Landscape design for ecotourism development by PT. Putra Mekongga Sejahtera Regency of Kolaka, Southeast Sulawesi Province

D N Buana¹ and Z A Sahabuddin²
¹Student of Management of the Environment, Hasanuddin University, 90245, Makassar, Indonesia
²Department of Defense Economics, Faculty of Defense Management, Defense University, 16810, Bogor, Indonesia

E-mail: dealisanoorbuana@gmail.com

Abstract. The mining industry is often found in life, such as nickel, which is a mixture of stainless steel. However, many people consider mining activities as activities that damage the environment. To change the negative image of the mining industry, it needs to be proven that mining activities can have a positive impact because it can add value to the community's economy. PT. Putra Mekongga Sejahtera is one of the companies engaged in nickel mining. In Kolaka Regency. PT. PMS conducts nickel mining activities using the open-pit method. Impacts that will occur when mining activities are completed are landform changes and vegetation loss. Therefore, landscape design planning activities for the development of agro-ecotourism are important to minimize environmental impacts and are expected to restore the condition of the former mining area to approach its original condition so that it can achieve the desire to achieve sustainable development by making the post-mining location an ecotourism area. The study was conducted using a qualitative approach; the sampling technique used was purposive sampling. The purpose of this study is 1. Analyzing the ecotourism agro landscape design strategy in the post mining area to approach its original condition so that it can achieve the desire to achieve sustainable development by making the post-mining location an ecotourism area. 2. Creating the concept of ecotourism agro-landscape in the post mining area. 3. Analyzing the readiness of the community around the PT.MS mining area to make the former mining area as an ecotourism area through community identification. The results showed that the former mining area was in the forest area. Landscape planning to be carried out leads to agro-tourism activities by involving the community. Agro-tourism activities are chosen so that they can add to the economic value of the community from the arrival of visitors to the ecotourism and crop yields.

1. Introduction

PT. Putra Mekongga Sejahtera (PT. PMS) is one of the national private companies engaged in nickel mining. Nickel mining of PT. PMS is located in the village of Dawi-Dawi, Kolaka Regency, Southeast Sulawesi Province. PT. PMS has IPPKH for the utilization of 349.42 Ha nickel-iron ore in accordance with Minister of Forestry Decree No. SK.646 / Menhut-II / 2011 dated November 14, 2011 [1].

PT. PMS carries out open-pit mining activities using the open-pit method. Mining activities PT. PMS starts with the activity of finishing stripping land (land clearing). After that, the topsoil and overload are removed. The overburden consisting of sandstone and topsoil will be placed in a
temporary landfill site that will be used for reclamation and repair activities. While mining activities include unloading (loosening), loading, transporting [2].

When mining is completed, it will certainly leave the former mining area in the form of a mine opening hole [3]. Ex-mining holes, if not done well planning, will certainly have an impact on the environment [4,5]. Therefore, reclamation and rehabilitation activities are important to minimize the environmental impacts arising from mining activities and are expected to restore the condition of the former mining area to be close to its original condition so as to achieve the desire to achieve sustainable development by making the post-mining area an ecotourism agro-area.

2. Conceptual Framework
As population growth continues to grow, the need for technology using mining materials is increasing. The existence of mining activities will result in changing environmental conditions around the mining area, such as changes in landforms, changes in physical and chemical properties of the soil, which will result in stunted plant growth, which can cause erosion due to changes in land use [6]. Therefore, the importance of good land management so that it will maintain the sustainability of land, especially land that has changed its function to become a mining area. One of the efforts to be carried out is by planning for reclamation and rehabilitation in the development of ecotourism agro-land so that the former mining area can function in accordance with its designation and has an environmental value that is almost close to the initial conditions before the mining activities [7,8]. In carrying out reclamation and rehabilitation in the development of ecotourism agro PT. PMS will involve the surrounding community in terms of planting and maintaining plants so that the agro-ecotourism development plan can achieve success as expected. In addition, ecotourism is expected to be an added value in terms of the economy for local residents who live around the area of agro-ecotourism [9]. If agro-ecotourism in the former mining area is successfully implemented, this will also be an alternative way to restore the image of the mining industry, which is always considered negative by residents who live around mining sites or the community in general because it is considered to bring damage to the environment [2,10]. Therefore, to achieve the success of the ecotourism agro-plan in the former nickel ore mining area of PT. PMS is needed by the seriousness of the stakeholders in planning agro-ecotourism activities. The conceptual framework can be seen in Figure 1.
3. Methodology

This research is research with a qualitative approach. The qualitative approach is used to enrich the description and analysis, the sampling technique used is purposive sampling. Research focuses on the reclamation and rehabilitation plan in the development of eco-tourism by PT. PMS. This research was conducted in September-December 2019, in the former mining area of PT. PMS located in Dawi-Dawi Village, Pomala District, Kolaka Regency. To facilitate the research process, researchers will use tools and materials that will be used during the study. Equipment and material requirements will be described in table 1.

Table 1. Research Tools and Materials.

| Tools and Materials          | Function                                                                 |
|------------------------------|--------------------------------------------------------------------------|
| Global Positioning System (GPS) | Knowing the coordinates of the research location and the point of sampling the soil |
| Plastic Samples             | Place soil samples to be tested in the laboratory                         |
| Camera                      | Documentation at the research location                                   |
| Voice recorder              | Voice recording when collecting data on informants                        |
| Questionnaire               | Used for social data collection                                           |
| Stationary                  | As a tool to record at the time of research                                |
| Arc Gis 10.2                | As a medium to map research locations                                     |
| Realtime Landscape          | As a medium for planning ecotourism agro                                   |
| Rainfall data for 2008-2018 | To find out the annual rainfall for 10 years                              |
| Map of soil type            | To explain the type of soil that is in the study location                  |
| Topographic maps            | To explain the difference in elevation at the study site                   |
| Map of the location of the former mining area of PT. PMS | To explain the research location |

3.1. Data Sources

Data obtained are based on primary data and secondary data. Primary data is data obtained directly based on results in the field, as well as interviews with relevant parties in the post-mining land-use plan to be used as an ecotourism agro-area. Secondary data is data obtained from various sources such as data from agencies related to research, literature studies, journals, theses, and previous research reports relating to research objectives and internet sites, secondary data in the form of land use data, and maps thematic. Thematic maps collected are administrative maps, IPPKH maps of PT. PMS, map of research location, a geological map of the research area. The explanation of primary data and secondary data can be seen in table 2 and table 3.
Table 2. Primary Data.

| Data Type                          | Data source         |
|------------------------------------|---------------------|
| Research location                  | satellite imagery   |
| Land type data                     | Field survey        |
| Data on community perception of the Ecotourism | Interview / questionnaire |
| Agro plan                          |                     |

Table 3. Secondary Data.

| Data Type                          | Data source                                             |
|------------------------------------|---------------------------------------------------------|
| Biophysical Data                   | Related Agency and PT. PMS                              |
| Rainfall data for the research area | Related Agency and PT. PMS                              |
| Map of research support            | Related Agency and PT. PMS                              |
| Previous research data related to research | Journals, theses and books related to research |

3.2. Data analysis

1. Land suitability analysis
   Assessment of land suitability classes for plants to be planted in post-mining areas is carried out with a system that is in line with plant growth requirements. Land suitability classes are determined by physical and chemical factors.

2. Landscape Design Analysis
   In landscape, design analysis will consider the slope as a basis in the regulation of the ecotourism agro-zone.

3. SWOT Analysis
   SWOT analysis is carried out to find out the strategies that will be used in the implementation of ecotourism agro-development in the post-mining area of PT. PMS5. Landscape Planning
   The final results of this study will lead to the concept of ecotourism agro-planning in general. While planning at the sample point will produce a landscape plan for the location of the development of the former mining area into ecotourism agro. In the case of development sites, this area is divided into two zones, namely the agro-tourism zone and the non-agro-tourism zone.
   The spatial concept was developed based on the agricultural potential of the plantation subsector

4. Result

4.1. Physical and Biophysical Analysis
   From the observations the location of the study is located at 121°37’19.7” - 121°38’36.8” BT and 4°12’20.4” - 4°12’41.2” LS. the study site consisted of the Comoros hill and river. The study area has an altitude of 150 m above sea level to 260 m above sea level with a slope of 0-15%. The study location has a tropical climate with a temperature of 20°C and a maximum of 23.8°C. The results showed that the soil at the post-mining location was classified in Typic Hapludox, clay, mixed, isohypertermic and Typic Hapludalfs, clay, mixed, isohypertermic. Natural fertility reserves in the soil, both virgin and former mining, have physical properties that need improvement. Low fertility is characterized by low levels of organic matter, levels of available Fe and available Mn are classified as sufficient, whereas available Zn and available Cu are classified as less. The results of plant nutrition analysis in relation to several types of plants whose growth is not good on revegetation land caused by Ca, Fe, Cu, or Mn deficiency. Therefore, repairs will be carried out by planting metal-absorbing plants in the nickel mining area by planting starfruit Bajo (Sarcotheca celebica) and nail wood (Pericopsis mooniana). Meanwhile, based on biophysical analysis that has been carried out, endemic vegetation in the study area is the starfruit Bajo, and nail wood while the MPTS plants around the study site are rambutan, mango, durian, banana, pineapple, and soursop. From the results of biophysical research, it can be seen that the suitability of land for plants to be planted can be seen in table 4.
Table 4. Recapitulation of land suitability.

| Soil Characteristics | Conditions In The Research Site | Land Suitability |
|----------------------|---------------------------------|------------------|
|                      | Rambutan | Durian | Mango | Banana | Pineapple | Soursop |
| Temperature (°C)     | 22.13    | S1     | S1    | S1     | S1        | S1      |
| Rainfall (mm/month)  | 132.73   | S1     | S1    | S1     | S1        | S2      |
| Drainage             | Moderate | S1     | S1    | S1     | S1        | S1      |
| Texture              | Sandy loam soil | S3 | S3    | S3     | S3        | S2 |
| Dept of soil (cm)    | >50      | S1     | S1    | S1     | S1        | S1      |
| Slope (%)            | 0-20%    | S1     | S1    | S1     | S1        | S1      |
| pH                   | 6.16     | S1     | S1    | S1     | S1        | S1      |
| C (%)                | 1.64     | S2     | S2    | S2     | S2        | S2      |
| N (%)                | 0.18     | S2     | S2    | S2     | S2        | S2      |
| C/N                  | 9        | S2     | S2    | S2     | S3        | S2      |
| P<sub>2</sub>O<sub>5</sub> Hcl (ppm) | 11.31 | S3 | S3 | S3 | S3 | S3 |
| K<sub>2</sub>O (mg/100 g) | 8.57 | S1 | S1 | S1 | S1 | S1 |
| KTK (me/100 g)       | 25.83    | S3     | S3    | S3     | S3        | S2      |
| K (me/100 g)         | 0.41     | S1     | S1    | S1     | S1        | S1      |
| Na (me/100 g)        | 0.46     | S3     | S3    | S3     | S3        | S3      |
| Mg (me/100 g)        | 2.34     | S2     | S2    | S2     | S2        | S2      |
| Ca (me/100 g)        | 9.63     | S1     | S1    | S1     | S2        | S1      |
| Base saturation (%)  | 50       | S1     | S1    | S1     | S1        | S1      |

Where: S1 = Highly Suitable, S2 = Moderately Suitable, S3 = Marginal Suitable

4.2. Landscape Design Analysis

The ecotourism agro landscape design applies the local wisdom of Mekongga tribe in utilizing nature to get balance. Local wisdom is applied in choosing vegetation in accordance with local biophysical conditions, using natural materials in building facilities. The main target of ecotourism agro is children and adolescents so that the basic concept of ecotourism agro to be raised is the concept of the natural panorama. In the concept of natural panorama, tourist visitors can see the natural beauty of the hill while gardening. Tourist visitors can also feel the sensation of camping from the top of the hill. Tourist visitors can choose various tourist facilities offered.

The ecotourism agro-landscape design emphasizes balance and unity with nature. The arrangement of facilities in the form of building structures takes into consideration the existing landscape conditions. The chosen material is a natural material that is often used by the people of Mekongga, such as stone, rattan, and wood, which are adapted to local climate conditions.

The concept of ecotourism agro-landscape space consists of limited utilization areas, tourist utilization areas, and tourist service areas. Areas of limited use are areas with supporting vegetation, such as timber trees. Tourism utilization area is an area that has the potential to be used as a tourist area. The tourist service area is an area that can be used as an area to support tourist activities.
The concept of color will be applied to complement facilities (signage, lighting, benches, bins), which will be described in the facility concept. The concept of color can also be the orientation of the direction so that visitors of the tour do not get lost.

The concept of circulation of ecotourism consists of primary circulation, secondary circulation, and tertiary circulation. The primary circulation is the main circulation intended for tourist vehicles to enter the tourist area. Secondary circulation is a circulation for pedestrians.

4.3. SWOT analysis

From the results of all the research that has been done, it can be seen the strategy of developing ecotourism agro-tourism in the post-mining area by conducting a swot analysis. Swot analysis can be seen in table 5.

| S.W.O.T | Internal          | Strength                      | Weakness                      |
|---------|-------------------|-------------------------------|-------------------------------|
|         |                   | 1. Has a beautiful panorama of | 1. Remote tourist access      |
|         |                   | hills                         | 2. There is no public         |
|         |                   | 2. Own land that can be made   | transportation               |
|         |                   | use of areas                  |                               |
|         |                   | 3. Creating job opportunities  |                               |
|         |                   | 4. There is community support  |                               |
| Opportunity | S.O Strategy | Developing the potential of   | W.O Strategy                 |
|           |                 | natural beauty                | 1. Utilizing Stakeholder      |
|           |                 |                               | support by adding facilities  |
|           |                 |                               | and infrastructure           |
|           |                 |                               | 2. Provide transportation for |
|           |                 |                               | tourists                     |
| Threat   | S.T Strategy     | 1. Make an agreement with the  | W.T Strategy                 |
|          |                  | community to implement        | 1. Conduct training to        |
|          |                  | protection and protect the    | improve human resource       |
|          |                  | ecotourism area               | skills related to MPTS       |
|          |                  | 2. Conduct counseling to      | maintenance                  |
|          |                  | increase population           |                               |
|          |                  | awareness                     |                               |
|          |                  |                               | 2. Make the tourist area      |
|          |                  |                               | more attractive by           |
|          |                  |                               | increasing tourist activity   |

4.4. Landscape Planning

From the results of the analysis that has been carried out, it can be seen that circulation in the post-mining area will be used as an ecotourism agro-area. From the results of the research, the ecotourism area will be divided into several zones, zoning can be seen in Figure 2.
5. Conclusions
The post mining area of PT. Putra Mekongga Sejahtera has an attractive panorama beauty because it is located on a hill, so it has the potential as an ecotourism agro. Mining sites consist of forests, hills, rivers and sedimentation ponds. Landscape design planning is carried out in accordance with the biophysical conditions of the post-mining area. The ecotourism agro-location is divided into several zones, namely conservation zones, agro-tourism zones, and reception zones. With the planning of landscape design in the post mining area as an ecotourism agro-area, it is hoped that it will increase the income of the population through tourism potential and yields.

References
[1] Regulation Of The Minister Of Agriculture 2011 Number 74.1 / Permentan / Ot.140 / 11/2011 About Kemiri Culture Guidelines (Indonesia)
[2] Damanik J and Weber H F 2006 Ecotourism planning: from theory to application Yogyakarta. Andi Offset 10 37–8
[3] Marsh W M 2005 Landscape planning: Environmental applications (Hoboken: John Wiley & Sons, Inc)
[4] Drumm A and Moore A 2002 Ecotourism Development A Manual for Conservation Planners and Managers Nat. Conserv. Arlington, Virginia, USA 1
[5] Gunn C A and Var T 2002 Tourism planning: Basics, concepts, cases (New York: Psychology Press)
[6] Yoeti O A 2000 Ecotourism: Tourism with an environmental perspective (Jakarta: PT Pertja)
[7] Rayes M and Lutfi 2006 Method of Investigating Land Resources (Yogyakarta: Andi Publisher)
[8] Starke B W and Simonds J O 2013 Landscape architecture: a manual of environmental planning and design (United Stated of America: McGraw-Hill Education New York)
[9] Mukarom F 2017 Indonesian Mineral Economy (Yogyakarta: Andi Publisher)
[10] Lindberg K and Hawkins D E 1995 Ecotourism: Guidelines for planning and management (Jakarta: Mitra Indonesia Natural Foundation)