areas has own characteristics and different perception in living environment. This condition makes the approaches for restoration also different. This study shows that it is important to know the

characteristics of the quarry areas where some programs of restoration will conduct. It is essential to consider two important aspects: the role of inhabitants in planning process and the meaning of compensation for successful restoration programs.

Environmental Context

The concern to the problems of this environmental degradation is very essential thing in order to perform sustainable environment. Regarding this problem it is crucial put environmental context, a basic framework. In the environmental context environmental quality is the main point. Voogd (1994) said that environmental quality is a concept with related to sustainability, beauty, security, vitality, diversity, amenity, health, and functionality.

The concept of sustainability in this point is closely related with resources consumption, Herman Daly (1990) explained about these useful rules:

1. *On non-renewable resources (e.g oil, natural gas) it should be estimate that the use of this materials is not more or not faster than the substitution by renewable resources.*
2. *On renewable resources (e.g fish, finder) it should be measure the use is not more and not faster than nature ability of regeneration*
3. *Do not exceed the natural absorption and degradation*

Another term from secretary of state for the environment the United Kingdom about restoration and after care solutions is:

> *Restoration and aftercare should preserve or enhance the long-term quality of the land worked for minerals so there is no net loss of land for use by future generations and the community is provided with an asset of equal or added value (secretary of state for the environment 1994a, Para 18.25)*

Restoration program conduct from the first plan until the end of mineral activities, the concept of mine closure is really important especially for mining company, Tad Szwedzicki (2001) explained how to achieve successful mine closure.

The following objectives must be addressed:

- *Protection of the remaining mineral resources.*
- *Ensuring high health and safety standards during decommissioning and post mining operations.*
- *Minimizing of the environmental impact on the site and out the site.*
- *Meeting expectations of the affected communities.*

1.2 Research Problems and Objectives

The condition of former mining areas in Indonesia is really bad. It happens because inadequate good approaches for solving after mining activity. The assessment of the pre, under, and post activity extraction does not meet the standard of environment quality. A good concept of restoration should be proposed in order to make the after care of mining areas activities run in proper way.

The aim of this research is a gaining theoretical framework for a restoration concept of mineral areas. Other mid objectives are:

- To understand spatial quality approaches in environmental living regarding restoration concept of mineral excavation areas.
- To understand the condition of mineral excavation in Indonesia and what is already done for the restoration.
- To learn from experiences from other country in this case the Netherlands, about the way of restoration of mineral extraction areas is working.

From these it is expected a concept of restoration of mineral extraction areas can be drawn and could be implemented in Indonesia.

1.3 Research Questions

There are several questions in attaining the objectives of the research:

1. What notions of spatial environmental quality are applied in restoration of mineral extraction areas?

2. What are actual conditions in mineral extraction areas in Indonesia?

3. What are actual conditions in mineral extraction areas in The Netherlands?

4. *What lessons can be learned from conditions and treatment of mineral extraction areas in Indonesia and the Netherlands?*
5. *What is appropriate approach regarding restoration of mineral extraction areas in Indonesia?*

1.4 Scope of Study

Scope of study is theoretical concept of spatial environmental quality in the context of mineral excavation restoration. The study will focus the way of countries particularly the Netherlands and other European countries coping restoration activities and try to make some adjustment for the concept that possible can be implemented in Indonesia.

1.5 Methodology

This research will use two methods, literature review and case study; literature review will describe the concept of environmental quality and spatial environmental aspect in relation to the concept of restoration mineral excavation areas, mean while the case study will elaborate characteristics of the area to make appropriate approaches for the concept of restoration. With the two methods it is expected the concept of restoration not only useful to the case study area but also can be use as references in relatively similar case.

The research will be organized in 5 chapters which become the structure of the Research. (See figure 1.1) The Structure of Research is as follows:

Chapter 1: It is explained background, research problems and objectives, research questions, scope of study, methodology, and research framework

Chapter 2: This chapter will elaborate theoretical framework of spatial, environmental quality, concept of restoration in mineral extraction areas

Chapter 3: General condition and restoration activities of mineral industries in Indonesia and the Netherlands

Chapter 4: Research Analysis

Chapter 5: Conclusions and Recommendations

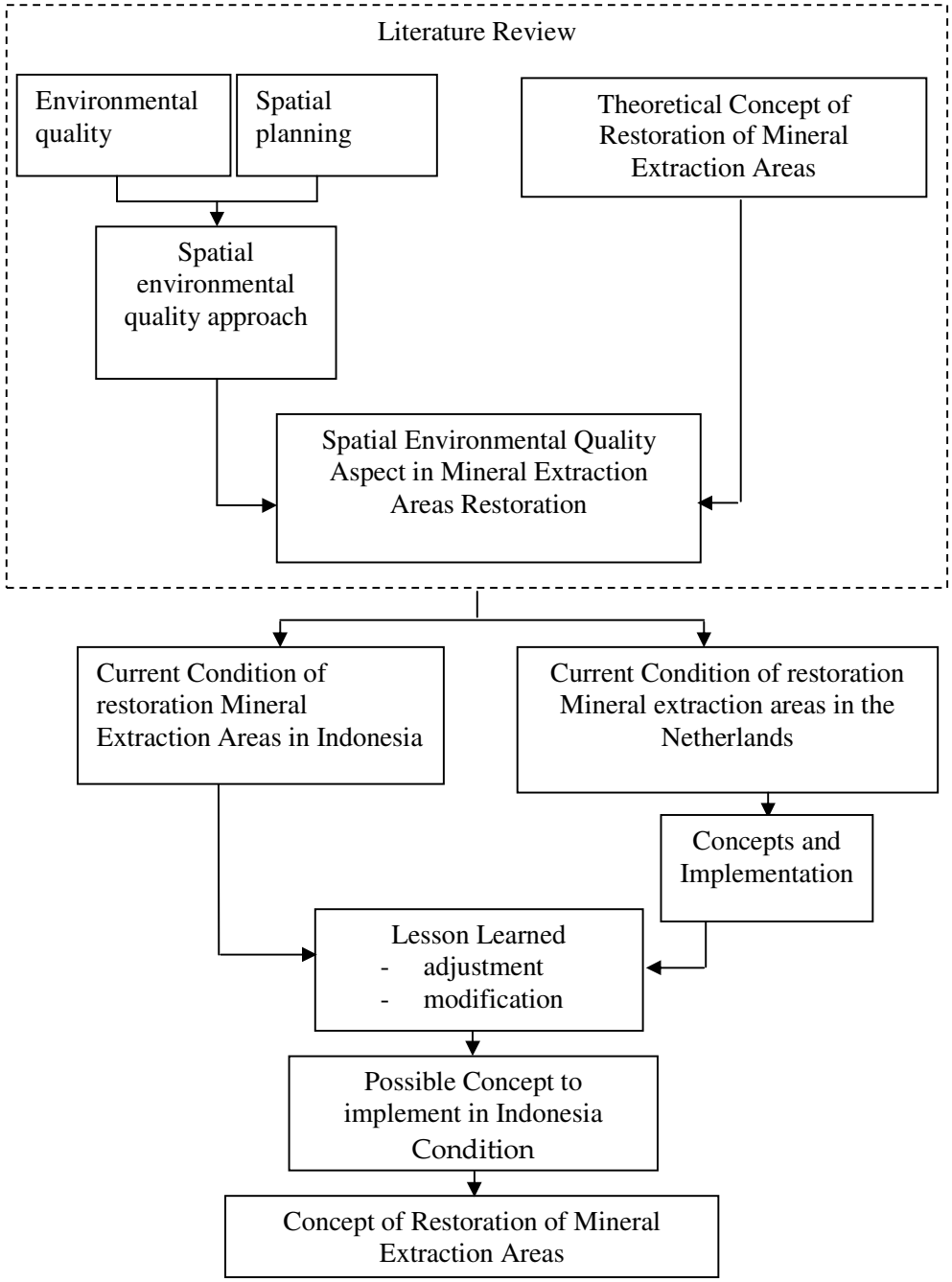


Figure 1.1 Structure of the Research (Research Frameworks)

Chapter 2

Environmental Quality and Restoration in Mineral Planning

This chapter will elaborate the concept of environmental quality and the relationships with spatial aspects, and restoration in mineral planning

2.1 Environmental Quality

Environmental quality becomes the first notion in this chapter, since it will become main objective of restoration and the standard for measuring the successful of restoration in mineral planning. To give a clear insight about environmental quality the explanation below will firstly elaborates the definition of environment.

2.1.1 Definition of Environment

Let start with *"what is environment"* , in general, environment is all things related to the whole area surrounding us, in other word it defined as all relating to the natural world, especially to its conservation and relating to, or caused by, a person's or animal's surroundings. It covers some elements in the world[1] such as:

- *Nature ⇔ Human (well-being, health)*
- *'Green' ⇔ 'grey' environment*
- *Biotic ⇔ abiotic*
- *Surroundings ⇔ living space in outside world and in our world*
- *Local ⇔ Global*

From explanation above it can be seen that environment has close relation with our life not only human but also every creature which live in the earth. The Activities of those creatures and the relationships with their surrounding places become one object what so called environment. The dimension of environment is wide which covers outside and inside, local and global world.

In broad term, environment also can be divided into two elements[1] as follows:

1. *Natural environment ('green')* which the contents are:

[1] presented by Jos Arts in lecture Environmental Planning, 2007

- *Flora, fauna, ecosystems*
- *Landscape, geomorphology*

2*. Human environment ('grey', living conditions)* which the contents are:

- *Water, soil, air and climate*
- *Noise pollution, air quality, safety, health*
- *Archaeology, cultural heritage*
- *Social (economic?)*
- *Energy consumption, use of materials, waste production*
- *Use of space*

The first element is natural environment or green. It covers flora and fauna ecosystems with its landscape and geomorphology. Flora constitutes various types of vegetations meanwhile fauna is related to creatures which live in the world. Types and characteristic of landscape and geomorphology are the other things which included in the first element. They build the structure of environment. Another element is human environment or also called as grey environment which mainly about water, soil, and climate with activities that occur in that area, such as noise pollution, the quality of air, safety, and health. It also includes things which related to archaeology and cultural heritage. Social (economic) is another point in this element, also energy consumption, the use of materials, waste production, and use of space. These two elements have interaction and influence each other; one affects another in the same ecosystem.

Beside that there are also some characteristics of environment[2] such as:

- *Common good*
- *No clear 'ownership'*
- *Long-term interest*
- *Low dynamics, cumulative, synergistic processes*
- *Underground, base for society*
- *Local + regional/national global*

[2] presented by Jos Arts in lecture Environmental Planning, 2007

- *Weak interest*

The first characteristics of environment is as common good, it means all things related environment can be used by all people for their needs, that is why there is no clear ownerships, everybody can get asses to them. This condition make environment deals with a long term interest both in local regional and national global context. Since it contains with a lot of interest and become base for society environment should be care as a common needs and everybody should give much attention to it, otherwise it will be diminished and the impact is significantly for our next generation. Another term is comes from EU directives[3], according to EU-regulations, environment defined as:

"*1st human beings, fauna & flora*
2nd soil, water, air, climate & landscape
3rd material assets and cultural heritage
4th interaction between the factors 1, 2 & 5th aspect of employment, social or economic impacts may be included"

From several terms above, it is obvious that the definition of environment is closely related to human beings, fauna and flora, soil, water, air, climate, landscape, material assets and cultural heritage with the interaction among them also the aspect of employment, social or economic impacts.

2.1.2 Environmental Layer Concept

One of the theories of environmental builder is the environmental layer concept. This concept try to illustrate the object of environmental and infrastructure planning. The layer approach concept explains environment components which develop the whole area of certain environment. Based on the book of Environmental and Infrastructure Planning (Paul Ike, Gerard Linden, Henk Voogd, 2004 pp 12-17) this theory is presented. In this concept the object of environmental and infrastructure planning displayed as 3 different layers as follows:

1. The ground layer

   The ground layer contains natural condition which already set in the certain areas.

[3] presented by Jos Arts in lecture Environmental Planning, 2007

It includes resources (minerals and water) altitude, soil types, topography, land contour, and geological characteristic. The condition of this layer is vary and different each area. Certain area will have specific types which are become style of that area. The characteristics of the area form the condition of ground layer; it represents identity of the landscape. The change of the condition process very slowly, even more than 100 years.

2. The infrastructure layer

   The infrastructure layer is developed by diverse networks that comprise the material structure. It is a connecting and structuring element. It covers elements which installed for supporting daily activities of human being such as railways, aviation routes, electricity, pipe lines, harbors, ports, airports, information technology networks. Not like the ground layer the changing process of this layer is rather low dynamics.

3. Occupation layer

   The third layer is occupation layer, this layer presents the spatial pattern of human activity, it closely related to land use occupation. It compose infrastructure that structure developments and build zones like residential or dwellings, agriculture areas, green areas, tourism site, market. The change of this layer is really connected to the change of human settlements which deal with urbanization, population growth, increasing or decreasing densely population, globalization. It is highly dynamic hanging process.

From the three layers above, the ground layer has strong connection with natural condition which closely related to environmental quality. The condition of this layer will give big influence to grade of environmental quality.

After knowing the definition of environment now let move to the environmental quality. Environmental Quality mainly related to the factual condition of environment. This condition can be measured by investigating the condition of

environmental elements which already explained previously. Those parameters become basic knowledge when people want to assess the level of environmental quality. Thus, it is noticeable that environmental quality is related to quality of human beings, fauna and flora, soil, water, air, climate, landscape, material assets and cultural heritage which placed in certain areas and also the interaction among them, in addition the aspect of employment, social or economic impacts. So the measurement of environmental quality will closely relate to the condition of such elements.

2.1.3 Spatial Planning

Spatial planning become basic means of arrangement and management of zoning areas. This plan becomes reference for the people where they should site and develop certain activities. It is such a guideline which controls the development in one area. With spatial plans the expansion and changes of land use function can be supervise and organized in correct way.

2.1.4 Environmental Quality and Spatial Planning

The need of improvement of environmental quality is a common issue. Initiative for enhancing the quality forces people to think about way for reserve the environment this way leads people to the scenario what is common called as integrating environmental quality improvement and planning. This concept tries to integrate the need of environmental improvement through spatial planning activity.

D. Miller and G. de Roo, (2004) explains the principles how spatial planning can be integrated with environmental quality improvement. At least there are five principles for integrating urban planning and environmental quality improvement:

- *Expand comprehensiveness*
- *Develop a sound and appealing evidence base*
- *Inclusive public involvement*
- *Include wide range of alternatives*
- *Balance objectiveness*

1. Expand comprehensiveness

Comprehensiveness is essential in this concept since there is wide range of the features of urban development should be integrated. Furthermore the traditional concerns of urban planning which related to population, infrastructures, spaces, and places should concentrate on maximize range of environmental quality feature particularly things which will influence health and quality of life (Houghton and Hunter in book of D. Miller, G de Roo, (2004). Political requirement somehow become starting point to implement sort of features in environmental quality in order to have a smooth process and supporting from community. The expanded of that features should covers not only in environmental perspective side but also fulfill the need of public interest (D Miller, G de Roo, 2004).

2. Develop a sound and appealing evidence base

Brugman, in book of D Miller, G de Roo, (2004) said that environmental subject should be arranged with a logic reason in order to make people believe to the issues. The reason must be develop with reliable even measurable evidence which can be fundamental knowledge for explaining the environmental condition. One technique to make valid evidence is producing a good storage of data. Besides building the fundamental evidence it is also important to think the way how to inform the environmental issues to public and decision maker so they can absorb the right information.

3. Inclusive public involvement

One of important part in this process of integrating urban and environmental planning is the participation from community as Leitmann in book of D Miller, G de Roo, (2004) said *"An open participation process is an important feature of initiative to integrate urban and environmental planning, for several reason"*

The need of collecting information from all part particularly citizen is essential to make this planning run in proper way. With public involvement broad range of information and thoughts can be achieved (D Miller, G de Roo, 2004). But in line with that it is also crucial to analyze based on scientifically assessment (Barlett in D. Miller, G. de Roo (2004).

4. Include wide range of alternatives

   The effectiveness of planning is reliant to sort of alternatives which provided. The variations of alternatives give an effect of increasing the possible assessment of environmental aspects. (D Miller, G de Roo, 2004) said uncongenial even controversial alternatives should be emerged to motivate neutralize ideas in early stage of planning process.

5. Balance objectiveness

   The objectives in planning process sometimes is not complementary even conflict occurs among them. To anticipate this problem planning should get proper way to balance it to make the objectives be received by all part. Even though this will inspire challenge in practical field of city planning (North in book of D Miller, G de Roo, 2004)

2.2 Restoration in mineral planning

2.2.1 The definition of Restoration in Mineral Planning

What is restoration? There are some terms regarding definition of restoration. First term is explained by Tad Szwedzicki (2001), Restorations is "*the return of disturbed land to pre mining condition"*, to recover the existing areas to the first situation before it being excavated. Another term comes from P. Tomlinson *Centre for Environmental Management and Planning, University of Aberdeen, Aberdeen (Ct. Britain)* (21 May 1984)

> *"Restoration is the replication of site-conditions prior to disturbance. Reclamation renders a site habitable to indigenous pre-mining condition organisms. Rehabilitation is the return of the land to a form and productivity in conformity with a prior land use plan, including a stable ecological state that does not contribute substantially to environmental deterioration and is consistent with surrounding aesthetic values."*

Tomlinson (1984) also display other term as follows,

"Reclamation is taken to mean the process of returning mined land to an agreed landform and land use in conformity with a prior land-use plan. Restoration is the replacement of the soils and creation of the desired landform, while after-care is the management practice required to return the land to its planned use once restoration in complete."

2.2.2 Environmental consideration

In the process of mining closure one of the important things is environmental consideration since it significantly reduce the long term effects of mining project. The characteristics of waste produced by mining operations and the treatment for disposal are essential in this context. (D. Van Zyl, M. Sassoon, C. Digby, A.-M. Fleury & S. Kyeyune, 2002). There are certain objects which vulnerably can be affected by the mining operations activities as follows:

- *land*
- *marine*
- *water*
- *riverine*

Foster (1999) elaborates about the value of quantification. This concept constitutes two aspect of measurement for environmental impacts. Firstly, tangible environmental impacts can be illustrated as follows:

- *loss of agricultural productivity*
- *loss of land*
- *the requirements to replace a water supply*
- *the cost of erosion protection*

The second is intangible impacts which cover some points below:

- *reduction in biodiversity and loss of habitat*
- *increase in ambient noise levels*
- *reduction in air quality*
- *threats to cultural heritage*
- *changes to recreational opportunities*
- *reduction in landscape quality*

These two perspectives; measuring about objects which will be affected by excavation activities and accounting the impacts are important a first basic for consideration of environmental aspect is restoration. So, when people start to plan

sort of schemes of restoration they will measure the objects and also make some calculation of environmental impacts which possible produced from excavation activities.

2.2.3 Regulation

Regulation is one important aspect in conducting restoration program. This aspect becomes legal support for conducting actions of restoration. Policies development can direct the way of restoration will be run. Guccione, 1978 (OSM, 1983a): presented four principle regulations which particularly relevant with terms of land reclamation.

(i) Disturbed areas must be returned to the approximate original contour (Section 16:102).

(ii) A vegetative cover shall be established on the reclaimed areas which is diverse, effective and permanent and which is necessary to achieve the approved post-mining land use. The re vegetated area should be at least equal to that which existed prior to mining and be capable of stabilizing the soil surface from erosion (Section 816: lll).

(iii) The success of re vegetation is to be judged on the effectiveness of the vegetation for the approved post-mining land use. The extent of cover compared to the cover occurring in natural vegetation of the area and the general requirements of Section 816.111.

(iv) All disturbed areas shall be restored in a timely manner to conditions that are capable of supporting the uses which they were capable of supporting before mining, or higher or better uses (Section 816: 133)

2.2.4 Mine closure consideration

Objective of mine closure

To achieve successful mine closure, several objectives have to be defined (Tad Szwedzicki (2001) :

- *Protection of the remaining mineral resources.*
- *Ensuring high health and safety standards during decommissioning and post mining operations.*
- *Minimizing of the environmental impact on the site and on the site.*
- *Meeting expectations of the affected communities.*

Besides that to guarantee the process Tad Szwedzicki (2001) said the authorities have to ensure that mining companies:

- *Integrate mine closure into planning and management at all phases of mine operations.*
- *Recognize that stakeholder involvement is essential for successful planning and implementation of mine closure.*
- *Provide adequate resource allocation for the cost of mine closure.*

Sassoon, 2000 said in order to gain the objectives, plan for mine closure should be incorporate with a project life cycle and be deliberate to make sure that:

- *Future public health and safety are not compromised;*
- *Environmental resources are not subject to physical and chemical deterioration;*
- *The after-use of the site is beneficial and sustainable in the long term;*
- *Any adverse socio-economic impacts are minimized; and*
- *All socio-economic benefits are maximized.*

Natural Resources

After excavation mineral activities the area is still contain mineral which left in the location. This burden material can be reserve as natural resource and may be cab be extracted in the future. So the information about location should be written as collecting information or data

Environment

The condition of environment surrounding areas should be take care in the process of mine closure.

So the condition such as in the figure 2.1 should be avoided as much as possible.

Figure 2.1 Progressive long-term failure of a slope in open pit
(source Tad Szwedzicki , 2001)

Safety

In the mine closure process safety is one factor which must be controlled seriously. The safety program is conducting since the preparation, during, and in the end of mining closure process.

Figure 2.2 demolition process of a processing plant

(source Tad Szwedzicki , 2001)

There are at least two phases which should really be supervised:

- Safety during demolition process (see figure 2.2)
- Safety of decommissioned sites

Social Factors

Beside technical aspects which already illustrated previously, other aspect that is also important is a social factor. The impact of mining operation particularly to the people surrounding areas both as mining workers and contractors should be taking into account in mine closure program. The government in coordination and cooperation with mining activities should prepare alternatives form of employment. Other program is to provide some of facilities which can give value to the community, for example to make a former area of mining excavation become heritage place such as mining museum. (See table 2.1)

Table 2.1 socio economic mitigation

Issues	Objectives	Control
• work force	• re-employment • re-location	• assistance with looking for other work and moving • financial assistance • counselling • retraining
• local communities	• stable economy • good health • education facilities	• regional development plan • develop local self-sustainable enterprises • establish foundation or trust fund for essential services • re-locate in-migrants

(source Mine Closure Working Paper, April 2002)

2.2.5 Mining Closure Program

Mine closure process has some program related to phases, elements, approaches, and planning process. These programs should conduct gradually and constantly. It should be integrated and work in comprehensive way. According to Tad Szwedzicki (2001) the phases of mine closure program can be displayed:

1) *Establishing mine closure completion criteria, performance indicators and a procedure for risk assessment. This includes technical, safety, environmental and social criteria.*
2) *Preparation of strategic and operational plans for closure and progressive rehabilitation plans.*
3) *Implementation of demolition plans and rehabilitation of mining leases.*
4) *Monitoring to ensure that rehabilitation has been successful.*
5) *Final reporting and site relinquishment.*

After knowing the phases of mine closure program another important aspects is the Elements of closure program. The elements of closure program are closure completion criteria, mine decommissioning, and monitoring.

1. Closure Completion criteria

   Post mining land use should be accepted by all part who related to mine closure and defined in detailed before completion criteria issued. After the land use of post mining certain the completion criteria should be provided. From Tad Szwedzicki (2001) there are some the aspects should be concerned in deciding completion criteria:

   - *rehabilitation to an agreed condition,*
   - *rehabilitation to an aesthetically acceptable state,*
   - *demolition of all disused and unserviceable buildings and structures,*
   - *disposing by removal or burying of all scraps, rubble, rubbish and discards,*
   - *prevention of water erosion and pollution,*
   - *treatment and disposal of contaminated water,*
   - *prevention and control of air pollution,*
   - *return of specified plants, and*
   - *establishment of animal communities, etc.*

   The performance should be asses Physical stability contains stability of ground over mined out areas and stability of man-made landforms, Chemical stability, and Biological stability. For clear explanation can be seen in table 2.2.

Table 2.2 the assessment of performance

Issues	Objectives	Control
Physical Stability		
• dam walls • structures • pipelines • ditches • settling ponds • culverts • erosion	• long-term stability • safety of structures • flood capacity • prevent blockage • prevent erosion • free passage of water	• breach dam or provide other forms of water runoff control • remove structures • plug intakes and decants • upgrade flood design • remove pipes • fill in ditches • provide for long-term maintenance • monitor
Chemical Stability		
• contamination of surface water • contamination of groundwater	• clean water	• remove or prevent contamination • drain, treat and discharge • install barriers • establish vegetation • monitor
Land Use		
• interruption of water supply • productivity of land drainage	• restore drainage patterns or establish alternative • return to appropriate land use	• stabilise and maintain dam or breach and establish erosion resistant drainage • establish vegetation

(source Mine Closure Working Paper, April 2002)

2. Mine Decommissioning

Mine decommissioning is divided into

Mining excavations, processing plant, Water management facilities - Waste rock dumps /disturbed areas-Tailing storage facilities-Heap leach facilities - Infrastructure - Exploration site

3. Monitoring

To assess whether the mine closure program is successful or not the monitoring program is executed. It evaluates progress of mine closure activity and appraise to what extent objectives and action of closure already achieved.

Tad Szwedzicki (2001) explained that monitoring activity at least covers:

- *exploration sites erosion and vegetation growth.*

- *surface above underground working measurement of surface subsidence, stability of ground around shafts, underground water quality, quality of mine water discharges,*
- *open pits stability of slopes, performance of water management system, water quality,*
- *waste rock dumps, heap leach facilities and tailings dams shall include: stability of the slopes, erosion of the slopes, drainage of water, quality of water, vegetation growth,*
- *processing plant and infrastructure sites water drainage, vegetation growth, soil erosion.*

Based on Mine Closure Working Paper (April 2002) the approach to mine closure and rehabilitation can be divided into several stages which are start from planning stage until passive care program, for clear explanation it illustrates as follows:

- *The Planning Stage*

  A closure plan should be established and integrated into the mine plan and environmental (including socio-economic) management plan or system at the earliest possible opportunity and regularly updated during the operating life of the project.
- *The Operational Stage*

  During production the management tests the closure objectives and takes the opportunity to review, improve and enhance the program.
- *The Active Care Stage*

  Following decommissioning the physical rehabilitation of the site is carried out and the social mitigation programs are completed.
- *The Passive Care Program*

  The passive care program is a period of monitoring and management designed to demonstrate that the active care program has been successful and the 'walk-away' state has been achieved.

Figure 2.3 shows the closure Planning Process including Policy, Plan, Completion criteria, etc (Mine Closure Working Paper, 2003

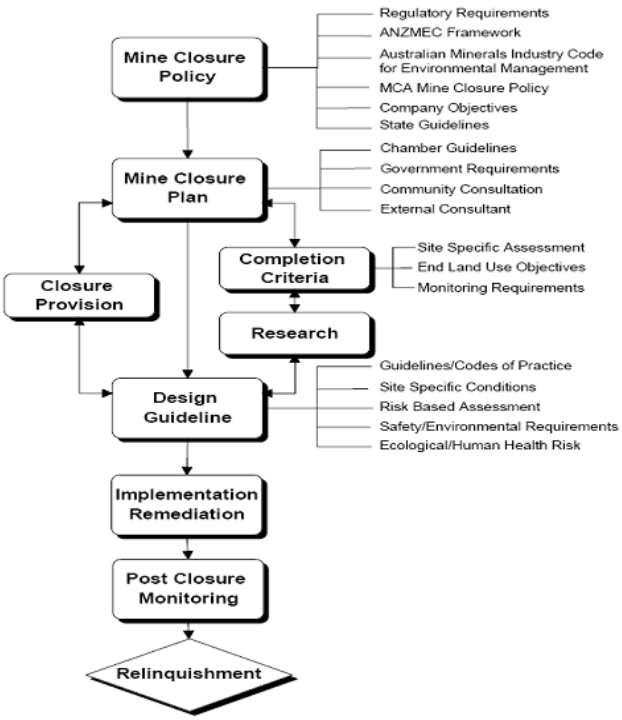


Figure 2.3 Mining Closure Process
(source Mine Closure Working Paper, April 2002)

2.3 Concluding Remarks

In summary, environmental quality become one of possible measurement for assessing the environmental condition. Meanwhile the concept of integrated spatial planning and environmental quality improvement is kind of solution for enhancing the quality of environment. On the other side restoration in mineral planning has criteria to indicate how the objectives of closure program are achieved.

From explanation previously it is clear that environmental quality becomes one of measurement to decide whether the condition of certain area is good or not in environmental perspective. It also obvious that in order to improve environmental

quality the integration to the spatial planning and environmental quality program is really important. Theoretical framework of this study can be seen in figure 2.4

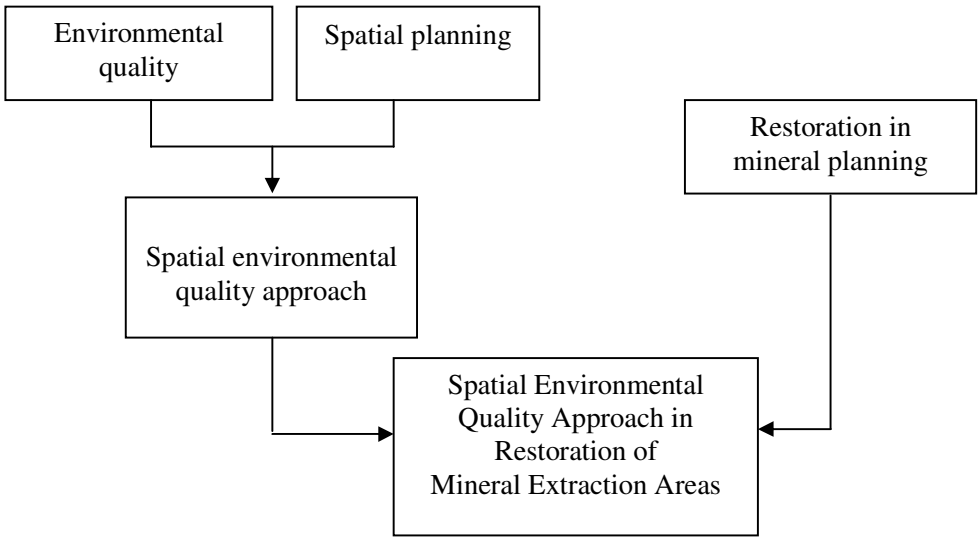


Figure 2.4 Theoretical framework of the study
(source analysis, 2007)

That is why the spatial environmental quality is kind of approach which possible to be implemented. Regarding restoration in mineral planning it also shown that the successful of restoration mineral excavation areas closely related to the environmental condition particularly after the mine closure program. That is why is the spatial environmental quality approach can be used as measurement of restoration activities especially for former mineral excavation areas. The approach of this of course vary and different in depend on the areas.

Chapter 3

Restoration of Mineral Excavation Areas in Indonesia and the Netherlands

This chapter will display and explain the condition of mineral extraction and efforts for restoration based on the information from Indonesia, Netherlands, and European countries.

3.1 Indonesian Case

Located in south east of Asia Indonesia is one of developing country in this area. With 245.452.739 total of population who live in 1.919.440 square meter, Indonesia notified as a country which has high densely population in the world. As one of the countries in south Asia Indonesia has several mineral that actively extracted. Tin, nickel, coalmines, and copper-gold are some of minerals excavated in this country. From ancient Sanskrit it is documented that the Dutch East Indies Company start runs its activities in the early of the 17th century (C. Aspinal, 2001). Mineral excavation actually had already conducted in Indonesia before that time. Aspinal, 2001 said during Hindu times activities of gold mines excavation was run in Kalimantan, and then more lively to period of 4th – 8th century one of board which identified as Chinese District of West Kalimantan do such of mineral mining works. Starting at the beginning of Dutch colonization until the Independence Day of Indonesia in 1945 the excavation activities of mineral materials such as tin, gold, and coal are still limited. The real operation was starting in the end of 1967 and gradually develops until now. With supporting from foreign companies and foreign investments Indonesia becomes one of the leading mining companies in Asia.

Recently, the concept of "*sustainability*" in all sectors is introduced in the world. Mineral planning activities are integrated in this movement. The concept of restoration of former quarry areas also becomes concern of Indonesian Government. Some efforts for supporting restoration program are pronounced by government. In line with that, public awareness about improving the environmental quality significantly also increases as well. Several Non Governmental Organizations

(NGO's) try to promote the movement of saving the environment. In fact, the implementation of restoration program in mineral areas still not performs to the condition as what people expected. Some cases indicate that Indonesia still need more achievement to run this program properly in order to make a good environmental life regarding mineral excavation activities. The next explanation will try to elaborate general condition, regulation, efforts, and challenges regarding mineral areas restoration in Indonesia.

3.1.1 General Condition of Indonesia

The mining operations are undergoing by some of companies which mostly come from foreign investments. Figure 3.1 shows the mineral operational locations.

3.1 Operational Locations of mining companies in Indonesia
(source http://minerals.usgs.gov)

In Indonesia there are several companies operate mineral excavation activities both domestics and foreign such as PT Indonesia Asahan Aluminium (Inalum), Nippon Asahan Aluminium Co. Ltd., PT Dairi Prima Mineral, PT Aneka Tambang Tbk, PT Batutua Khanisma Permal (BKP). Beside that, according the Government Ordinance in Lieu of Law (Perpu) No. 1/2004 in November 2003; there are 13 companies to continue their operations. Those were PT Antam Tbk (Bulit N. Maluku and Bahobulu Southeast Sulawesi), PT Freeport Indonesia Co. (Freeport) (Mimika and Puncak Jayawijaya in Papua), PT Gag Nickel, PT International Nickel Indonesia Tbk (PT Inco), PT Indominco Mandiri, PT Interex Sacra Raya, PT Karimun Granite, PT Natarang Mining, PT Nusa Halmahera Minerals, PT Sorik Mas Mining, PT Telsart Tambang Kencana, and PT Weda Bay Nickel (Pui-Kwan Tse , 2004)

According to Carlile and Mitchell (1993) research, the potency of minerals in Indonesia is identified with a total on land extent of over 15,000 km2. This activity located in certain areas of Indonesia. Its distribution sited from Aceh Arc, Sunda Banda Arc, Sumatra Meratus Arc, Central Kalimantan Arc, Sulawesi East Mindanao Arc, Halmahera Arc, until Irian Jaya Arc (see figure 3.2).

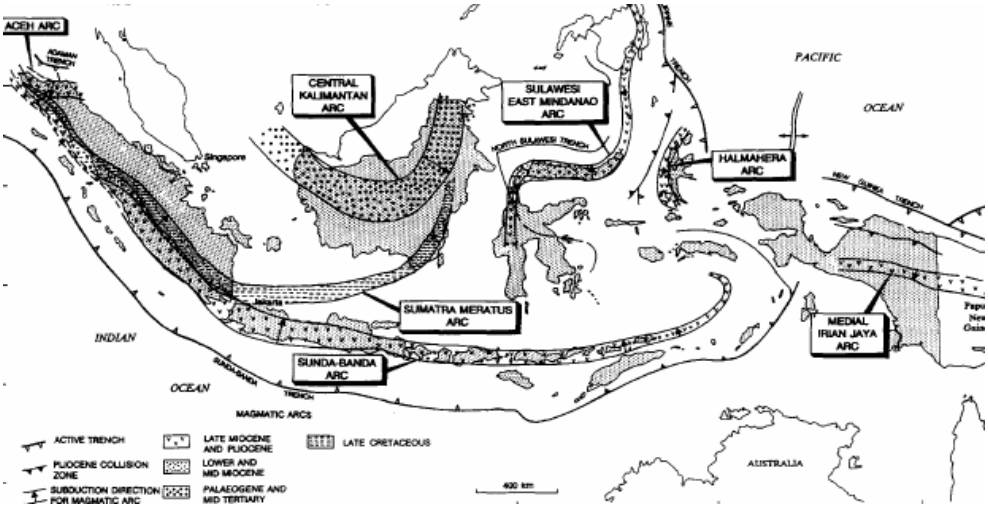


Figure 3.2 Distribution and polarity of mineralized Late Cretaceous to Pliocene magmatic arcs in Indonesia
(source after Carlile and Mitchell, 1993)

For the last two decades some big companies such as Grasberg (Freeport McMoran), Soroako (Inco), Kelian (Rio Tinto), Mt Muro (Aurora Gold), Minahasa and Halmahera (Newmont) and Kaltim Prima (BP/Rio Tinto) explore the mineral operations in Indonesia. Now some of the areas are expected to be closed (see Table 3.1). It displays the recent and expected closure of mining operations in Indonesia, data was notified in 2001.

Table 3.1 recent and expected closures of major mining operations in Indonesia

Companies	Parent company	Province	Year started	Year closed	Annual production
Gold					
PT Prima Lirang Mining	Billiton – Gencor Ltd	Wetar Is., NTT	1986	1999	8,790 kgs
PT Barisan Tropical Mine	Laverton Gold NL	Bengkulu	1997	2000	2,450 kgs
PT Indo Muro Kencana	Aurora Gold Ltd.	South Kalimantan	1994	2002	5,620 kgs
PT Gosowong Halmahera	Newcrest Mining Ltd	North Maluku	1999	2002	6,300 kgs
PT Newmont Minahasa Raya	Newmont Gold USA	North Sulawesi	1996	2004	7,160 kgs
PT Kelian Equatorial Mining	Rio Tinto Indonesia	East Kalimantan	1992	2004	11,670 kgs
Coal					
PT Kendilo Coal	BHP-Billiton Plc.	East Kalimantan	1993	2002	956,750 t

Source: Mulyono (2001).

As already explained previously mining sectors has an essential role to contribute Indonesian income. It can be seen from gross domestic product of Indonesia although it is not slightly similar. The gross domestic product of Indonesia from mineral and energy production is change from time to time. The estimated production of mineral and energy as percentage of gross domestic product is altering. From figure 3.2 it can be depicted that during period of 1965 until 2000, there are trend of increasing percentage from 1965 until 1980, then decline in 1985, 1990, 1996, and raise again in 2000. In 1980 the percentage of gross domestic product from mineral and energy production is about 19 %. It significantly decline in 2000 until around 10 % of gross domestic product.

Data from Asian Development Bank, 2005, p. 3-7; Bank Indonesia, 2005; World Bank, 2005a, b shows that mineral sectors contribute revenue 25 % of government budget and also occupied about 0,5 % of the labor workers and give 3 % of the GDP.

Figure 3.3 Estimated mineral and energy production as percentage of gross domestic product in Indonesia, selected years 1965 – 2000 (source Mulyono, 2001)

This fact proves that mineral industry is one of sectors which has essential role to support Indonesian economy. On the contrary, this sector also contributes to the degradation of environmental quality in Indonesia since the treatment for after care still not run in proper way. That is why it is important to asses a good concept of mineral restoration. Thus, the mineral industries still can carry on their activities but in other side the quality of environment also can be achieved.

3.1.2 Structure of Mineral Industry

The structure of mineral industries in Indonesia mostly is metals such as copper, tin, gold, silver, and nickel. For completely spectrum it can be notified from table 3.2

Table 3.2 Structure of Mineral Industry in Indonesia in 1998
(Thousand metric tons otherwise specified)

Commodity	Major operating companies and major equity owners	Locations of main facilities	Annual capacity
Tin:			
In ore	PT Koba Tin (Westralian Sands Ltd., 75%; PT Tambang Timah TBK, 25%)	Koba, Bangka Island	6
Do.	PT Tambang Timah (Government, 100%)	Onshore and offshore islands of Bangka, Belitung, and Singkep	45
Metal, refined	Peleburan Timah Indonesia (Government, 100%)	Mentok, Bangka Island	42

(source http://minerals.usgs.gov)

Table 3.2 Structure of Mineral Industry in Indonesia in 1998 (continued)

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Locations of main facilities	Annual capacity
Aluminum:			
Bauxite	PT Aneka Tambang (Government, 100%)	Kijang, Bintan Island, Riau	1,300
Metal	PT Indonesia Asahan Aluminum (Nippon Asahan Aluminum Co. Ltd. of Japan, 59%; Government, 41%)	Kual Tanjun, North Sumatra	225
Cement	PT Indocement	Citeureup, West Java	8,000
Do.	PT Semen Cibinong	Narogong, East Java	1,400
Do.	PT Semen Gresik	Gresik, East Java	1,500
Do.	PT Semen Padang	Indarung, West Java	2,200
Coal	PT Adaro Indonesia (New Hope Corp, 50%; PT Asminco Bara Utama, 40%; Mission Energy, 10%)	Paringin and Tutupan, South Kalimantan	20,000
Do.	PT Bukit Baiduri Enterprise (PT Gajah Tunggal Gal Mulia, 90%, others, 10%)	Samarinda, East Kalimantan	3,000
Do.	PT Kaltim Prima Coal Co. (BP Coal Indonesia Ltd., 50%; Rio Tinto Ltd., 50%)	do.	16,000
Do.	PT Arutmin Indonesia (BHP Ltd., 80%; Bakrie Group, 20%)	Banjamasin, South Kalimantan	5,000
Copper, in concentrate	PT Freeport Indonesia Co. (Freeport-McMoRan Copper and Gold Inc. of the United States, 81.28%; Government, 9.36%; others, 9.36%)	Ertsberg and Grasberg, Irian Jaya	550
Gold metric tons	Aurora Gold Ltd. (100%)	Balikpapan, Central Kalimantan	60
Do.	PT Freeport Indonesia Co. (Freeport-McMoRan Copper and Gold Inc. of the United States, 81.28%; Government, 9.36%; others, 9.36%)	Ertsberg and Grasberg, Irian Jaya	55
Do.	PT Kelian Equatorial Mining (Rio Tinto Ltd, 90%; PT Harita Jaya Raya of Indonesia, 10%)	Sangatta, East Kalimantan	15
Do.	PT Newmont Minahasa Raya (Newmont Mining Corp., 80%; PT Tanjung Serapung, 20%)	Manado, North Sulawesi	15
Do.	PT Prima Lirang Mining (Billiton BV of the Netherlands, 90%; PT Prima Maluku Indah of Indonesia, 10%)	Lerokis, Wetar Island	3
Petroluem, crude thousand barrels per day	Atlantic Richfield Indonesia, Inc. (subsidiary of Arco of the United States)	Arjuna and Arimbi, offshore, West Java	170
Do.	Maxus Southeast Asia Ltd. (subsidiary of Maxus Energy of the United States)	Cinta and Rama, offshore, Southeast Sumatra	95
Do.	Pertamina (Government, 100%)	Jatibarang, West Java, and Bunyu, offshore East Kalimantan	80
Do.	PT Caltex Pacific Indonesia (Texaco Inc., 50%; Chevron 50%, both of the United States)	Minas, Duri, and Bangko, central Sumatra	700
Do.	Total Indonesia (subsidiary of Compagnie Francaise des Petroles of France)	Handi and Bakapai onshore and offshore East Kalimantan	180
Gas:			
Natural million cubic feet per day	Mobil Oil Indonesia, Inc. (subsidiary of Mobil Corp. of the United States)	Arun, Aceh in North Sumatra	1,700
Do.	Roy M. Huffington (subsidiary of HUFFCO of the United States)	Badak, East Kalimantan	1,000
Liquefied	PT Arun LNG Co. Ltd. (Government, 55%; Mobil Oil, 30%; the Japan Indonesia LNG Co., 15%)	Balang Lancang, Aceh in North Sumatra	10,000
Do.	PT Badak LNG Co. Ltd. (Government, 55%; HUFFCO Group, 30%; the Japan Indonesia LNG Co., 15%)	Bontang, East Kalimantan	7,900
Nickel:			
In ore	PT Aneka Tambang (Government, 100%)	Pomalaa, South Sulawesi and on Gebe Island, Moluccas	34
In matte	PT International Nickel Indonesia (Inco Ltd. of Canada, 59%; Sumitomo Metal Mining Co. Ltd. of Japan, 20%; others, 21%)	Soroako, North Sulawesi	45
Nitrogen	PT Aseah-Aech Fertilizer (Government, 60%; other members of Association of Southeast Asian Nations, 40%)	Lhokseumawe, North Sumatra	506
Do.	PT Pupuk Iskandar Muda (Government, 100%)	do.	506
Do.	PT Pupuk Kalimantan Timur (Government, 100%)	Bontang, East Kalimantan	1,012
Do.	PT Pupuk Sriwijawa (Government, 100%)	Palembang, South Sumatra	1,438
Steel, crude	PT Krakatau Steel (Government, 100%)	Cilegon, West Java	2,400

(source http://minerals.usgs.gov)

Those companies produce mineral materials annually. From data of United States Geological Survey Minerals in 2004 shows that the high production

Table 3.3 Production of Mineral Commodities in Indonesia:

(Metric tons unless otherwise specified)

Commodity		1994	1995	1996	1997	1998
METALS						
Aluminum:						
Bauxite, gross weight	thousand tons	1,342	899	842 r/	809 r/	1,055
Metal, primary		221,900	220,000 e/	225,000 e/	216,150	133,000 e/
Chromite sand, dry basis e/		2,500	10,000	13,300	2,156 4/	2,000
Copper, mine output, Cu content		322,190	443,618	507,484	529,121	647,994
Gold, mine output, Au content 2/	kilograms	47,877 r/	64,031 r/	83,564 r/	86,927 r/	87,000 e/
Iron and steel:						
Iron sand, dry basis		361,511 r/	366,111 r/	425,101 r/	516,403 r/	560,524
Metal:						
Ferroalloys, ferronickel		28,725	53,675	48,260 r/	49,990 r/	42,260
Steel, crude	thousand tons	3,220	3,500 e/	4,100 r/	3,800 r/	3,500 e/
Manganese: e/						
Ore		2,695 r/	634 r/	34 r/	889 r/	600 e/
Ferromanganese		10,000	14,000	14,000	15,000	13,000
Nickel:						
Mine output, Ni content 3/		81,100	88,183	90,000 e/	67,900 r/	77,600
Metallurgical products:						
Matte, Ni content		45,989 r/	46,067 r/	39,500 r/	32,012 r/	35,697
Ferronickel, Ni content		5,745	10,735	9,653 r/	9,999	8,452
Silver, mine output, Ag content	kilograms	102,834 r/	275,568 r/	255,403 r/	219,392 r/	348,987
Tin:						
Mine output, Sn content		41,897 r/	46,058 r/	52,304 r/	55,175 r/	53,959
Metal		31,100	38,628	39,000 e/	52,658 r/	53,401
INDUSTRIAL MINERALS						
Cement, hydraulic e/	thousand tons	21,907	23,129	25,000	26,000	25,000
Clays:						
Bentonite		14,409	26,057	26,000 e/	653,823 r/	840
Fireclay e/	thousand tons	1,950	2,000	2,000	2,000	1,800
Kaolin powder		53,236	14,373	15,000 e/	1,956 r/	10,036
Diamond: e/						
Industrial stones	thousand carats	22	22	22	23	22
Gem	do.	6	7	7	7	6
Total	do.	28	29	29	30	28
Feldspar		40,483	49,415	50,000 e/	24,399 r/	53,068
Gypsum		1,286	1,327	1,400 e/	-- r/	406
Iodine	kilograms	89,098	76,824	75,000 e/	83,000 r/	66,000
Nitrogen, N content of ammonia e/	thousand tons	2,800	2,850	2,875	2,880	2,800
Phosphate rock e/		7,000	7,500	7,500	533 r/ 4/	752
Salt, all types e/	thousand tons	650	670	670	680	660
Stone:						
Dolomite		4,386	4,056	4,000	13,411 r/	17,785
Granite	thousand tons	5,113 r/	5,386 r/	4,827 r/	6,138 r/	4,801
Limestone	do.	20,814	13,143	15,000 e/	6,329 r/	6,575
Marble	square meters	15,286	10,446	12,000 e/	13,000 e/	8,357
Quartz sand and silica stone		588,429	278,925	300,000 e/	636,468 r/	293,100
Sulfur, elemental e/		3,500	3,500	3,500	3,500	3,400
Zeolite e/		70	70	75	75	70
MINERAL FUELS AND RELATED MATERIALS						
Coal, bituminious	thousand tons	32,174 r/	39,936 r/	50,332 r/	55,982 r/	61,146
Gas, natural:						
Gross	million cubic feet	2,940,000	2,900,000 e/	2,950,000	3,166,034 r/	2,641,447
Marketed e/	do.	1,700,000	1,700,000	1,700,000	1,800,000	1,600,000
Petroleum, crude including condensate	thousand 42-gallon barrels	588,000	580,000 e/	575,000	539,752 r/	534,892

e/ Estimated. r/ Revised.

1/ Table includes data available through August 15, 1999.

2/ Includes Au content of copper ore and output by Government-controlled foreign contractors' operations. Gold output by operators of so-called people's mines and illegal small-scale mines is not available, but may be as much as 20 metric tons per year.

3/ Includes a small amount of cobalt that is not recovered separately.

4/ Reported figure.

(source http://minerals.usgs.gov)

3.1.3 Regulation

Recently, Indonesia tries to change the direction of policies from centralize to decentralize. The execution of laws N0 22/1999 regional autonomy law and law No 25/1999 fiscal decentralization law in 2001 leads the changes of policies development in this country. The authority of development and controls now not only sited for central government but also have to be shared for regional or local government. But the implementation of this new direction still not run as what people expected. Unclear explanations of power sharing, authority distribution and sectors division make some problems in practical matters. It looks that the new path is very good in conceptual thought but still lack in operation. This circumstance affects the whole sectors including mineral industry.

An example of awful implementation of the new direction in mineral industry is confusion of delivery and organization revenue from mineral business particularly gas, mining, and oil which including taxes, royalties, and land rent (Pui-Kwan Tse, 2004). Pui-Kwan Tse, 2004 said that regional autonomy had not given significant reform to community prosperity and democracy and discourage trade and investments. Refer to Indonesian Chamber of Commerce and Industry survey, It found that 297 of 881 bylaw made by regencies and municipalities were identified deject investments. The problems are mainly about tariffs barriers and extra taxes for some products and labours force in those regencies. Due to that situation in 2004 the state amended the regional autonomy law with law No. 32/2004 and fiscal decentralization law with law No. 33/2004 (financial balance between the Central Government and local governments) which arrange the proportion of authority of financial between central and local government.

As consequences of the new policies path, the rule for mineral industries is also proposed to modify. It is useful due to the change of the situation in mineral sectors which need to be adjusted by new regulation. The general mining law No 11/1967 will be replaced by new draft law 25th May 2001 (now still in legalization process). This new draft law will have new name which is the Mineral and Coal Mining Law. Petrominer said in their report about the changes in this new draft: "*The fundamental*

changes in the new draft bill are as follows: the term contract of work (CoW) will be replaced by a mining license, and the mining authority will be replaced by a people's mining license. The draft bill will strengthen such environmental concerns as mining safety, waste disposal, and post mining land reclamation. The draft bill will be submitted to the State Secretariat for approval before it is submitted to the House of Representatives for consideration in 2005" (Petrominer, 2005d).

Based on Department of energy and minerals resources directorate-general of geology and mineral resources the core content of new draft Law, 25th May 2001 can be resumed as follows:

- Control of minerals

  Minerals Materials is national assets, therefore it must be supervised by the state. As mandate from act 33 of Indonesia Constitution it is said "all materials in Indonesian land must be explored and utilized to the fullest for the prosperity and welfare of the people". Different with the former Law of No 11/1967 which give full control for central government to hold mining activities, the new draft give chance for local government accompany with central governments grip mining works.
- Authority in Mining Management

  In line with regional autonomy, the authority of central governments is condensed and local government authority is obviously distinct.
- Categorization of Minerals

  There are six categories of minerals: radioactive, metal, non-metal, coal; peat; solid metal, geothermal, and groundwater.
- Permit and agreement

  1. Mining Operation Permit (*IUP*),
  2. Peoples Mining Permit,
  3. Mining Operation Agreement, *PUP.*
- Mining Operators

  a. Domestic investors, PUP, IUP
  b. Foreign investors (IUP), PUP,

c. Peoples Mining.

- Issuance of mining permits

  It can be hold by regency/municipality, provincial governor, and also depending on certain specifics.

- Community Development

  Participation of community is regulated.

Aspinal, 2001 explained for the comparison of former regulation, the 11/1967 mining law states:

- Article 1: *All minerals found within the Indonesia mining the Indonesian mining jurisdiction in the form of natural deposits, as blessings of God almighty are national wealth of The Indonesian people to utilize by the state for the maximum welfare of the people.*
- Article 5: *Mining can be conducted by*
  1. *Government agency appointed by a minister*
  2. *A state enterprise*
  3. *A regional enterprise*
  4. *An enterprise with joint capital between the state and the region*
  5. *A cooperative*
  6. *A private body or individual who is qualified*
  7. *An enterprise with joint capital between the state and/or the region and cooperative and/or the qualified person*
  8. *By way of people mining*
- Article 11: *Peoples mining:*
  1. *The objective of peoples mining is to give the local population opportunity to exploit minerals in their efforts to participate in the development of the state in the field of mining under the guidance of government.*
  2. *Peoples mining can only be carried out by local people holding a mining authorization (permit) for peoples mining.*

3. *Provisions on peoples mining and methods and condition of obtaining a mining authorization (permit) for peoples mining shall be regulated by government regulation*

- Chapter VI Procedure and requirements for obtaining a mining authorization
  Article 17: *Application for a mining Authorization shall be submitted to the minister.*
- Article 18: *The application for a mining authorization will only be considered by the minister after the applicant has proved his ability and capability with regard to the intended mining activities.*
- Chapter VII Termination of Mining Authorization
  Article 20: *Mining Authorization terminates:*
  1. *By its returning*
  2. *By cancellation*
  3. *Due to the expiration of its term*
- Article 30: *After completion of mining for minerals in certain time, the holder of the relevant mining Authorization is obliged to restore the land in such a condition so as not to evoke any danger of disease or any other danger to people living in the environment of the mine.*
- Chapter XI Penalty Provisions
  Article 31: *Anyone carrying out mining activities without holding a mining authorization is liable to imprisonment not exceeding 6 years and/or fine not exceeding five thousand rupiah.*

Besides those regulations above there are also some of Acts which relevance to securing and producing minerals:

- MEMR Decree No. 2555.K/201/MPE/1993 on Implementation of Work Health and Safety and Mining Environment Mines Inspection in General Mining
- Joint Decree of MEMR and the minister of manpower No. 1245.K/26/DDJP/1993 on Supervision Implementation of Work Health and Safety and Mining Environment

- GR No. 19/1973 on Regulation and Supervision of Work Health and Safety in Mining
- MEMR Regulation No. 01/PM/Pertamb/1978 on Supervision of Mine Dredging Work
- Law No. 23/1997 on Environmental Management
- GR No. 27/1999 on Analyses on Environmental Impact (in Indonesia known as AMDAL)
- Minister of the Environment Decree No. 17/2001 on Types of Business/Activities Plans Which Must Be Accompanied with Analyses on Environmental Impact
- MEMR Decree No. 103.K/008/M.PE/1994 for the role of the Inspector from the DGMCG in supervising Environment Management Plans (RKLs) and Environment Monitoring Plans (RPLs);
- GR No. 82/2001 on prohibition on discharging solids (including muds and slurries) into water or water sources; and GR No. 18/1999 which may apply to all tailings disposals.

3.1.3 Challenges in mineral Planning Restoration

In conducting restoration programs there are several constraints which are come from some factors. Some factors contribute to the problems of implementation of restoration in Indonesia. Those factors are social, regulation and environmental management, and governance.

1. Social

Social problems related to mining activities are quite complicated in Indonesia. It related to problems of unemployment, women workers, and illegal miner. The unemployment rate in Indonesia is still quite high. This condition stimulates people to work in mining sectors. It makes dilemma when mining companies are not adequate to provide job for them or when the companies start to close their activities. It is somewhat create problems of environmental degradation and social unrest.

Those problems is related each other. Firstly, people who are not admitted in mining companies will exploit minerals with their own way, those leads to illegal mining

activities. Those illegal miners work without clear direction particularly in environmental matters. So, it pushes to increase the destruction of environment and will become an obstacle in restoration program. Secondly, when mining companies shut their activities (mining closure) many former workers in this case labors will loss their job. And they also tend become illegal miners who still try to gain the rest of mineral material in former sites. Due to insufficient chance of new job for them it can be rouse social unrest in community. That is why the development and involvement of community become essential subject that still need to be solved in Indonesia.

2. Regulation and the implementation of environmental management

In previous explanation, the new direction of decentralization mode is still not run properly. Until now the new draft of mining operation still not yet legalized. The mining policy and legislation system need to be improving particularly in application of environmental management. Since environmental issues still is not really cared by Government who more consider about economic purpose, the regulation should give more guarantees for environmental management assessment.

3. Governance

Coping sort of problems in restoration it is argued that Indonesia have to develop good governance system, this system will direct the whole mechanisms of restorations. Cooperation and coordination among elements of governance will beneficial for successful restoration program. Since regional autonomy introduced, government in provincial or regional levels have big roles for development. They should become pioneer in integrating all elements in governance for supporting restoration projects in their areas. And it is actually already arranged in the new draft of mining regulation. The challenge is to what extent elements in governance can contribute their role optimally. If they can give significant efforts for this, it is expected that the restoration will be run properly.

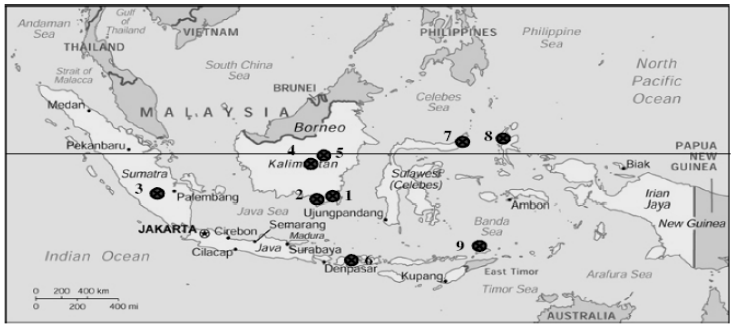
3.1.5 Effort for restoration

Although there are several problems faced by Indonesian Country regarding mineral restorations, actually some effort is try to be done by several parties. NGO"s

Mining companies, and also government has started the effort for restoration program.

One of the environmental problem in the mining sector in Indonesia is geared around the attitude of the mining industry, which is defensive and insufficiently transparent. Due to reduce this attitude some NGOs especially those with an advocacy basis are significantly force the companies to change this bad behavior. Some of the case is solved by the pressure of these organizations.

Facing the Indonesia condition, some companies try to start effort for restoration. One of contributor in this movement is what so-called IMSC. This organization contains some major mining companies. Figure 3.4 shows the companies and their locations.



Mine	Company	Parent Company	Commodity
1 Senakin	Arutmin Indonesia	BHP*	Coal
2 Satui	Arutmin Indonesia	BHP*	Coal
3 Rawas	Barisan Tropical Mining	Laverton-Durban	Gold
4 Mt Muro	Indo Muro Kencana	Aurora	Gold
5 Kelian	Kelian Equatorial Mining	Rio Tinto*	Gold
6 Batu Hijau	Newmont Pacific Nusantara	Newmont*	Gold/Copper
7 Minahasa	Newmont Pacific Nusantara	Newmont*	Gold
8 Gosowong	Nusa Halmahera Minerals	Newcrest	Gold
9 Wetar	Prima Contracting	Prima Lirung Mining	Gold

* GMI Members

Figure 3.4 Location of IMSC Companies and their project
(source cesare and maxwell, 2003)

They try to minimize the effect of mining industries by issuing the key aspects, objective, principles which are stakeholder involvement, planning, implementation, standards, and relinquishment. So far it is quite good implemented although small percentage and still need to enhance. In Bangka-Belitung although the destruction of environment is significantly occurs actually some effort is done by the companies.

They try to plant some vegetation in formers areas of excavation. But as already explained previously (see social sub chapter 3.1.3 pages 37) some people particularly illegal miners still carry out mining activities. They try to gain the rest of mineral from former areas which left in abundant site. Thus, this activities destruct the vegetation which already planted at those areas.

What already explained previously show the real condition of mining sectors in Indonesia. The general condition, regulation, challenges, and effort of restoration program face by Indonesia. It seems still much homework which should be done. And of course appropriate approaches will give chance for up grading the condition.

3.2 The Netherlands case

After discussing Indonesian case now it moves to the condition of the Netherlands. The Netherlands located in heart of Europe. This country has total 16,192,572 inhabitants (per 1 January 2003) who spread outs in 41,528 square kilometres (33,873 sq. km of land) in 1 January 2001. The form of Netherlands government is a parliamentary democracy, it controlled by parliament which contains two chambers second or Lower Chamber and first or Upper Chamber constructed in council of ministers. The country has 12 provinces (with a provincial governor and a provincial council). Each province is divided into municipalities (with a burgomaster and a local council). There are 483 municipalities (1-1-2004). There are also areas owned by the national government which is state waters large rivers and coastal water areas (ike, 2006)

The Netherlands is one of the countries in Europe which execute several activities in mineral excavation. This country has long story of mineral activities. For along time activity of mineral extraction occurs overwhelm the country. It starts when Roman emporium expands this country in the first Century of Anno Domini (van der moolen, 1995). Almost of the villages in that time had private excavation sites which extract clay, sand, and gravel. At that time peat-excavation became the biggest type of mineral activities. Peat contains fuel and building –material. That condition was stimulated by the increasing demand of replacement materials for wood and the need of materials support for industrial activities.

Those condition somewhat influence policies direction of the country particularly in local and regional level. Moolen (1995) said that there are three reasons why the interest of local and regional authorities in mineral excavation is enhanced. First reason is the declining of land tax revenues since ineffective areas which as the result of excavation activities such as large lakes and small waters did not make the land owner earn enough money. Next reason, as consequences of population growth, many inhabitants search land for their dwelling needs. It make the availability of land is

lessen, land become more valuable. And the last reason is there is small attention and action related to after-care activities for former area of peat excavation.

General Condition of mineral extraction in the Netherlands

The demand of minerals materials in the Netherlands is quite high. One of the primaries reason is mineral materials is significantly used for development in this country particularly to widen edifice and construction business. Every year the Dutch building sectors consume enormous cubic of mineral materials such as limestone, clay, and gravel. This condition somehow rouses the activity of mineral extraction. Due to the need of enhancing the production the intensity of excavation activities are raise. Consequently, the areas of mineral excavation are stretched, and in line with this many excavation firms enlarge their production. So, the demands for mineral materials stimulate the development of mineral industries in Netherlands.

The excavation industries grow notably in several locations in the Netherlands, The areas of mineral materials extraction spreads out from the south (gravel excavation), in the middle (coarse sand), the south east (coarse sand), and the North Sea (fill sand-road construction, raising land surface) of the country. Another mineral is clay-bricks and dike construction sited in almost all provinces in Netherlands (p. ike, 2006). Ike, 2006 said that some rivers like the Scheldt Rhine, Meuse, and the Eems is abundant with unconsolidated deposits. Besides, a large amount of peat place in swamps; limestone (cretaceous age) in the extreme south and limestone (Triassic age) in the extreme east of the country; glacial deposits of sand and gravel in the northern parts of the country; and in the southern part of the province of the Limburg close to the town of Heerlen placed silica sand.

Moolen, 2001 explained that some of areas in the Netherlands like Friesland, Drenthe, Gelderland, and North Brabant, and Limburg become point for mineral extraction activities. The large amount of pit-coals, clay, sand and gravel is sited in Limburg. Most of gravel production in Netherlands (about 90 %) comes from this area. The mineral extraction is mainly placed in the river Meuse. Other places which

are producing gravel, sand and clay are province of Gelderland and North Brabant. In south-east Drenthe and The Friesland the peat excavation is mainly conducted. Figure 3.5 displays the situation of ecological structure in the Netherlands

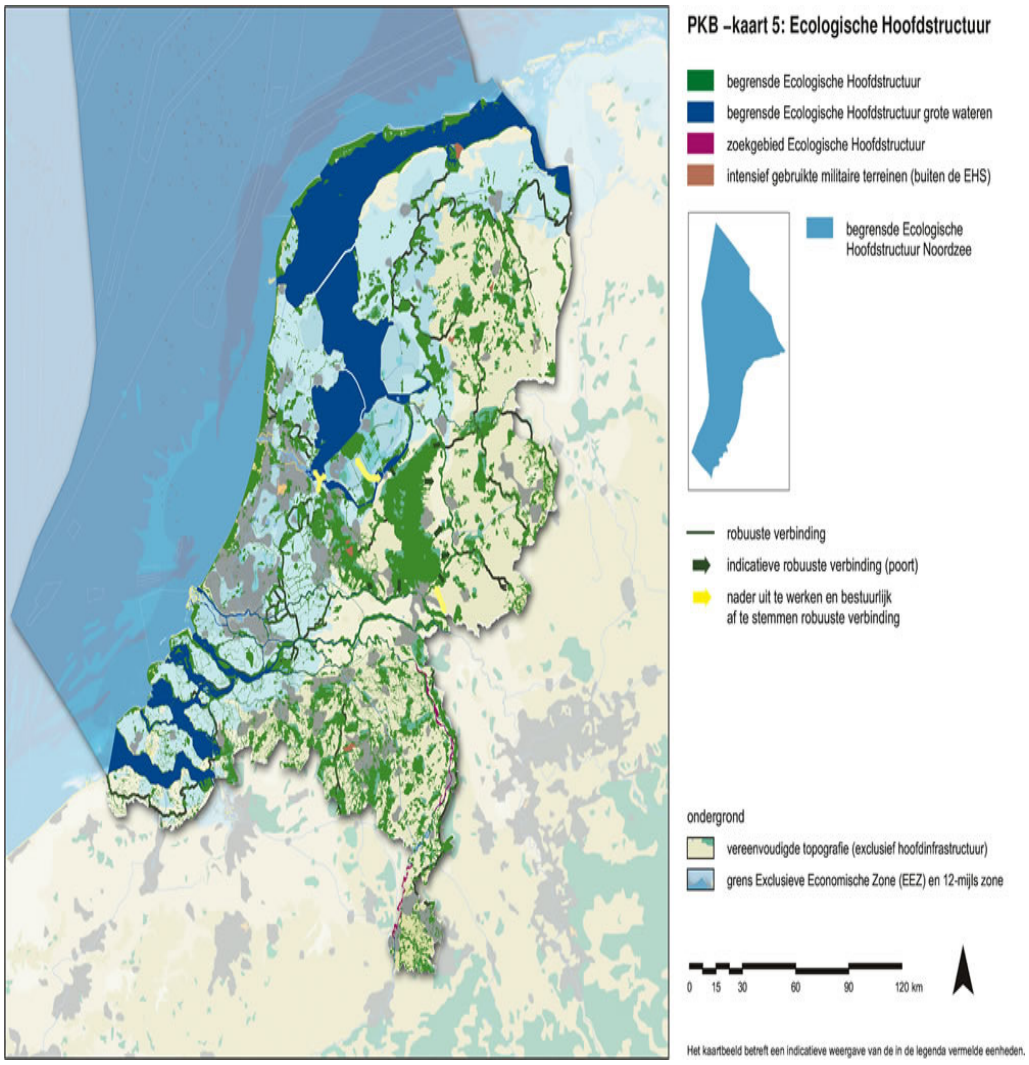


Figure 3.5 Main Ecological Structures in the Netherlands
(source www.gisactief.nl)

3.2.2 The structure of mineral industry in the Netherlands

Mineral industry is Netherlands mainly produce limestone, silica sand, coarse sand, clay, gravel, crushed rock, filling sand, and sand for limestone.

For more explanation it can be seen in table 3.4 below.

Table 3.4 Structure of mineral industry in the Netherlands

Minerals	Explanation
Limestone	There are only three locations: Cement industry: In the south of the Province of Limburg; ENCI is using the limestone for its own factory. Milling industry: Two quarries in the extreme east and the south of The Netherlands. Only one company: Ankerpoort Maalbedrijven N.V.
Silica sand	Two companies are assumed to have a market share larger than 10%. There are three smaller companies, which produce low graded silica sand.
Coarse sand (by-product = gravel)	Regional producers: approximately 15 companies, producing 7 Mt per year; National producers: 8 companies, producing about 14 Mt per year. For larger sites they mostly cooperate in a new enterprise. Six companies work together in the Industrial Sand en Gravel Producers Association (IZGP)
Clay	About 50% of the brick factories are owned by two international building materials internationals (CRH and Terca/Wienenberger). The Royal Netherlands Brick Manufactures Association has 22 members (50 brick factories
Crushed rock	Most of the 16 members of the Association of Producers and Importers (VPI) are active in the import of crushed rock (from Belgium, Germany, Scotland and Norway). There are also Dutch extraction companies, which produce across the border and market crushed rock by them. The members of the Dutch Gravel and Sand Traders Association (NVGZ) also trade in crushed rock.
Filling sand (extraction in state waters, inland project. Coarse sand is by-product)	Around 50 companies are united in the Dutch Association of Sand Extractors. Also other companies are active in this market.
Sand for lime-sandstone	In The Netherlands there are eleven sand-limestone factories. The bricks are sold via the Central Selling Office. The sand-limestone factories produce almost all the sand near the factory (operated by the factory).
Gravel (by-product = sand)	The same companies as coarse sand. The extracting of gravel is mainly located in the central part of the province of Limburg. In the other provinces, gravel is produced as a by-product of the sand production.

(source ike, 2006)

The change of minerals production can be seen in table 3.5. This table shows that in 2000 there are a little bit increasing of mineral production such as coarse sand, limestone, fill sand (fine sand), silica sand, meanwhile production of sand for limestone, gravel is decrease. The high quantities is fill sand and then coarse sand meanwhile the lowest one is silica sand. Crushed rock is not produce both in period 1989-1999 and 2000.

Table 3.5 Minerals production in The Netherlands period 1989-1999 and 2000

Commodity	**Production 1989-1999** (a) (million tons)	**Production 2000** (b) (millions tons)
Coarse sand	21	21,5
Gravel	7	6,6
Limestone	1,5	1,6
Silica sand	0,5	0,9
Clay	3,4	3,7
Crushed rock	0,0	0,0
Fill sand (fine sand)	74,0	87,7
Sand for lime-sandstone	3,6	2,6

(a) The second National Structure Plan on Surface Raw Materials, part 1, p. 20.
(b) Ministry of Transport, Public Works and Water Management, Road and Hydraulic Engineering Institute (2003c)

Mineral extraction also have role for supporting of employment in Netherlands, although the total amount of employee tend to decrease (analysis of Federation of Surface Mineral Extracting Industries (FODI) in table 2 displayed the estimation of employment in minerals industry.

Table 3.6 Employment in 1998 and 2001 in The Netherlands minerals industry

Industry	**Employment**	**Employment**
	1998	**2001**
Limestone (milling industry)	300	300
Limestone (cement industry)	1,280	690
Stoneware industry	3,000	?
Brick manufactures	2,100	1,475
Roof tile manufactures	600	600
Sand (gravel): regional producers	450	450
Gravel (sand): national producers	450	400
Sand (gravel): national producers	300	300
Lime-sandstone	1,000	800
Silica sand	70	60
Filling sand	?	?

source: Estimation Federation of Surface Mineral Extracting Industries (FODI), 1988 en 2001

From table 3.6 the brick manufactures absorb quite big amount of workers in 1998 but it slightly decrease in 2000.

The comparison of import and export of minerals in the Netherlands is illustrated in table 3.7 those data also based on year 1989-1999 and 2000. There are increasing amount in import of crushed rock, coarse sand, clay, silica sand; and import of fill sand and gravel. On the other side import of gravel, limestone and export of coarse sand are decline.

Table 3.7 Imports and Exports

Commodity	**Import** (million tons) **1989-1999 (a)**	**2000 (b)**	**Export** (millions tons) **1989-1999 (a)**	**2000 (b)**
Coarse sand	9	11	9	8.7
Gravel	19	13.1	1	2.6
Limestone	1.6	1.3	0.0	0
Silica sand	0.5	0.6	0.2	0.3
Clay	0.3	0.4	0.1	0
Crushed rock	4.9	9.6	0.0	0
Fill sand (fine sand)	0.0	0	2	3.6
Sand for lime-sandstone	0.0	0	0.0	0

(a) The second National Structure Plan on Surface Raw Materials, part 1, p. 20
(b) Publikatiereeks Grondstoffen 2003/11

Regulation

Recently, the rules for mineral extraction in the Netherlands have significantly changed. Now the National Policy on surface raw materials is integrated in the National Spatial Plan (Part 3: final governmental decision (Ministries van VROM, LNV, VenW en EZ, 2004)). The main change is the removal[4] the Second Structure Plan on Surface Raw Materials which means taking out the government's role in mineral planning raw material supply as mentioned by the secretary of State of Public Works and Water Management in May 2003. This action is stimulated by the needs of reducing financial and supporting for market parties become more active in extraction activities (ike, 2006).

Give more chance for private sectors to participate, it looks one the main changes of the new regulation. They are invited to give more of their contribution.

[4] the text becomes only one and a half pages

A plan for an optimal market economy is designated. The aim of the policy with respect to raw building materials is to stimulate the extraction of these materials in a socially responsible way. This guideline explains about main principles of raw policy such as:

1. *Raw materials should be used economically and for high-grade applications as much as possible.*
2. *The maximum use of secondary raw materials or renewable raw materials such as timber.*
3. *The national and local authorities should set a good example to others.*
4. *As far as possible the extraction of raw materials should be multifunctional in order to grade up spatial quality.*
5. *A socially desirable function should be developed associated with the extraction such as recreation facilities, housing on a waterfront, water management, nature conservation, etc.*

(Ike, 2006)

Provinces in the Netherlands develop Regional Mineral Extraction Plans. The form of plan is depending on what provincial want. They are free for it. The Ministry of Transport, Public Works and Water Management is responsible only for the State Waters and the North Sea.

The Netherlands also conduct the effort for collecting data and information of Dutch subsurface which is related to mineral industries. Beginning in 1977 the Netherlands institute of Applied Geosciences becomes core board of geo-scientifical information and research institute for The Netherlands (ike, 2006). The members of supporting parties of the research are national government, provincial governments and extraction companies. For instance, Ike, 2006 said in order to know the existence of coarse sand one project exploration is conducted. The Dutch continual shelf has carried out approximately 500 drillings during 2000 – 2003. This work is held by coordination of the province of Zuid Holland and the Ministry of Transport, Public Works and Water Management. Another research conducted by LCCO (*Landelijke Comisie voor de Coordinatie van het Ontrgrondingen beleid*) the National Commission for the coordination of mineral planning policy is study of relationships between extraction and restoration of landscape and nature as explained by van der mooolen and wolters (1999).

The Explanation below illustrates how to conduct mineral extraction in the Netherlands (ike, 2006)**:**

- *Extraction companies must apply for an extraction permit with the province a regional directorate of the Directorate General for Public Works and Water Management (State Waters).*
- *An extraction permit is provided when the request is in accordance with the provincial Regional Spatial Plan (Spatial Planning Act) and/or Regional Mineral Extraction Plan (provinces and/or state waters).*
- *A Mineral Extraction Plan can be issued as part of the Regional Spatial Plan or Regional Policy*

As a framework of minerals activities regulation is essential aspect. Here some of Acts which relevance to securing and producing minerals (ike, 2006):

- *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*
- *Pollution of Surface Waters Act*
- *Air Pollution Act*
- *Soil Protection Act*
- *Soil Protection Act*
- *Administrative Law Act*

Meulen (2005) constitutes the condition of the Netherlands. The shifting of mineral regulation occurs in this country. At 1960s and 1970s mineral extraction is under sub national permit-issuing authorities (provinces and for on land extraction and the directorate-general of public works and water management for the state

waters). At that time the regulation not provide the intervention and coordination mechanism by national government. In mid 1970s the national concern is mainly related to supplies of gravel, concrete, mortar sand, and clay for the structural ceramic industry. And in 1980 the National Commission for the coordination of mineral planning policy (*LCCO*) start the preparation of national Mineral planning guide until 1989. During that time the need of planning and coordination emerged that mineral planning should be integrated with other policies especially spatial planning. Then, now it is issued in regulation the amendment developed for national coordination and the embedding of mineral planning and spatial planning.

Meulen (2005) also said about sustainable mineral development, the action for rehabilitation should be done for preserving sustainability. The need for recycling and economic use of materials is become common issue. Introduction of secondary substitution for mineral materials is conducted. But the effort for using renewable materials is not success yet. It still needs improvement and become challenges in the future. Another point is if the management of restoration is not arranged in proper way, it will be only increase import levels without gaining the objectives of environmental quality improvements.

Restoration in the Netherlands

Restoration program in the Netherlands starts to become one of objectives in mining industries. Actually it already begins at long time ago when the government reverses the former areas of mineral extraction become agriculture land (Haarlemmer, Beemsmter, and Schermer).

Friesland now known as recreation centre in the Netherlands particularly water recreation centre. Previously this area is mainly used for excavation especially peat-soil and also material excavation which taken by inhabitants for their residential needs (Moleen, 1995). This is one of example how people try to change environmental condition of former excavation areas. Although it is not implemented yet to whole country but it proves that if people give a high effort for restoration programs it will be present in the real action and the result can be seen definitely.

Now the new regulation of mineral excavation in the Netherlands already gives clear guideline to such objectives of restoration as stated in main raw policy. The important notions are in the last two principles, as follows:

4. *"As far as possible the extraction of raw materials should be multifunctional in order to grade up spatial quality."*
5. "*A socially desirable function should be developed associated with the extraction such as recreation facilities, housing on a waterfront, water management, nature conservation, etc"* (ike, 2006).

The Dutch Government emphasizes 4 and 5 principles to keep on the direction of restoration run in the right track. The obligation of all extraction of raw materials activities should enhance spatial quality with various functions become standard of environmental quality measurement. Another point is the development of socially desirable function such as water recreation, residential areas, and center of nature conservation. It will be beneficial for government and also give positive impact to community in order to preserve environmental value and also might stimulate income for the country. Those grand designs of restoration only will run in good direction if all part contributes their maximum effort for the program. Comprehensiveness and integration in all steps of the program will lead to the successful of restoration activities.

Provinces in the Netherlands make some standard list for companies as requirements for opening new mineral activities. One of important points is the availability of plans for restoration. This plan will show to what extent the companies will conduct the mining closure strategy. They should convince the government with those plans, otherwise they will not accept an extraction permit. Next point is the request of those mineral extraction activities must in accordance with the provincial Regional Spatial Plan (Spatial Planning Act) and/or Regional Mineral Extraction Plan (provinces and/or state waters). Finally, if all the requirements have meet criteria and standards, the government will issue a permit extraction for the companies. One last

point is "*A Mineral Extraction Plan can be issued as part of the Regional Spatial Plan or Regional Policy"* (ike, 2006). Based on those procedures above it is clear that companies in order to get a mineral extraction permit should provide plans which convince the government. This situation stimulates competitiveness among mining companies. Only companies which can provide the convincing plan will become the winners and will accept the permit. So, government will choose "the best plan" from all application of mineral extraction permit.

In one side, these actions show the effort for protecting environmental quality life and manage the sustainability of development mineral industries but in other side also stimulate another effect. Firstly is related to the application, the companies should provide plans for restoration when they apply the extraction permit for conduct their new mineral industries (as already figure out previously). Because of this matter the procedure and process of the permit application will conduct in quite long time and not so easy to do. Secondly is about financial aspect. The companies should invest enough budgets for restoration plan and its implementation. It will give impact to their cash flow. Some of the companies do not have willingness to pay for these matters. So, it will reduce some part of investments in Netherlands.

Those two conditions above bring some consequences to the mineral industries in the Netherlands. Due to this long-difficult procedure some of companies are pretend to move their plans to other countries in Europe. It is easy for them since the EU (European Union) regulation for arranging this affair still not proposes yet. So, those companies are free to choose the countries where they will site their new mining industries. Thus, it is assumed that because of the new regulation there will be a declining volume of mineral production and the import value of mineral will rise.

Besides the Netherlands case, some of European Countries constitute quite similar approach of restoration. Scotland, Wales, England also include environmental quality as main consideration in restoration mineral extraction areas. Scotland has made some restoration considerations which mainly related to the management of soil

resources, soil storage, and soil handling machinery, landform, and drainage. They also did several programs such as reclamation to agriculture, reclamation to forestry, and amenity use (Scottish Executive, 2002). Meanwhile Wales also include the restoration and aftercare perspectives in mineral planning policy in order to provide the means at least maintain and enhance the long quality of land and landscape take for mineral extraction (Mineral Planning Policy Wales, 2000). England also conducts similar approaches for their mineral industries. Restoration is directed for purpose of remedial treatment of soil and also alternatives function of former extraction areas such as recreational sites, agriculture, and forestry (Mineral Planning Guidance UK, 1995).

Chapter 4

Lessons Learned for Restoration Program

This Chapter will represent aspects of analysis and try to resume what lesson can be gained from the case on Indonesia and the Netherlands. It is such a consideration of alternative concept of the implementation spatial quality in restoration excavation areas.

4.1 Aspect of Analysis

For discussing sort of analysis in mineral restoration, there are some aspects include in explanation as figure out in table 4.1

Table 4.1 Aspect of Analysis

Aspect of Analysis	Indicators
General Condition	Geographical Socio-economic Planning system Institutional Structure of Industry
Environmental Quality	Purpose and objective Fundamental Concept Measurement and Requirements Evaluation and Monitoring
Spatial	Regulation Comprehensiveness Integration
Restoration	Stakeholder Planning Financial Provision Implementation Standard Relinquishment

source (analysis, 2007)

The four aspects present the content of analysis of this research. It will elaborate the condition of mineral industries and its restoration in two countries. Now let discuss four aspects in this research one by one, it starts with general condition.

4.1.1 General Condition

The summary of general condition which already figures out in chapter 3 will displays here. It discuss about geographical, socio-economic, institutional and fiscal context, and also about the structure of mineral industry in each country. Geographical condition of two countries is highly different. It makes sense since the climate type of those is very dissimilar. The point which is relatively same is land use occupation. For complete explanation can be seen in table 4.2

Table 4.2 Geographical Condition of Two Countries

Physical Circumstances	Indonesia	The Netherlands
Location	South East Asia	Western Europe
Land Area	1,826,440 sq km (95,10 %)	33,883 sq km (81,6 %)
Water Area	93,000 sq km (4,90 %)	7,643 sq km (18,84 %)
Total Area	1,919,440 sq km	41, 526 sq km
Climate	2 season, tropical, hot, high humidity, moderate temperature in High lands	4 season, temperature, marine Cool summers and mild winters
Terrain	Coastal lowland, Mountainous, hilly, large islands	Coastal Lowlands and reclaimed land (polder)
Elevation extremes	The lowest point up to 0 masl and the highest point up to 5,030 masl	The lowest point up to -7 masl and the highest point up to 322 masl
Natural Resources	Fertile soil, petroleum, mining, natural gas, woods	Sand and gravel, arable land, natural gas, limestone
Land Use	Modern activity 81, 93 % Crops 18,07 %	Modern activity 77,27 % Crops 22,73 %
Natural Hazards	Flooding, drought, earthquake, volcano, tsunami, forest fires	Flooding

(source world book fact, USA 2005)[5]

From table it can be depicted that the topography of land is much different. This dimension should be considered carefully when arrange restoration plan. Thus, what

[5] retrieved from http://www.cia.gov/cia/publications/factbook/geos/nl.html

can be implemented in the Netherlands might not suitable in Indonesia for this context. But for the general concept, it is still useful to be learned.

The next point is the socio-economic context, Indonesia as developing country still have problem in unemployment, although it also occurs in Netherlands but the rate is relatively lower than Indonesia (see table 4.3). This fact rouses the condition which already explained previously. Due to insufficient of job vacancies people tend work as illegal miner. Those make sort of obstacles and disturb the objectives of restoration program. Another point is in order to enlarge GDP capita of the country, Indonesia push the extension of mineral extraction as one of vital element contribute in GDP.

Table 4.3 Socio-economic Condition

Socio-economic Characteristics	Indonesia	The Netherlands
Population	245,452,739	16,491,461
Population growth	1.41 %	0.49 %
Unemployment	Agriculture 46, 5 % Industry 30,6 % Services 54, 6 %	Agriculture 2 % Industry 19 % Services 79 %
GDP per Capita	10.90 %	6.50 %
National Budget	$ 3,600	$ 30,500
Investment	Revenue $ 54.3 billion Expenditure $ 57.7 billion National Budget → deficit	Revenue $ 291.6 billion Expenditure $ 303.7 billion National Budget → deficit
Public Debt	21.50 %	19.3 %
International Fund	$ 43 billion of GDP	$ 4 billion of GDP

source world book fact, USA 2005[6]

It sometimes makes government not really care about the need of restoration. Since the desired purpose is mainly about enhancing the production of minerals. It still challenges for Indonesia to give much attention for this matter.

[6] retrieved from http://www.cia.gov/cia/publications/factbook/geos/nl.html

Planning system is another point in general condition analysis. Based on data of world book fact, USA 2005 (see table 4.4) in some part planning system in Indonesia has some similarities with the Netherlands. The similarities are the locus of power and type of plan document. Both of countries use decentralization type even though for Indonesia it is relatively new. Indonesia start the direction with introduced the regional autonomy law. And in line with this the new draft for mineral industries is already design although still not yet legalized. On the contrary, the maturity and the scope of system, public-private relations are slightly diverse.

Table 4.4 Planning System in Two Countries

No	Planning System Characteristics	Indonesia	the Netherlands
1	Locus of power	Central (National) recently change to decentralization	decentralized
2	Scope of System	Fragmented	Integrated
3	Extent and Type of Plan Document	Spatial national Plan; sectoral policies	Spatial national plan; sectoral policies
4	Public-private relationships	Market-led	Plan-led
5	Legal Framework	Roman Dutch law; modified by local principle Pancasila	Civil Law system; constitution not allowing judicial review
6	Maturity of the system	Less of public Acceptance, no up to date policy instruments; lack of vertical integration; lack of government transparency	More public support, vertical and horizontal integration
7	Expressed Object	Moderately-distance from plan	Closely-distance from plan

(source world book fact, USA 2005)[7]

In Indonesia public participation not yet fully implemented, that is why the level of public acceptance is still low. Meanwhile public in the Netherlands looks give more attention and role in planning activities.

[7] retrieved from http://www.cia.gov/cia/publications/factbook/geos/nl.html

The fourth point is Institutional context, Board for managing mineral Sectors both in Indonesia and the Netherlands is relatively similar. It divided into central government provincial and regional (local) government. The mineral sector is mainly under provincial level, the different is in Netherlands there are some areas are directly control by central government (water state). Another point is if the Netherlands start to give more opportunity to private sectors to participate in mineral industries and reduce the role of government, Indonesia has already a quite long time give much portion in mineral industries to private sectors. In one side privatization both in Netherlands and Indonesia is a good movement but in other side it can be a big problem if the mechanism and the coordination system are not run in the right direction. Thus, in the future it is still good to involve private sector but it must under clear and well organized system.

The two countries have types and characteristics of mineral industries. For detail explanation regarding this substance can be seen in chapter 3 of this research. About Structure of Mineral Industry in Indonesia and the Netherlands are explained specifically (see Table 3.2 page 30-31 and Table 3.4 page 44) and concerning production (see table 3.3 page 32 and Table 3.5 page 45) and also about export and import (see Table 3.7 page 46).

In summary, when looking the general condition of mineral industries in two countries it looks in some aspects the condition in the Netherlands is relatively better than Indonesia particularly in planning system and the way how the Netherlands implement it, wide range of public participation, transparency and accountability of government are sort factors which support this condition.

Now let move to the next analysis. Chapter 2 constitute about some aspects of this research such as Environmental Quality, Spatial Plan, and Restoration. Hence those will be elaborate more each part of them.

4.1.2 Environmental Quality

In previous chapter it is argued that environmental quality becomes measurement or standards of successful restoration. This statement means that in doing restoration

program, the objectives should be mainly referred to environmental quality improvement. The orientation of mining development becomes one important point which should be considered. Although the main purpose of mining activities is to gain benefits as goal of mineral industries that tends to economy orientation but it is also important to consider the objective of keeping environmental quality as well.

Table 4.5 Environmental Quality

Environmental Quality	Indonesia	the Netherlands
Purposes and objective	+	++
Fundamental Concepts	-	++
Measurements and requirements	-	+
Evaluation and Monitoring	+	+ +

source analysis, 2007

Note:
- = lack some of part
- - = bad condition
+ = good, but still need improvement
+ + = good

Looking these environmental quality aspects, one important notion is the basic concept to improve the value of environment. The concept of integration spatial plan and environmental quality improvement looks good in this point. So, the need of enhancing environmental quality is supported by spatial plan especially in segmenting zoning areas for mineral industries and the assessment of providing plan based on requirement regarding environmental value. This concept start introduce in Netherlands (D Miller and G. de Roo, 2004) with five principles for integrating urban planning and environmental quality improvement which are expand comprehensiveness, develop a sound and appealing evidence base, inclusive public involvement, include wide range of alternatives, and balance objectiveness.

There are measurement for assessing the restoration program whether it meet requirements or not. And the condition or quality of environment becomes main consideration for measuring it. It covers the quality of water, soil, air surrounding areas, also the sea areas in certain case.

In Netherlands, to get permit for running mining industries, companies must show that they have ability to keep the quality of environment, for instance with give a scenario of planning with related not only during the process of extraction but also after the activities is finished. In the meantime Indonesia also applies this but not really run properly particularly in evaluation and monitoring. So that is why the analysis gives positive value for the Netherlands in purposes, basic concept, and monitoring

4.1.3 Spatial Aspects

In doing restoration of mineral areas as already explained in previous chapter, spatial aspect is next important notion after environmental quality. Why it is important at least there are 3 aspects, regulation, comprehensiveness, integration.

Table 4.6 Spatial Aspects

Spatial Aspect	Indonesia	the Netherlands
Regulation	-	+ +
Comprehensiveness	-	+ +
Integration	-	+ +

source, analysis 2007

Note:
- = lack in some part
- - = bad condition
+ = good, but still need improvement
+ + = good

Regulation as explained previously in chapter 3 became basic framework in this matter since it will set out the whole process of mineral excavation activities. Regulation also becomes starting point for change the direction. For example is the change of centralized to decentralize.

The new direction from centralized to decentralized make Indonesia need somewhat adaptation in transition period in order to run in right way the proper approach in restoration program. In Indonesia regulation for mineral planning is still

in the process of revision. Until now the new draft law 25th May 2001 has not issued yet. Meanwhile the Netherlands now already issue the new regulation. This is mainly give authority to provincial level. In Netherlands now the procedure of establishment new mining locations must have permit from regional province in which the companies will be placed. The considerations of issuance permit have to be based on spatial plans of that region. So, all things related to zoning, positioning, site areas highly refer to direction of spatial plans. The core principle of Netherlands Mineral Act related to mining sectors is the requirements for a plan for restoration.

Beside regulation, comprehensiveness is also important. Since restoration is related not only to one aspects but also has connection to other sectors. The comprehensive paradigm should be inherently positioned in the framework. The way how people see the management of restoration should include various factors as considerations. So, the comprehensiveness framework is obligate in doing restoration program, otherwise it will be partially cope the problem.

Integration is another crucial thing. All elements who related to the program should be joining together to handle the activities. Coordination and cooperation are two necessary points here. With those it is expected that all parties have same perspective to obtain the successful of restoration program. Thus, the comprehensiveness and integration in this position should run simultaneously.

For two points above it is argued that the Netherlands is quite good in doing such thing. One of the reason is that regulation is effectively become an instrument to make comprehensiveness framework and integration of all elements in carrying out the program of restoration.

4.1.4 Restoration

Last but not least of this research analysis is about the key objective and principle of mining closure (in this case restoration program) itself. Table 4.7 constitutes those key objective and principle. Based on Cesare and Maxwell, 2003, 42-52) key objective and principle of mining closure related to stakeholders involvement, planning, financial provisions, implementation, standards, and relinquishment.

Stakeholders have vital role in implementation of restoration program, since they are pillar of governance which becomes one key success.

Table 4.7 key aspect, objective and principles

Key aspect	Objective	Principles
1. Stakeholder involvement	To enable all stakeholders to have their interests considered during the mine closure process.	1. Identification of stakeholders and interested parties is an important part of the closure process. 2. Effective consultation is an inclusive process that encompasses all parties and should occur throughout the life of the mine. 3. A targeted communication strategy should reflect the needs of the stakeholder groups and interested parties. 4. Adequate resources should be allocated to ensure the effectiveness of the consultation process. 5. Wherever practical, companies must work with communities to manage the potential impacts of mine closure.
2. Planning	To ensure that the closure process occurs in an orderly, cost effective and timely manner.	1. Mine closure should be integral to the whole mine life plan. 2. A risk-based approach to planning should reduce both cost and uncertainty. 3. Closure plans should be developed to reflect the status of the project or operation. 4. Closure planning is required to ensure that closure is technically, economically and socially feasible. 5. The dynamic nature of closure planning requires regular and critical review to reflect changing circumstances.
3. Financial provision	To ensure that cost of closure is adequately provided for so that the community and/or state is not left with a liability.	1. A cost estimate for closure should be developed from the closure plan. 2. Closure cost estimates should be reviewed regularly to reflect changing circumstances. 3. The financial provision for closure should reflect the real cost. 4. Accepted accounting standards should be the basis for the financial provision. 5. Adequate securities should protect the community from closure liabilities.
4. Implementation	To ensure that there is clear account-ability and adequate resources for the implementation of the closure plan.	1. The accountability for resourcing and implementing the closure plan should be clearly identified. 2. Adequate resources must be provided to assure conformance with the closure plan. 3. The on-going management and monitoring requirements after closure should be assessed and adequately provided for. 4. A closure business plan provides the basis for implementing the closure plan. 5. The implementation of the closure plan should reflect the status of the operation.
5. Standards	To establish a set of closure design criteria and completion criteria for the closure process.	1. Legislation should provide a broad regulatory framework for the closure process. 2. It is in the interest of all stakeholders to develop standards that are both acceptable and achievable. 3. Closure design criteria are required to ensure that permanent man-made structures remaining post closure are adequately designed for long-term conditions. 4. Completion criteria are specific to the mine being closed, and should reflect its unique set of environmental, social and economic circumstances. 5. An agreed set of indicators should be developed to demonstrate successful rehabilitation of a site. 6. Targeted research will assist both government and industry in making better and more informed decisions.
6. Relinquishment	To reach a point where the company has met agreed completion criteria to the satisfaction of the responsible authority.	1. A responsible authority should be identified and held accountable to make the final decision on accepting closure. 2. Once the completion criteria have been met, the company may relinquish their interest. 3. Records of the history of a closed site should be preserved to facilitate future land-use planning.

(source cesare and maxwell, 2003, 42-52)

Based on keyword and principles it can be explaining the condition of Indonesia and the Netherlands as display in table 4.8

Table 4.8 Restoration Aspects

Restoration Aspects	Indonesia	the Netherlands
Stakeholder involvement	-	+ +
Planning	+	+
Financial Provision	-	+
Implementation	-	+
Standards	+	+
Relinquishment	+	+ +

source, analysis 2007

Note
- = lack some of part
- - = bad condition
+ = good, but still need improvement
+ + = good

Stakeholder involvement is hire positively in Netherlands, meanwhile Indonesia still have problem in this. For financial provision and implementation Indonesia also have problem, due to the quite big budget for execute restoration program sometimes companies not carry out in the right way. Thus the implementation is not meet to the standards. How about in Netherlands, the condition generally is quite good although still need optimization.

4.2 Lessons Learned

Summarizing the whole analysis there are some aspects which can be identified and collected as lesson learned in order to gain a good restoration program. The Lesson learned generally become consideration for other areas to be implemented as its own concept. Marsh and Dolowitz (1996) said that degree of transfer depend on scope of idea. It can be the whole idea, partially or some part of the ideas. It depends on the condition and situation. So these lessons learned mainly about the general

condition of the country not specific application of the program implementation. Based on the discussion above sort of lessons can be resuming:

1. Public participation, transparency and accountability of government particularly in conducting system are very essential.
2. Environmental Quality as main purposes and objective is arguable as fundamental concept which crucial in run restoration program.
3. Integration of spatial aspect and environmental quality improvement is a main notion and become one suitable approach in doing restoration program.
4. Achieving the key objective and principle of restoration program is sort of guarantee for successful restoration.
5. Both counties have positive and negative sides, choose the suitable approach and appropriate example from each country will beneficial for gaining successful program.

Those lessons learned not only can be used in Indonesia context but generally can be consideration for other countries which face problem in solving the mineral extraction problem particularly in spatial and environmental aspects.

Chapter 5

Conclusions and Recommendations

5.1 Conclusions

From previous explanation it is clear that Mineral Restoration activities both in Indonesia and the Netherlands are essential to be done. The first reason is that sustainable development should be conducted. Due to the need to implement sustainability in all sectors including mineral industries it is expected that all efforts to support this should be developed. Secondly, environmental quality should be care by all people. Since the environment is a place where people live, stay, interact and carry out their activities everyday, it should be safeguarding and preserve from degradation of quality. The level of environmental quality will significantly influence the life value of the people surrounding it. So, it is common obligatory for all people who live in certain areas to protect and keep the quality of their environment. Another point is the universal needs and saving for the future. It should be realized that environment is not only belonging to some parts of people at this time but also to next generation in the future world. Thus, people should give their contribution to preserve it as an inheriting thing for the subsequently user.

In accomplishing restoration program of course some problem will be faced. Ineffective and inconsistency control of government, less of public acceptance, lack of transparency, low level of accountability, and domination of economic orientation are some of them. But at the some time also it is challenge for people solve those problems and try to keep effort for this program. Otherwise it will be such a disaster particularly in mineral sectors and generally for all human being surrounds the world.

This research focus on how the two countries conduct their mineral industries and to what extent the principles of restoration already implemented. It covers the dimension of theoretical framework, case studies, and research analysis. The next description will resume the answers of the research questions, as follows:

The First question is *what notions of spatial environmental quality are applied in restoration of mineral extraction areas?*

The important notions in application of restoration program are environmental quality and spatial aspect. These two aspects become basic consideration in conducting restoration. Environmental quality becomes the main purposes and objectives and use as measuring the standards of successful restoration. Meanwhile spatial aspect is used as tools for directing the implementation of restoration activities. With spatial approach it is expected the direction will be run on the right way and it becomes such a control in closure mining programs. Therefore, environmental quality and spatial plan become two essential elements in supporting the concept of restoration.

The second question is about, *what are actual conditions in mineral extraction areas in Indonesia?* and *what actual conditions in mineral extraction areas in Netherlands?* For answering this question some explanation will be displayed here. In the Netherlands, the government makes a scenario of planning with related not only during the process of extraction but also after the activities is finished. In the meantime Indonesia also applies this but not really run properly particularly in evaluation and monitoring. About comprehensiveness and integration, the Netherlands has been quite good in doing such thing. The condition in Indonesia also runs in the same direction but still needs some improvement. Stakeholder involvement is conducting positively in the Netherlands, meanwhile Indonesia still have a problem in this. For financial provision and implementation Indonesia also has difficulty, due to the quite big budget for executing restoration sometimes companies do not carry out on the right way. The Netherlands also has the same problem related to the optimization of those things.

The next question in this analysis was *what lesson can be learned from conditions and treatment of mineral extraction areas in the Netherlands?*

First lesson is that public participation, transparency and accountability of government is very essential. Secondly, environmental quality as main purposes and objective is arguable. Next, the integration of spatial aspect and environmental quality improvement becomes important point. And achieving the key objective and principle of restoration program is the last lesson from analysis of this research.

The last question was *what is appropriate approach regarding restoration of mineral extraction areas in Indonesia?*

The approach is the integration of spatial plan and environmental quality improvement. This concept uses spatial approach in directing restoration in order to achieve the primary objectives and purpose, enhancing quality of environment. For implementing this concept of course there is a sort of adjustment. The amending approach is built based on the characteristics of Indonesia which covers geographical, the structure of mineral industry, institutional context, planning system, socio-and economic. It also consider about key objectives and principles of restoration.

In summary, the whole analysis of the condition and alternatives approach is illustrated in table 5.1

Table 5.1 Summary Analysis

Indicators	Indonesia	The Netherlands	Proposed Alternative
Environmental Quality o Purpose and objective o Fundamental Concept o Measurement and Requirements o Evaluation and Monitoring	-	+ +	Enhance environmental Quality perspective both in regulation and the community (awareness)
Spatial o Regulation o Comprehensiveness o Integration	+	+ +	Integration of Environmental quality measurements in spatial plans (regulation)
Restoration o Stakeholder o Planning o Financial Provision o Implementation o Standard o Relinquishment	+	+ +	Maintain the quality of plan, schemes, and implementation of restoration

(source analysis, 2007)

Note
- = lack some of part
- - = bad condition
+ = good, but still need improvement
+ + = good

5.2 Recommendations

Some recommendations can be issued for enhancing the quality both concept and implementation of mineral restoration.

It is not fully guarantee thing that run good in one county will also success in other countries. Of course the experience from one country is not fully suitable with other country. The approaches implemented in the Netherlands will not automatically fit with the Indonesia condition, but some lessons from the Netherlands could become a sort of inspiration or consideration to be transferred in Indonesian context.

Since the condition of one country vary and specifically unique with other countries adjustment in implementation is logic in this situation. Sort of amendment in regulation and also the approaches in implementation will beneficial for Indonesia. For instance, since the level of participation in two countries is different for the need to enhance public participation the government in Indonesia should be active to give information to community for supporting and joining together in restoration programs. So it is still not adequate only put this in regulation like what Netherlands Government has done.

Based on the real condition of Indonesia it will be wise if the recovery of restoration program is run gradually. The preparation of implementation is very important in this context. Without good preparation the objectives and target of restoration program look difficult to achieve. Things that relatively new for Indonesia government like transparency and accountability and also public participation should be prepared in right direction.

Stakeholder involvement becomes last keyword of this recommendation. All parties should give their contribution for succession restoration program. Government, private sector, and community accompany work to gain succession of the program. Good governance will become one of requirements to evaluate whether restoration program will run properly or not.

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