Spatial Conflict of Mining Land in Tolitoli District -Province of Central Sulawesi

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Abstract. Spatial planning is supposed to be applied in the use of space, so there will be no overlapping space utilization. In fact, there are still overlapping uses of land, between the area of mining and plantation, as well as with forest areas. The purpose of this study was to find out the conflicts that occurred due to overlapping permits given to mining and plantation companies, and also to forest status. The method used was by overlaying the maps of Mining Business Permit with that of Plantation Business Permit, and also with Forest Area Map. In Tolitoli District there were 23 mining business permit holders with 7 types of mining commodities, covering total area of 81,503.54 Hectare. In addition, there were 5 companies holding plantation business permits, mostly on palm oil, and only 2 companies with rubber and sengon wood business commodities, with a total area of 80,005.35 Hectare. From the result of spatial analysis, it was found that there was an overlapping area of 22,869.70 Hectare, while the area of 118,072.93 Hectare did not overlap. The Mining Business Permit overlapped with the Plantation Business Permit covering an area of 18,853.32 Hectare, and 4,301.77 Hectare were located in Forest Protected Area and Nature Reserve.

1. Introduction

Spatial planning of a district is made by considering the physical condition that is vulnerable to disaster; the potential of natural resources, human resources, and artificial resources; economic, social, cultural, political, legal, defense, security, environment and scientific and technological conditions as a whole; as well as geostrategic, geopolitics, and geo-economics (Chapter 3, Article 6) [1] In reality, there is still a lot of overlap in the use of lands due to conflict of interests by each sector.

The Spatial Planning Map of Tolitoli District has been made for 20 years period (2012-2032), and has been ratified in Tolitoli District Regulation Number 16/2012 [2]. The Spatial Planning Map consisting of spatial pattern and spatial structure maps is composed of various thematic maps, which sometimes still have problems. These problems include overlapping between mining and plantation permits, and overlapping between each permit with forest areas. The land overlap is thought to be caused by the use of different sources and scales of base maps when the license was assigned. The occurrence of overlapping land is predicted due to several reasons such as different map sources, different base map scales, and different map production years.

Spatial problems such as overlapping multiple land uses can be solved by spatial analysis in Geographic Information System. Spatial analysis is an approach in geography and discipline associated with it by using statistical methods to simplify spatial patterns. Spatial analysis is a technique or process that involves a count and evaluation of logic being done in order to seek or discover potential relationships or patterns that may exist between geographic elements (contained in digital data with
boundaries of certain study area). In spatial analysis, spatial data is needed, i.e. data that has a georeference in which various attribute data lies in various spatial units.

1.2 Objective
The objective of this research was to find out overlapping of land use permits in Tolitoli District, the factors that caused it, and the solution and its recommendation to minimize the potential of spatial conflicts.

2. Materials and method
2.1. Material and Tool
The materials used were mining permit map, plantation permit map, and forest status map. All the maps were in shapefile format. The hardware used was a personal computer or notebook, while spatial data processing software used was ArcGIS.

2.2. Analysis Method
The analytical method was the overlay (union) in the geographic information system among the land use permit maps to determine the spatial relationships among several maps [3]. Union is a spatial analysis function used to aggregate some of the spatial elements presented in a selected theme to become an element [4,5].

2.3 Analysis Framework
The analytical framework for the evaluation of land use permit conflicts in this study is presented in Figure 1.

![Figure 1](image)

**Figure 1.** Spatial Analysis for Evaluation of Space Use Permit.

3. Results and discussion
3.1. Mining Business Permit
In Tolitoli District there were 25 metal mineral mining business license holders, consisting of 3 gold companies, 12 molybdenum companies, 6 copper companies, 2 iron ore companies and one manganese and galena [6,7]. Location map of the distribution of mining business permits in Tolitoli District is shown in Figure 2, while the name of the company and its type of business is presented in Table 1.
Figure 2. Map of Mining Business Permit in Tolitoli District.

According to data from the Mining Office of Tolitoli District (2014), it has legalized 7 mining business licenses, comprising of gold, copper, molybdenum, iron ore, galena, manganese and granite. All types of minerals under 23 companies hold mining business licenses with an area of each commodity for each company as in Table 1.

3.2 Plantation Location Permit
In Tolitoli District, there were 5 plantation permit companies, mostly palm oil commodities, and two rubber and sengon wood commodity companies (Table 2) [8]. Bukit Berlian Persada Company with oil palm commodity had 7 locations of business license (Table 2). Location map of plantation permits in Tolitoli District is presented in Figure 3.

Figure 3. Map of Plantation Location Permit in Tolitoli District.
Table 1. Mining Business Permit in Tolitoli District.

| Num. | Name of Company                  | Mineral Commodity | Area (Ha)  |
|------|----------------------------------|-------------------|------------|
| 1    | Abascus Mineral Harvester        | Molybdem          | 4,219.97   |
| 2    | Abascus Mineral Harvester        | Cooper            | 4,169.48   |
| 3    | Dianelsa Nusantara Abadi         | Molybdem          | 5,371.95   |
| 4    | Erasmus Energindo                | Galena            | 1,330.25   |
| 5    | Genesis Berkat Utama             | Mangaan           | 2,279.74   |
| 6    | Global Akses Sinergi 2           | Cooper            | 6,795.71   |
| 7    | Ina Abascus Mining               | Molybdem          | 4,486.20   |
| 8    | Indonesia Ekaristi               | Molybdem          | 69.28      |
| 9    | Jibra Mineral                    | Molybdem          | 9,846.77   |
| 10   | Karya Tambang Tolindo            | Iron ore          | 5,162.03   |
| 11   | Mayorindo Abadi                  | Granite           | 179.42     |
| 12   | Mbh Multi Resource               | Gold              | 132.30     |
| 13   | Mbh Multi Resource               | Molybdem          | 0.27       |
| 14   | Mbh Multi Resource               | Cooper            | 2,412.18   |
| 15   | Navara Westindo                  | Molybdem          | 8,312.93   |
| 16   | Prima Tambang Indonesia          | Gold              | 4,658.01   |
| 17   | Promistis                        | Molybdem          | 1,035.24   |
| 18   | San Diego                        | Cooper            | 2,738.39   |
| 19   | Sulteng Mineral Harvester        | Molybdem          | 3,497.15   |
| 20   | Sulteng Mineral Prima            | Iron ore          | 4,864.89   |
| 21   | Titan Aneka Tambang              | Gold              | 4,714.13   |
| 22   | Tunas Kasih Andhika2             | Molybdem          | 593.47     |
| 23   | San Abacus Mineral               | Molybdem          | 4,633.81   |
|      | **Total**                        |                   | **81,503.54**|

Source: Mining and Industry Service Division of Tolitoli District. 2014

In addition, in Tolitoli District there were individual plantations (such as coconut, cloves, cocoa, nutmeg, etc.) [2]. Data of exact areas for all of these individual estates were not available, so they did not appear on the map.

Table 2. Plantation Permit in Tolitoli District.

| Num. | Name of Company               | Plantation Commodity          | Area (Ha)  |
|------|-------------------------------|-------------------------------|------------|
| 1    | Bukit Berlian Persada         | Palm Oil                      | 18,470.23  |
| 2    | Citra Mulia Perkasa           | Rubber and Sengon wood        | 19,952.34  |
| 3    | Indonesia Ekaristi Alpha      | Palm Oil                      | 8,486.74   |
| 4    | Setya Bangun Persada          | Palm Oil                      | 12,547.14  |
| 5    | Total Energi Nusantara        | Rubber and Sengon wood        | 20,548.89  |
|      | **Total**                     |                               | **80,005.35**|

Source: Plantation Service Division of Tolitoli District. 2014
3.3 Spatial Conflict of Mining Land

The local government of Tolitoli District has issued permits to utilize the space (land) of its territory. In this analysis only 2 (two) permits of space utilization were used, that were Mining Business Permit and Plantation Location Permit. Space utilization permit analysis was conducted to determine whether there was any overlaps or not, between permits of space utilization for mining and plantation. The Map of Space Utilization Permit was an overlay between the Map of Mining Business Permit and Map of Plantation Location Permit (Figure 4). The results of the widespread calculation with overused GIS results are presented in Table 3 and Table 4.

![Figure 4. Map of Space Utilization in Tolitoli District.](image)

Table 3. Spatial Utilization Conflict in Tolitoli District.

| Num. | Utilization       | Area (Ha)  | Area (%) |
|------|-------------------|------------|----------|
| 1    | Not Overlapping   | 118,072.93 | 83.77    |
| 2    | Overlapping       | 22,869.70  | 16.23    |
| Total|                   | 140,942.63 | 100.00   |

Table 4 shows the condition of space utilization in Tolitoli District in general. Overlay results indicated that there were overlapping permits for the utilization of space for mining and plantations, covering area of 22,869.70 Ha (16.23%). Table 5 presents a more detailed overlap, between each company. Permits for Bukit Berlian Persada (palm oil) overlapped with 10 (ten) mining companies with a total area of 12,828.80 Ha. Permits for Indonesia Eucharistic Alpha (oil palm) overlapped with 4 (four) mining companies with a total area of 5,241.09 Ha. Permits for Total Nusantara Energy (rubber and sengon wood) overlapped with 3 (three) mining companies, covering 1,532.53 Ha. Permits for Setya Bangun Persada (oil palm) overlapped with 2 (two) mining companies, covering 1,540.26 Ha. In addition to granite, most of the mining businesses in Tolitoli District were on a type of metal mineral (gold, copper, molybden, etc.), which were still in the exploration stage. However, when they come into exploitation stage later, some problems may arise, because all of these mineral minings would be open pits [9,10].
Table 4. Overlap area between Mining Business Permit and Plantation Location Permit.

| Mining Company               | Plantation Company               | Sub District | Area (Ha) |
|------------------------------|----------------------------------|--------------|-----------|
| Abascus Mineral Harvester    | Bukit Berlian Persada            | Dampal Selatan | 1,088.43  |
|                              |                                  | Dampal Utara  | 196.09    |
| Dianelsa Nusantara Abadi     | Bukit Berlian Persada            | Dondo        | 93.28     |
| Dianelsa Nusantara Abadi     | Indonesia Ekaristi Alpha         | Dampal Selatan | 230.02    |
|                              |                                  | Dondo        | 4,914.79  |
| Genesis BerkatUtama          | Total Energi Nusantara           | Basi Dondo   | 24.35     |
| Global Akses Sinergi 2       | Bukit Berlian Persada            | Dampal Utara  | 850.04    |
| Global Akses Sinergi         | Total Energi Nusantara           | Lampasio     | 1,088.43  |
| Ina Abascus Mining           | Bukit Berlian Persada            | Dampal Selatan | 517.00    |
| Indonesia Ekaristi           | Indonesia Ekaristi Alpha         | Dondo        | 6.61      |
| Jibra Mineral                | Setya Bangun Persada             | Basi Dondo   | 21.63     |
|                              |                                  | Dondo        | 24.81     |
| Mbh Multi Resource           | Indonesia Ekaristi Alpha         | Dampal Selatan | 54,468    |
|                              |                                  | Dondo        | 46.05     |
| Navara Westindo              | Setya Bangun Persada             | Basi Dondo   | 1,315.69  |
|                              |                                  | Dondo        | 1,484.73  |
| Prima Tambang Indonesia      | Total Energi Nusantara           | Lampasio     | 1,352.29  |
| Promistis                    | Bukit Berlian Persada            | Dondo        | 273.59    |
| San Diego                    | Bukit Berlian Persada            | Dampal Utara  | 656.44    |
|                              |                                  | Dondo        | 1.45      |
| Sulteng Mineral Harvester    | Bukit Berlian Persada            | Dampal Utara  | 1,455.88  |
| Sulteng Mineral Prima        | Bukit Berlian Persada            | Dampal Selatan | 3,918.87  |
| San Abacus Mineral           | Bukit Berlian Persada            | Dampal Selatan | 93.80     |
|                              |                                  | Dampal Utara  | 77.67     |
| **Total**                    |                                  |              | **18,853.32** |

3.4 Evaluation of Space Utilization Permit

Table 5 presents the area and location of mining land that overlapped with plantation land in Protected Forest area. There were 6 mining companies in Tolitoli District that overlapped with 4 plantation companies. Figure 5 presents an evaluation of the use of space in protected forest area.

Figure 5. Map of Space Utilization Evaluation Permit of Tolitoli District.
Table 5. Overlap area of mining and plantation lands in Forest Protected Status (Num. 635).

| Num. | Plantation Company | Mining Company | Sub District | Area (Ha) |
|------|--------------------|----------------|--------------|-----------|
| Protected Forest | Bukit Berlian Persada | Dianelsa Nusantara Abadi | Dondo | 0.91 |
| Protected Forest | Bukit Berlian Persada | Dianelsa Nusantara Abadi | Dondo | 0.65 |
| Protected Forest | Bukit Berlian Persada | Dianelsa Nusantara Abadi | Dondo | 0.11 |
| Protected Forest | Indonesia Ekaristi Alpha | Mbh Multi Resource | Dondo | 0.27 |
| Protected Forest | Indonesia Ekaristi Alpha | Mbh Multi Resource | Dondo | 12.52 |
| Protected Forest | Indonesia Ekaristi Alpha | Dianelsa Nusantara Abadi | Selatan | 76.69 |
| Protected Forest | Indonesia Ekaristi Alpha | Dianelsa Nusantara Abadi | Dondo | 3,611.53 |
| Protected Forest | Indonesia Ekaristi Alpha | Jibra Mineral | Dondo | 1.00 |
| Protected Forest | Total Energi Nusantara | Prima Tambang Indonesia | Lampasio | 0.17 |
| Protected Forest | Total Energi Nusantara | Prima Tambang Indonesia | Lampasio | 4.99 |
| Protected Forest | Total Energi Nusantara | Global Asks Sinergi | Lampasio | 9.76 |
| Protected Forest | Total Energi Nusantara | Prima Tambang Indonesia | Lampasio | 0.56 |
| Protected Forest | Total Energi Nusantara | Prima Tambang Indonesia | Lampasio | 0.63 |
| Protected Forest | Total Energi Nusantara | Prima Tambang Indonesia | Lampasio | 228.42 |
| Protected Forest | Setya Bangun Persada | Navara Westindo | BasiDondo | 3.17 |
| Protected Forest | Setya Bangun Persada | Navara Westindo | BasiDondo | 1.35 |
| Protected Forest | Setya Bangun Persada | Jibra Mineral | BasiDondo | 13.13 |
| Nature Reserve / Protection Area | Indonesia Ekaristi Alpha | Dianelsa Nusantara Abadi | DampoLamp | 82.11 |
| Nature Reserve / Protection Area | Indonesia Ekaristi Alpha | Dianelsa Nusantara Abadi | Dondo | 253.81 |
| Sub Total | | | | 335.92 |
| Total | | | | 4,301.77 |

4. Conclusion
There were 22,869.70 Ha (16.23%) overlaps of space utilization for mining business permits and plantation site permits in Tolitoli District. The result of evaluation of space utilization permits in Protected Area showed that, on the area of 17,021.72 ha (39.17%) there is permit of space utilization for mining and/or plantation purposes. The result of spatial use permit evaluation in Production forest shows that, on an area of 3,335.28 Ha (9.72%) there is permit for space utilization for plantation that is 650.55 Ha (1.90%) for mining 2,682.99 Ha (7.82%), while overlapping plantations and mining area of 1.74 Ha (0.01%). The overlapping of space utilization in Tolitoli district was caused by 2 (two) possibilities, which were (1) different kinds and level of accuracy of the maps used or (2) lack of coordination between the licensing institutions.

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