

# Analysis of conformity between existing land use with regional spatial planning: A case study of Sidenreng Rappang Regency, South Sulawesi

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## Analysis of conformity between existing land use with regional spatial planning: A case study of Sidenreng Rappang Regency, South Sulawesi

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**Abstract.** It requires spatial planning is suitable for the direction of land use. This study aimed to evaluate the suitability of existing land use with regional spatial planning, and determine the course of spatial use control. The research using a comparative quantitative method and for making land units using Geographic Information Systems (GIS). Land units were produced from overlapping between the administration map, land use map (existing), and map of spatial plans. Three categories were made consists of suitable, unsuitable, and not implemented yet. The results of the research showed that existing land use in Sidenreng Rappang regency consists of nine types, namely paddy fields, plantations, settlements, swamps, shrubs, moor, forests, lake, and mixed gardens. Analysis of land use suitable with the regional spatial planning covers 123,882 ha (63.57%), 66,033 ha (33.88%) unsuitable, and 4,952 ha (2.54%) has not been implemented yet. The direction for controlling the use of the land is applying four control instruments, both those that have been implemented and those that have not been achieved so far, namely licensing, zoning regulations, granting incentives and disincentives, and imposing sanctions. Land use directives in Sidenreng Rappang Regency are well implemented (66.11 %) but require instructions that have not been achieved with a spatial regulation (33.88%).

### 1. Introduction

It cannot be denied that regional development planning is something that can not be ignored in the overall development of the country. Formally it can be defined that plan is a process for determining the right course of action. Actions are said to be suitable when it fits the purpose. So, the plan deals with the question of what goals will be achieved and how to achieve them. Thus, the choices that must be made in the planning process consist of three stages. The first is the selection of purpose and criteria. The second identifies alternatives that are in line with the purposes, and the third is the selection of guidelines for actions towards that goal. So, it can be concluded that planning is the selection of activities for the future that are suitable for our wishes.

Sidenreng Rappang Regency is one of the regencies located in South Sulawesi Province, Sidenreng Rappang Regency is 200 km from Makassar City and is located at the junction between the route to Palopo and Toraja. Sidenreng Rappang Regency is also an area designated as an agricultural and animal husbandry area, and this can be seen from the work of most Sidenreng Rappang district residents, namely farmers and ranchers. As an area of agriculture and animal husbandry designation, the suitable spatial and territorial arrangement in Sidenreng Rappang Regency is something that must



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be done well to ensure the availability of people's living needs. Managing spatial planning and territories is one of the regional development strategies for realizing national development. The regulation of spatial and regional is the authority of the Sidenreng Rappang Regency government. The government also plays a role in determining the specific placement for certain areas and determining the placement of development in accordance with the spatial plan in the Sidenreng Rappang Regency.

## 2. Materials and methods

There are three types of maps used that is the administrative map of Sidenreng Rappang Regency, the existing land use map of Sidenreng Rappang Regency, and map of the spatial pattern 2012-2032 in Sidenreng Rappang Regency. As for the research procedures were conducted with the following stages (1) Data analysis method, (2) analysis of the suitability of existing land use to the spatial plan in the Sidenreng Rappang Regency, (3) Method of analyzing the unsuitability factors, (4) Method of determining the sampling points, and (5) The direction controlling the use of space

## 3. Results and discussion

### 3.1. Land use classification

Land use can be said to be a realization of human purpose in exploiting land cover to keep the human material and spiritual [1]. This is why land use is dynamic, following the development of human life and culture [2]. Based on the map of the existing land use obtained from BAPPEDA Sidenreng Rappang Regency and field validation [3] there are nine (9) types of land use in Sidenreng Rappang Regency (figure 1) along with the area (ha) of land use that can be seen in table 1 and figure 1.

The smallest area of land use in the Sidenreng Rappang Regency is found in the use of swamps and moor with respectively, 775.30 ha (0.39%) and 2,187.26 ha (1.12%).

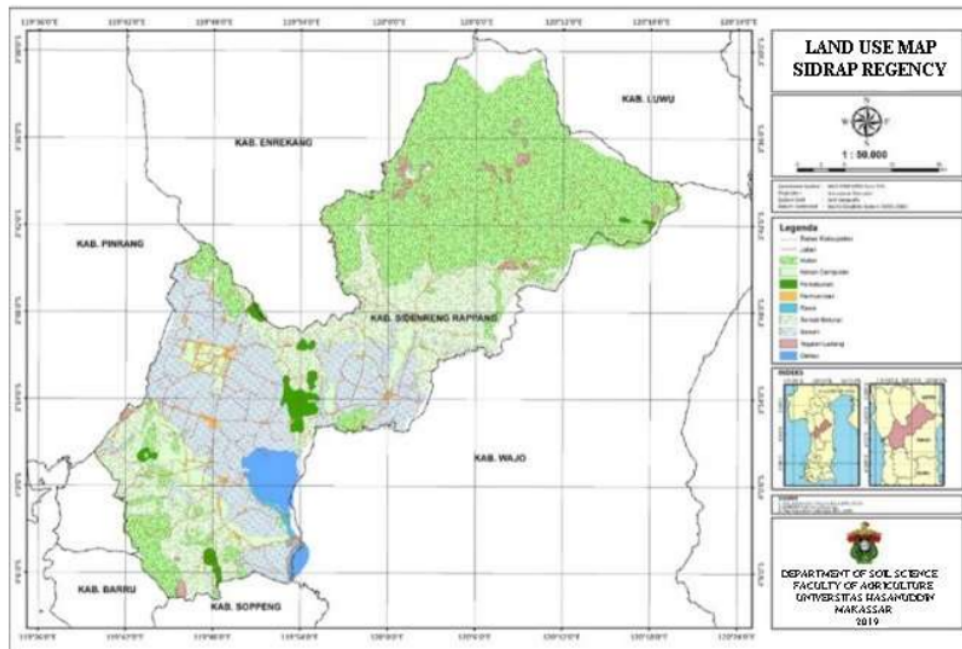
**Table 1.** The type and extent of land use in Sidenreng Rappang Regency 2019

| Land Use    | Area (Ha)  |
|-------------|------------|
| Forest      | 82,893.70  |
| Mix Gardens | 13,281.08  |
| Plantations | 3,571.41   |
| Swamps      | 775.30     |
| Shrubs      | 39,314.53  |
| Paddy       | 45,435.86  |
| Moor        | 2,187.26   |
| Settlements | 2,311.61   |
| Lake        | 4,611.90   |
| Amount      | 194,382.65 |

The elaboration of nine (9) types land use based on the nomenclature set by BSN [2] that is SNI 7645: 2014 about the classification of land cover and the actual situation in the field is as follows [4]:

- Forest in the Sidenreng Rappang Regency, the conditions are still heterogeneous and natural.
- Mix Gardens in Sidenreng Rappang Regency is planted with annual plant and annual crops, such as corn, mango, banana, and other plants.
- Settlements in Sidenreng Rappang Regency are dominated by residential areas as private residences.
- Paddy in Sidenreng Rappang Regency are generally planted with paddy continuously, can be two or three times a year depending on the rice variety without crop rotation with other plants.
- Lake Sidenreng Rappang Regency was called Lake Sidenreng, which is one of the sources of income for the society and the government. In addition to being a tourist area, Lake Sidenreng was used by the community to irrigate rice fields around the lake and fishing grounds.

- f. Moor in Sidenreng Rappang Regency is generally used for the cultivation of corn, cassava, sweet potatoes, chilies, peanuts, and others.
- g. Shrubs in Sidenreng Rappang Regency generally have high or low grasses with a few trees low density.
- h. Plantation in Sidenreng Rappang Regency is generally planted with fruit trees such as guava, cocoa, mango, coconut, and other plants.
- i. Swamp in Sidenreng Rappang Regency, there are some water plants around the outskirts of Lake Sidenreng.



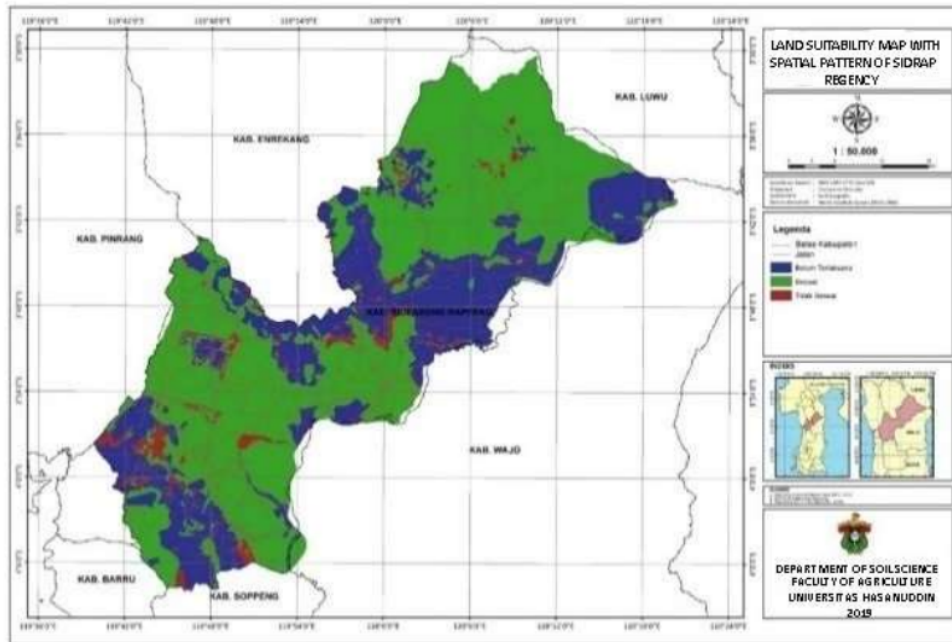
**Figure 1.** Map of land use in Sidenreng Rappang Regency 2019

### 3.2. Suitability of land use with a spatial plan

In the research, an analysis was carried out to find out whether there are suitable or unsuitable areas for land use with spatial patterns 2012-2032 in Sidenreng Rappang Regency [3]. The period of validity of an areas spatial pattern is 20 years. The spatial structure has the meaning of settlement centers and a network of infrastructure and facilities systems that function as supporting social and economic activities of the society, which is a hierarchy that has functional relations [5].

Analysis of land-use suitability maps with the Sidenreng Rappang Regency spatial planning pattern obtained three categories are suitable, not implemented yet and unsuitable, as presented in figure 2. The groups are suitable, not implemented yet, and do not match the spatial pattern of Sidenreng Rappang Regency based on the land-use suitability matrix with the spatial pattern is a modification of the Mustamei logic matrix [6] presented in table 2 and 3. The logic matrix consists of cross-tabulation of spatial patterns in Sidenreng Rappang Regency for the period 2012-2032 and land use in Sidenreng Rappang Regency 2019.

There are nine (9) types of land use in 2019 and 11 Spatial Planning patterns with categories that are suitable, unsuitable and not implemented yet by looking at irregularities that occur in the field (table 2, 3 and figure 2).



**Figure 2.** Map of land use suitability with space pattern in Sidenreng Rappang Regency

**Table 2.** Land use suitability matrix with space pattern

| Space Pattern  | Land Use |           |            |          |            |
|--|----------|-----------|------------|----------|------------|
|  | Lake     | Forest    | Mix Garden | Garden   | Settlement |
| Lake   | 4,611.9  | -         | -          | -        | -          |
| Protected Forest   | -        | 43,838.09 | 297.36     | 238.26   | -          |
| Production Forest  | -        | 65.48     | -          | -        | -          |
| Limited Production Forest  | -        | 16,841.25 | 368.76     | 242.35   | -          |
| Society Forest   | -        | 163.14    | 109.44     | 56.8     | -          |
| Upland rice, corn, cocoa, oil palm, robusta, cashew, jatropaha, cattle                   | -        | 4,107.06  | 1,416.51   | 172.81   | -          |
| Paddy rice, upland rice, corn, cocoa, oil palm, robusta, cashew, jatropaha, cattle       | -        | 3,203.03  | 7,851.87   | 2,420.15 | -          |
| Paddy rice, upland rice, corn, oil palm, robusta, cashew, jatropaha, cattle              | -        | -         | -          | -        | -          |
| Upland rice, corn, cocoa, oil palm, robusta, cashew, jatropaha, cloves, pepper, hazelnut | -        | 14,513.41 | 1,283.32   | 581.12   | -          |
| Settlement   | -        | -         | 1,940.89   | 29.05    | 2,277.18   |
| Nature Park  | -        | 227.55    | -          | -        | -          |

**Table 3.** Land use suitability matrix with space pattern

| Space Pattern  | Land Use |           |           |        |
|--|----------|-----------|-----------|--------|
|  | Swamp    | Paddy     | Shrubs    | Moor   |
| Lake   | 104.5    | 526.49    | -         | -      |
| Protected Forest   | -        | -         | 524.46    | 419.03 |
| Production Forest  | -        | -         | 50.12     | -      |
| Limited Production Forest  | -        | 23.69     | 5,925.96  | 588.85 |
| Society Forest   | -        | -         | 337.2     | -      |
| Upland rice, corn, cocoa, oil palm, robusta, cashew, jatropaha, cattle                   | -        | 1,911.88  | 19,378.81 | 324.9  |
| Paddy rice, upland rice, corn, cocoa, oil palm, robusta, cashew, jatropaha, cattle       | 570      | 40,990.67 | 8,145.04  | 278.46 |
| Paddy rice, upland rice, corn, oil palm, robusta, cashew, jatropaha, cattle              | 175.47   | -         | -         | -      |
| Upland rice, corn, cocoa, oil palm, robusta, cashew, jatropaha, cloves, pepper, hazelnut | -        | 169.4     | 4,719.96  | 568.63 |
| Settlement   | 17.94    | 2,132.2   | 127.89    | -      |
| Nature Park  | -        | -         | -         | -      |

The existing land use in 2019 which is in accordance with the spatial pattern is called suitable, as in the spatial pattern designated as a protected forest with the use of existing land also forest. For the use of land 2019 that is not accordance with the spatial pattern, the land is called unsuitable, as in the spatial pattern designated as protected forest with mixed land use. Land use is not accordance with spatial patterns, however it is still possible to adjust with the spatial pattern is called not implemented yet. It can be seen in the spatial pattern designated as a settlement, but the land use is paddy. The extent of land-use suitability with the spatial pattern of Sidenreng Rappang Regency is presented in table 4.

**Table 4.** The extent of land-use suitability with the spatial pattern of Sidenreng Rappang

| Existing Land Use | Suitability (Ha) |            |                     |
|-------------------|------------------|------------|---------------------|
|                   | Suitable         | Unsuitable | Not implemented yet |
| Lake              | 4,611.90         | -          | -                   |
| Forest            | 60,907.96        | -          | 22,051.05           |
| Mix Gardens       | 10,551.70        | 775.56     | 1,940.89            |
| Plantation        | 3,416.43         | 295.06     | 29.05               |
| Settlement        | 2,277.18         | -          | -                   |
| Swamp             | 104.50           | -          | 763.41              |
| Shrubs            | -                | -          | 45,754.33           |
| Paddy             | 40,990.67        | 2,629.46   | 2,132.2             |
| Moor              | 1,171.99         | 1,007.88   | -                   |
| Amount            | 123,882.58       | 4,952.31   | 66,033.44           |

The results of the analysis showed that land use is in suitable with the spatial pattern of 123,882.58 ha (63.57%), not implemented yet in an area of 66,033.44 ha (33.88%), and unsuitable with the area of 4,952.31 ha (2.54%).

Unsuitability that occurs needs to be considered because if the potential of the region that is not in suitable with the spatial pattern and likewise with changes in the area from the region has not been implemented to be unsuitable will cause an imbalance in the use of resources in the present and the future. Besides, deviations land use with spatial patterns can cause land damage and degradation due to uses that are unsuitable for the potential of the land, according to Hardjowigeno and Widiatmaka [7] and Widiatmaka [8].

The inconsistency of land use cannot be separated from the behavioral factors and the background of the human who occupies them, for example the growth of settlements that are forbidden to become dwellings, according to a statement [9]. The role of the government and all stakeholders in the implementation of spatial planning has not been maximized. Lack of socialization and education in the formulation of spatial planning patterns to the community has caused the community not to know what kind of plans to build in their residential locations. Rustiadi[10] states that spatial planning must be adjusted to the capacity of the government and the community so that the plans that have been prepared can be implemented

Based on the results of the analysis, land use that suitable with the spatial pattern is recommended that land use be continued in the future, while land use that is unsuitable and permanent should be accommodated in the future in revising the improvement of the spatial plan pattern of Sidenreng Rappang Regency. The permanent land use is built-up land with examples of residential land use, so it is impossible again to be adjusted with spatial patterns. Land use that is unsuitable for the spatial pattern is recommended further development to be stopped. Land use that has not been implemented can still be suitable with the spatial pattern of the Spatial Plan. Therefore, development in areas with land use that have not been implemented with a spatial pattern is recommended to be allocated in suitable with the spatial plan of Sidenreng Rappang Regency or future land use is advised to follow the direction of the spatial plan.

### 3.3. Factors that influence land use incompatibility with spatial plan

The results of the field interview analysis obtained 7 (seven) variable factors that influence land use inconsistencies in the spatial plan (table 5).

**Table 5.** Frequency of suitability of field interview results

| Inconsistency variable <sup>1)</sup>                        | Frequency | Percentage <sup>2)</sup> |
|---|-----------|--------------------------|
| a. Lack of socialization to the society                     | 20        | 74.07%                   |
| b. Absence of licensing                                     | 19        | 70.37%                   |
| c. Shelter needs  | 18        | 66.67%                   |
| d. Public facilities and accessibility                      | 14        | 51.85%                   |
| e. Land use existed before the spatial plan was established | 13        | 48.15%                   |
| f. Transfer of land ownership                               | 13        | 48.15%                   |
| g. Less supportive agricultural facilities                  | 8         | 29.63%                   |

Note

1) Obtained from respondents during field interviews

2) A percentage of 33 field interview respondents

### 3.4. Directions for spatial use control

Control of spatial use is a function that must be carried out by the government. The control aims to improve the welfare of the community, realize justice, reduce conflict, and the negative effects of spatial planning and ensure that development is efficient, effective, and in accordance with functions and consistent with regional spatial plans [11].

The direction of controlling spatial use based on four control instruments and research results that can be input for the Regional Government of Sidenreng Rappang Regency are as follows:

- a. Licenses that have been carried out so far need to be continued and improved, one of them is by making the licensing flow easy and transparent so that the society is willing to administer of permits related to land and buildings. Furthermore, it is necessary to monitor the licenses that have been issued so that the land use is in suitable with the allotment
- b. Detailed preparation of the Spatial Plan and its zoning regulations needs to be done with several considerations. Such as changes in land use and land ownership rights owned by the community; protected areas both inside forest areas and outside forest areas are retained their functions and land uses and are not permitted to be cultivated or converted; residential, industrial, and plantation areas, may not be built outside the designated area of designation. Meanwhile, if there are changes, it is permissible as long as it does not disturb other areas in the vicinity.
- c. The provision of incentives and disincentives that is: (a) Land use that is suitable with the spatial plan can be given incentives with the construction/development of regional infrastructure, for agricultural areas can be provided agricultural support facilities. (b) The spatial plan has not been implemented. The land use is monitored and directed so that the spatial use is suitable for its designation, and this can be carried out with give facilitating licensing, development of regional infrastructure, and tax relief for spatial use that is in line with the spatial plan. (c) Land use that is unsuitable with the spatial plan, then land use and the building may not be developed (if in the form of built-up land). If willing to change land use according to the designation, compensation can be given in the form of a waiver of licensing fees, compensation for losses, replacement land for relocation, and the construction/development of regional infrastructure.
- d. Unsuitable land use, especially in protected areas, needs to be given a written warning and directed to change land use according to the spatial plan. If not implemented, administrative sanctions, fines, tax increases, or demolition of buildings can be given (if it is built up).
- e. The need for socialization to the public related to regulations established by the government. Besides the need for supervision, monitoring and evaluation in stages and periodically supported by good cooperation from all parties both from the government, society, private sector, and other stakeholders

#### 4. Conclusion

Analysis of land-use suitability with spatial patterns into three category, that is suitable, unsuitable, and not implemented yet. The results of the analysis showed that land use is in suitable with the spatial pattern of 123,882.58 ha (63.57%), not implemented yet in an area of 66,033.44 ha (33.88%), and unsuitable with an area of 4,952.31 ha (2.54%).

The direction for controlling the use of space uses four (4) control instruments, both those that have been implemented and those that have not been implemented so far, that is licensing, zoning regulations, granting incentives and disincentives, and imposing sanctions. In addition, the need for policy socialization and monitoring and evaluation in stages and periodically

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