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Research Article

The Compatibility of Area Functions Map with Actual Site Conditions in Konawe Selatan District

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ABSTRACT

The Konawe Selatan District region is characterized by Karst hills, various soil types, and steep slopes. Functional classification considers the physical and non-physical characteristics of the location to determine its many uses. The map developed by the Regulation of the Agriculture Minister of Indonesia should be checked with the actual condition for the validation process before presenting to the society and Local government. Therefore, this research aimed to determine the compatibility of the area function map result with the actual conditions in Konawe Selatan District, Southeast Sulawesi, Indonesia. The research is a regional survey, collecting data from interviews and observations, and the data were analyzed descriptively and quantitatively with percentages. The results show that the compatibility of the Konawe Selatan District area function map is 89.61%, functioning as a guideline in the land use plan. Furthermore, the map could guide potential land-use planning functions such as protected forests, limited production forests, rice fields, and settlements. In conclusion, the map is appropriate for disseminating information and material for land use policies in Konawe Selatan District to stakeholders.

Keywords : actual condition; area function; compatibility; map

1. Introduction

Konawe Selatan is one of the districts in Southeast Sulawesi, Indonesia. The mapping of its regional functions is useful in planning a land conversion to reduce potential disasters. The conversion of forests can cause floods through deforestation (Appannagari, 2018; Hamdani et al., 2014). The Konawe Selatan District is vital in maintaining environmental stability with its steep slopes and hilly morphology. Environmental changes have spatial relations with the surrounding area, such as Kendari City, Bombana District, and Konawe District, which is directly bordered. Mapping land use activities following the planned function of an area is essential in maintaining the stability of the environment and the surrounding.

Konawe Selatan district, with the area dominated by forest, needs to increase awareness of land use. Preservation and maintenance of forest quality and quantity are important in maintaining environmental stability (Camacho et al., 2016). The existence of an area function map can provide an overview for the community and local government in realizing a sustainable area.Mapping is an important tool as a regional guide for land use planning that pays attention to spatial capacity. The process in geography applies information and remote sensing system (Annis & Nardi, 2019; Eray, 2012). The direction map for the area requires input from the local government policymakers (Abadi et al., 2019; Faturahman, 2017; Von der Porten et al., 2019) and serves as an important information tool for people (Setiawan et al., 2014).

The suitability process is the validation before the map is released to the public, and it is verified by visiting and observing the actual site conditions. The analysis of the area, especially forests, has a positive impact on the environment because it gives the best information to the map reader (Anurogo et al., 2018; Basu, 2017; Setiawan et al., 2013).Mapping of regional functions in Konawe Selatan District can be conducted through a geographic information system. The function of the area can be analyzed with geographical information systems through spatial analysis capabilities (Amnah, 2016; Mann & Saultz, 2019; Rika et al., 2016). The process needs to be checked to determine the suitability of the map for actual conditions (Kasnar et al., 2019; Sejati et al., 2020).

Mapping the function of forest areas can be used as a control for regional development in Konawe Selatan District. Regulations that control the development of an area are regulated in the Spatial Planning Law (UU-26, 2007). Furthermore, this law is also controlled by the Regulation of the Minister of Agriculture (Kepmentan-837/1980, 1980). National regulations are translated into local reform for Konawe Selatan District through the Regional Spatial Plan (Perda-19/2003, 2013). These regulations become the control and suitability of the map prepared with the local government plan.

Many studies have researched the function and use of land. Initial research was conducted by Cahyadi et al. (2012), who showed the land use in Gunung Kidul District on the map of protected forest areas that were dominated by moderate cultivation, followed by Latif (2014), who mapped 218,366 hectares in Merauke District or 4.67% of the total area. Another research was conducted by Suryadi et al. (2017), who mapped the Soeharto Hills Grand Forest Park area with 53,340.95 hectares, or 78.71% of the total area according to function. In addition, Luxfiati & Harudu (2019) conducted similar research, resulting in a map of protected forest areas, limited production forests, and production forests in the Muna District, with 22.56% not conforming to the Regional Planning.

Hardianti & Harudu (2019) conducted research in Konawe, Konawe District, which resulted in the distribution and area of protected, production, and limited production forest, with the largest reaching 260,505.86 hectares. Fitrianti et al. (2013) mapped protected buffer and cultivated areas in the Gisting District with an 86.27% on the function. In addition, Sejati et al. (2020) mapped settlements and their suitability to actual conditions with a 100% conformity level. Meanwhile, Zulfikar et al. (2013) showed a potential rice field of 9,871 hectares which was not used.

Previous research has focused on mapping without directly comparing the process to actual site conditions. In the research by Sejati et al. (2020), compatibility efforts have been carried out, but the number of samples is still minimal and focuses on residential areas. However, it examined the suitability of complex maps of residential areas, including forest areas, settlements, and rice fields, with actual conditions in the Konawe Selatan District.

Field checks are used as a guide for the validity of the map as input for licensing the ideal function of the area as forest, settlement, and rice fields. Due to the limited findings concerned with field checks or site visits, this research intends to analyze the suitability of the regional function map with actual site conditions before it is released to the people and local government. Furthermore, it aims to determine the suitability of the regional function map with the actual conditions.

2. Methods

This research is a regional survey with a quantitative approach covering the entire Konawe Selatan District, including 22 sub-districts and 315 villages. Samples of map suitability with actual conditions were taken from the population using the Slovin formula (Setiawan, 2007), totaling 77 villages. Meanwhile, samples were taken using a proportional random sampling technique in each sub-district, and Figure 1 shows the study area map.

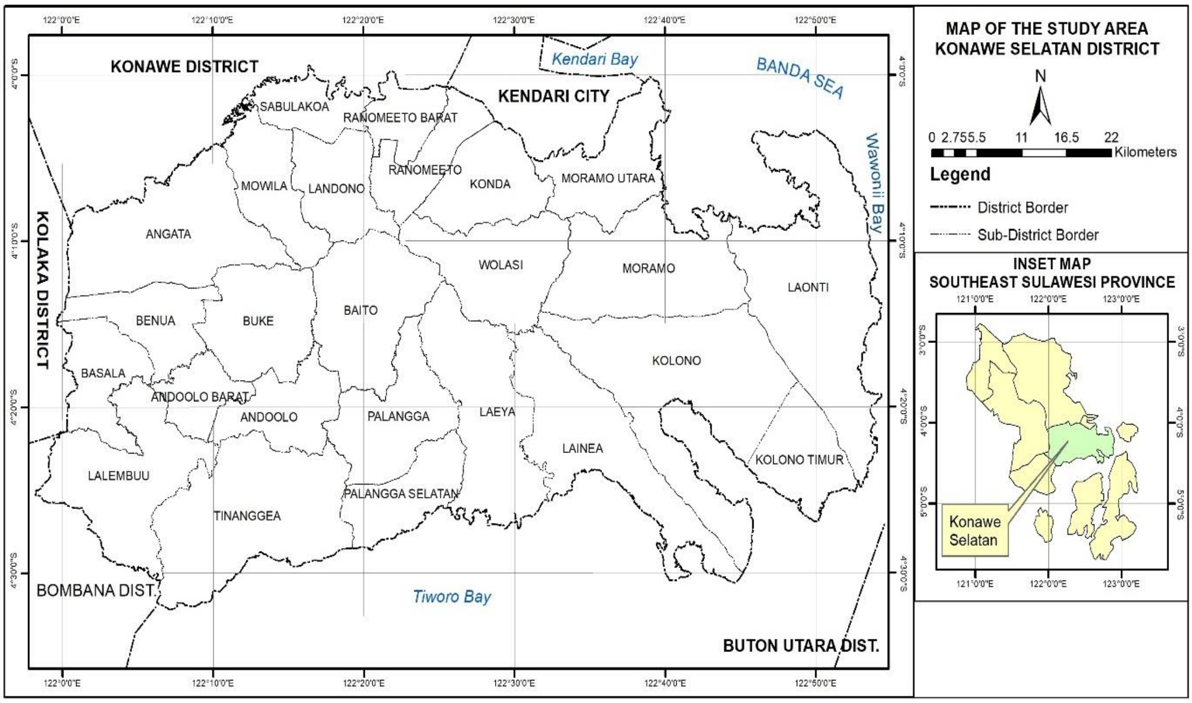

Figure 1. Map of study area

The collection of data related to the suitability of maps with actual site conditions using observation sheets and interviews was developed based on the characteristics of the area function (Kepmentan-837/1980, 1980). Interviews were conducted to determine the suitability of actual site conditions. Furthermore, respondents were chosen from the village government stakeholders, such as the head and secretary. Observation of the sites would also confirm the results by directly checking the village, and a score of 0 is given when there is an inappropriate function.

Secondary data in the form of an area function map created using ArcGIS 10.4.1 software for personal use Therm license subscription. The base map from BAPPEKAB Konawe Selatan District includes administrative, slope class, soil type, rainfall, SAS Planet images, and Land use. The map is the result of Sejati & Saputra (2021), and the effective area was controlled with field observations and interviews to determine the actual conditions. The weighting and the direction of the function area score are shown in Tables 1 and Table 2 below.

Table 1. Weighting for area function map

Variable	Value of Slope class	Range: Slope Percentage (%)	Classification & Score: Classification	Score
Slope	1	0 – 8	Flat	20
	2	8 – 15	Sloping	40
	3	15 – 25	Rather steep	60
	4	25 – 40	Steep	80
	5	>40	Very Steep	100
	Soil Class	Soil Type	Classification	Score
Soil Sensitivity to erosion	1	Alluvial, Gley Soil, Planosol, Brown Hydromorf, Arterite Groundwater	Not Sensitive	15
	2	Latosol	Slightly Sensitive	30
	3	Brown Forest Soil, Non-Calete Brown, Mediterranean	Moderate	45
	4	Andosol, Laterite, Gromosol, Podsol, Podsolic	Sensitive	60
	5	Regosol, Lytosol, Organosol, Renzina	Very Sensitive	75
	Rainfall Class	Rainfall Range (mm/day)	Classification	Score
Rainfall	1	≤13,5	Very Low	10
	2	13,6 – 20,7	Low	20
	3	20,7 – 27,7	Moderate	30
	4	27,7 – 34,8	High	40
	5	>34,8	Very High	50

Source: (Kepmentan-837/1980, 1980)

Table 2. Area function classification

Score	Classification
>175	Protected Forest Area
124-174	Limited Production Forest Area
<124	Permanent Production Forest Area
<124	Rice Field Area (Slope 8-2%)
<124	Settlement Area (Slope <2%)

Source: (Kepmentan-837/1980, 1980)

The quantitative descriptive method was used to analyze the data in percentage form. The results of observations of conformity to actual conditions were scored 1 and 0 for appropriate and inappropriate samples. The total score was divided into the percentage of conformity of the map to the actual condition with the formula and categorization by Arikunto (2011) , and then Figure 2 shows the research flow.

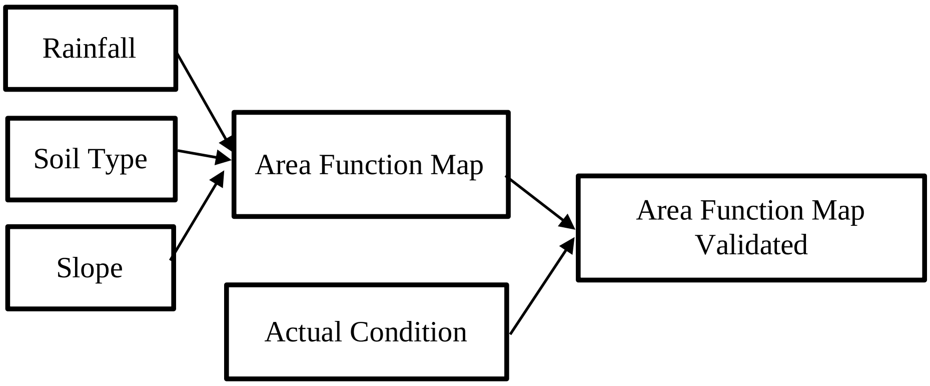

Figure 2. Research flow chart

3. Results and Discussion

The map of regional functions in Figure 3 shows the parameters contributing to the Konawe Selatan District's results. The total rainfall parameter of 421364.6 hectares has an average of 1727.029429 mm/year and 4.7308571 mm/day. Daily rainfall as a potential component of protected forest areas is given a score according to the Center for Land Conservation and Soil Conversion parameters (Fitrianti et al., 2013). The higher the rainfall, the more likely an area will become a forest (Hardianti & Harudu, 2019; Luxfiati & Harudu, 2019; Sejati & Saputra, 2021).

Podsolic dominates the soil type parameter with 193.396.26 hectares or 45.9%. This soil is classified as very high or sensitive erosion sensitivity, contributing to the area's score as a forest function. Eroded soil should be easily conserved to prevent further erosion (Hardianti & Harudu, 2019). The slope parameter is dominated by a slope above 40%, with 149,550.6 hectares, or 35.49%. Slopes above 40% are classified as very steep and contribute to the potential score for forest areas. A slope with an inclination below 25% is considered suitable for residential functions (Sakarov, 2019).

Overlaying the three parameters above gives a map of the area function. The map is controlled with SAS Planet imagery to determine the effective area (Farizki & Anurogo, 2017). This area is dominated by limited production forests, settlements, protected forests, rice fields, and production forests with 179,517 hectares or 42.69%, 131,325 hectares or 31.23%, 52,014.2 hectares or 12.37%, 42,485, 3 hectares or 11.77%, and 8,130.93 hectares or 11.93%. Regional potential mapping is used to determine strategic policies in the future (Faturahman, 2017).

The results of observations in selected villages and sub-districts with the heads obtained 70 sample locations with conformity, and 8 sites have several unsuitable areas. The level of map suitability is 89.74%, which indicates the map is worthy of being used as a source of information for the community and stakeholders in the Konawe Selatan District. Suitability to the actual situation is important to check its usability before releasing it to the public or used as a policy consideration (Kasnar et al., 2019; Sejati, Hasan et al., 2020; Sejati, Karim et al., 2020). Mapping the area is to determine its suitability with the regional spatial plan (Latif, 2014). Figure 3 shows a map of the suitability of regional functions in the Konawe Selatan District.

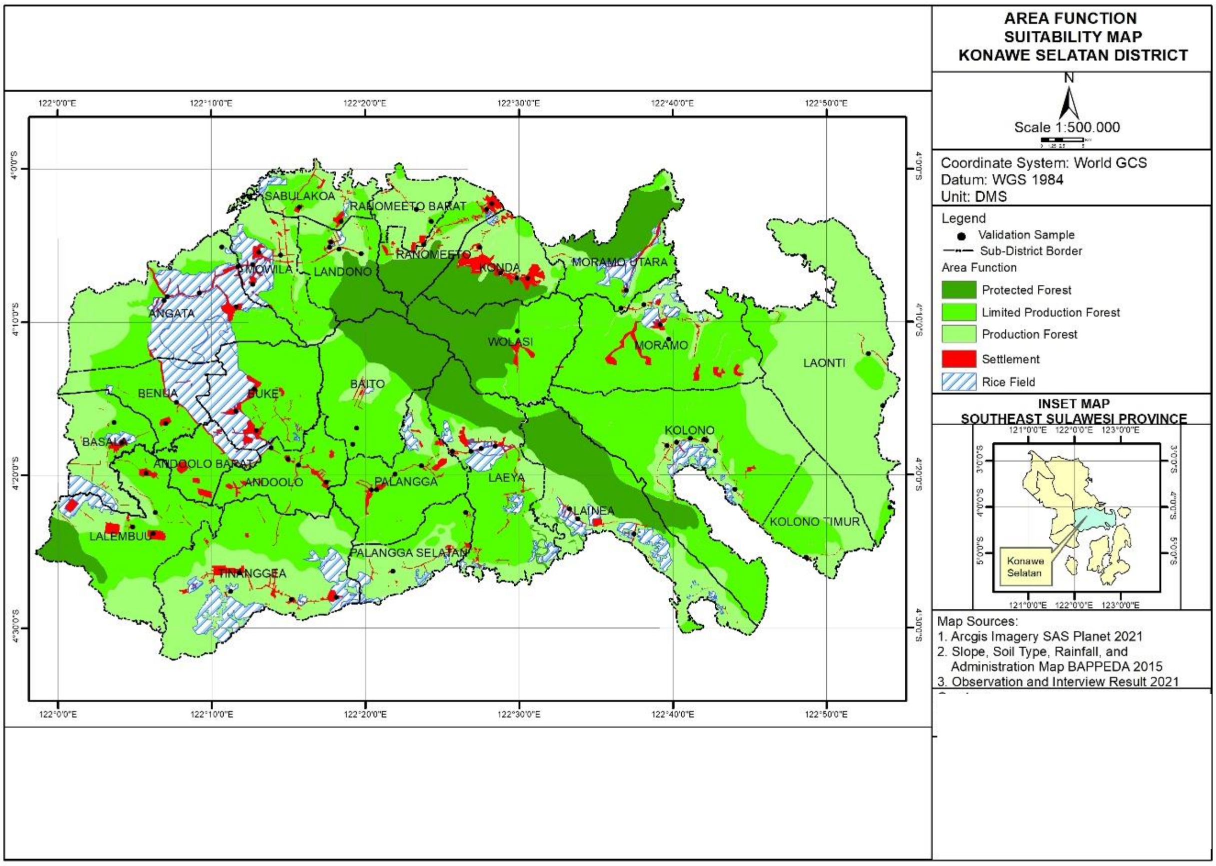

Figure 3. Area function suitability map Konawe Selatan District

Figure 3 shows the validation for area function mapping, where eight points do not match the actual conditions. These incompatible points are obtained from observations, where comparing the function of the area on the map with the actual or remote sensing is called a ground or field check. Furthermore, interviews strengthened matching to confirm the observation results (Guzzetti et al., 2012).

The four data validation locations should function as protected forests, and the actual conditions are about two production forests, a settlement, and a rice field. Two data as limited production forest. The incompatibility of the function of the snow area is controlled as input for policymakers in the management (Nitoslawski et al., 2021).

The suitability of the function of the area obtained 69 points out of 77 or 89.61%. This signifies that the map is suitable for disseminating public information or policy tool for local governments. Remote sensing data from the image can be released immediately, while interpretation results should be checked for suitability (Cracknell, 2019; Dong & Xiao, 2016). The results of the observations conducted in 77 selected villages and sub-districts are shown in Table 3.

Mapping through GIS, remote sensing, or a combination of the two requires a conformity check to validate the correctness of the map product and image interpretation. Regional success in planning is to meet the target proportion of area functions according to the content of the regulation article made (Chaturvedi et al., 2015).

Table 3. The scoring of the compatibility area function map with actual condition

No	Sub-District	Villages/ Ward	Latitude	Longitude	Score
1	Moramo Utara	Lalowaru Ward	-4.023638	122.655157	1
2	Moramo Utara	Mata Lamokula Village	-4.154094	122.605093	1
3	Moramo	Bakutaru Village	-4.188031	122.656688	1
4	Moramo	Marga Cinta Village	-4.172302	122.647333	1
5	Moramo	Tambosupa Village	-4.150543	122.629874	1
6	Moramo	Lamokula Village	-413465	122.610766	0
7	Andolo	Andoolo Village	-4.318402674	122.2438924	1
8	Andolo	Alangga Ward	-4.324972322	122.2552764	1
9	Andolo	Lalonggombu Village	-4.306226424	122.2256117	0
10	Andolo	Potoro Ward	-4.34370864	122.2853482	1
11	Buke	Andoolo Utama Village	-4.287358208	122.2096182	1
12	Buke	Awalo Village	-4.266158577	122.1875458	1
13	Buke	Adaka Jaya Village	-4.242098887	122.2072677	1
14	Palangga	Watu Merembe Village	-4.335082088	122.3597392	1
15	Palangga	Wawonggura Village	-4.351927135	122.3399257	1
16	Palangga	Onembute Village	-4.325851452	122.3883411	1
17	Palangga	Palangga Ward	-4.35195826	122.334185	0
18	Laeya	Punggaluku Ward	-4.304173505	122.4685432	1
19	Laeya	Rambu-Rambu Village	-4.310062032	122.4423512	0
20	Laeya	Lerepako Village	-4.306994313	122.4534287	1
21	Laeya	Aepodu Village	-4.309893209	122.4222374	1
22	Wolasi	Mata Village	-4.178969021	122.4929562	1
23	Konda	Masagena Village	-4.121576018	122.5039485	1
24	Konda	Lambusa Village	-4.115812346	122.4741667	1
25	Konda	Lamomea Village	-4.088052	122.4520675	1
26	Konda	Tanea Village	-4.121414967	122.4924614	1
27	Baito	Tolihe Village	-4.302349355	122.3142592	1
28	Baito	Sambahule Village	-4.284812455	122.3182848	1
29	Lalumbuu	Atari Indah Ward	-4.399362	122.097672	1
30	Lalumbuu	Puunangga Village	-4.376474	122.099789	1
31	Lalumbuu	Sukamukti Village	-4.333425	122.090264	1
32	Lalumbuu	Padaleu Village	-4.3922	122.075485	0
33	Ranomeeto	Amoito Village	-4.084947	122.391469	1
34	Ranomeeto	Ranomeeto Ward	-4.046376	122.459102	1
35	Ranomeeto	Kota Bangun Village	-4.040492	122.464938	1
36	Benua	Benua Village	-4.256622554	122.1228779	1
37	Benua	Puunggawu Kawu Village	-4.279663	122.111409	1
38	Basala	Lipu Masagena Village	-4.300454	122.063739	1
39	Basala	Epeesi Village	-4.278287	122.055348	1
40	Mowila	Wuura Village	-4.106645	122.205999	1
41	Mowila	Lalosingi Village	-4.093142	122.212425	0
42	Mowila	Mulya Sari Village	-4.096039	122.236082	1
43	Mowila	Lamolori Village	-4.127896	122.205902	1
44	Ranomeeto Barat	Abeko Village	-4.059342	122.399407	1
45	Ranomeeto Barat	Lameuru Village	-4.046612	122.383566	1
46	Palangga Selatan	Wawo Wonua Village	-4.376592	122.436662	1
47	Palangga Selatan	Lalowua Village	-4.440574	122.35742	1
48	Angata	Kosebo Village	-4.145607	122.109598	1
49	Angata	Lamoeri Village	-4.152586	122.187814	1
50	Angata	Puao Village	-4.137542	122.147905	1
51	Angata	Langea Indah Village	-4.087198	122.172425	1
52	Angata	Angata Village	-4.141360801	122.1132307	1
53	Angata	Landabaro Village	-4.108716	122.189547	1
54	Kolono	Kolono Ward	-4.296155	122.680153	1
55	Kolono	Awunio Village	-4.309916	122.707021	1
56	Kolono	Mondoe Jaya Village	-4.298325	122.697502	1
57	Kolono	Roda Village	-4.351555	122.728343	1

No	Sub-District	Villages/ Ward	Latitude	Longitude	Score
58	Kolono	Wawoosu Village	-4.3040488	122.6548853	0
59	Kolono	Silea Village	-4.3002869	122.6650911	1
60	Kolono	Puudongi Village	-4.297255101	122.6947582	1
61	Lainea	Aoero Village	-4.372787699	122.5490212	1
62	Lainea	Matabubu Jaya Village	-4.4002717	122.6191297	1
63	Lainea	Watumeeto Village	-4.383840297	122.5583676	1
64	Landono	Landono Dua Village	-4.059620493	122.301629	1
65	Landono	Lalonggapu Village	-4.087817997	122.2891244	1
66	Landono	Wonua Morini Village	-4.044136399	122.2563864	1
67	Landono	Lakomea Village	-4.094630798	122.3233484	1
68	Landono	Wonua Sangia Village	-4.089624997	122.2992433	0
69	Landono	Trinada Mulia Village	-4.082048237	122.2905421	1
70	Laonti	Labotanoe Village	-4.097481391	122.8039195	1
71	Laonti	Lawisata Village	-4.203946797	122.8732161	1
72	Laonti	Tue-Tue Village	-4.260566296	122.8888223	1
73	Laonti	Namu Village	-4.371193092	122.8964071	1
74	Laonti	Rumbia Rumbia Village	-4.425605429	122.805585	1
75	Tinanggea	Molo Indah Village	-4.469072593	122.2959432	1
76	Tinanggea	Lasuai Village	-4.470986193	122.2475831	1
77	Tinanggea	Panggoosi Village	-4.462148397	122.1814133	1

The result shows the non-suitable areas' motive is economic in utilizing the forest. This is under Finnis (2021) that the economic motive affects the development of agriculture. Some farming locations are near the heavily forested area in Ontario, Canada. The result also aligns with Li et al. (2016) that socioeconomic factors can force land use and cover changes in Wuhan City, China. Furthermore, Livengood & Kunte (2012) stated that the local people's view could affect the development of the settlement area. García-Nieto et al. (2013) and Hirschmugl et al. (2014) reported that the lack of clear boundaries corroborates the land use.

The effects of poor planning by choosing problematic areas are the occurrence of floods and landslides. The results show floods and landslides in the area that was non-compatible with a map direction. Damhuri et al. (2018) stated that flood disaster areas used as agricultural land need efforts to survive. The results align with Saadu et al. (2021), where anthropogenic activities can increase forest degradation and water quality in the North Selangor Peat Swamp Forest Malaysia. Furthermore, Shahabi & Hashim (2015) stated that landslides in the forest affect human activities.

Agricultural productivity is below the regional average according to the function of the area. The non-compatible areas have a difference in productivity from 4 to 20 tons/hectare. Meanwhile, the agricultural function that does not guide the function map negatively affects land productivity. This is consistent with Mansaray et al. (2017), where the major rice production areas in Shanghai, China, contributed the largest productivity in the District. Nitoslawski et al. (2021) stated that agricultural land forests have less productivity.

4. Conclusion

The suitability of the area function map with the actual site conditions in Konawe Selatan District can be disseminated. The valid map dissemination could be used for public consumption and as input to determine the policies, especially land use permits. The economic motive of additional income is the reason for the discrepancy, where forest areas are used as rice fields even though productivity is low due to the high risk of floods and landslides. Therefore, further analysis should be conducted to construct the motive of people in land use change of area function using a qualitative approach.

Conflict of Interests

The authors declare that there is no conflict of interest with any financial, personal, or other relationships with other people or organizations related to the material discussed in the article.

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