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Carrying Capacity of Tabunio Watershed in Tanah Laut Regency

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ABSTRACT

Natural resources have been utilized as the main capital in the economic growth and development in Tabunio Watershed. The natural resources and environmental management not carried out in accordance with the carrying capacity can have an impact on food, water, energy and environment.

The purpose of this study was to determine the carrying capacity of Tabunio watershed. The result is expected to be a reference for determining the direction of Tabunio watershed restoration. The research method used in the study was an ecological regional approach of watershed, and the process and presentation of the analysis were performed spatially through geographic information system.

The results of the study: **1) Clean water supply:** low (1,538.63ha); medium (36,898.31 ha); high (23,771.42ha); very high (350.20 ha). **2) Food supply:** low (21,243.89 ha); medium (6,195.53); high (22,851.89 ha); very high (12,267.25 ha). **3) Genetic Resource supply:** low (12,822.08ha); medium (14,240.34 ha); high (31,712.71 ha); very high (3,783.44 ha). **4) Biodiversity supply:** very low (12,822.08 ha); low (3,334.65ha); medium (42618.40 ha); (3,783.44ha). **5) Housing and Living Space:** very low (1,131.19ha); low (1,373.38ha); medium (3,668.54ha); high (16,382.75ha); very high (40,002.70 ha). **6) Recreation and ecosystem:** very low (37,265.27ha); low (16,350.41ha); medium (3,714.37ha); high (1,388.82ha); very high (3,839.69ha).

Keywords: carrying capacity, watershed

INTRODUCTION

Background

Natural resources have been utilized as the main capital in economic growth and development in the watershed Tabunio. Management of natural resources and the environment that are not carried out in accordance with the carrying capacity can have an impact on food, water, energy and the environment.

Agency research and development area of South Kalimantan (2010) states that in 2007 to 2010 in Tanah Laut regency there are events of flooding of 22 villages. an increased vulnerability to flood an area 157.971.40 ha.

Hall watershed management Barito (2009) states that that particular watershed Tabunio with 242.442.5 ha area are critical land area of 56.881.6 ha. whereas in 2013 there were critical land area of 66.966.6 ha, an increase of 17.7%, which cause abnormal discharge fluctuations in the availability of water for domestic use and for agricultural wetlands. Tabunio watershed is one of the watersheds that have perananan very important to the availability of water for agriculture, plantation and domestic indtri in Tanah Laut. Carrying capacity of the environment is the ability of the environment to support humans, other living beings and the balance between the two. Furthermore, the environmental carrying capacity is the ability of the environment to absorb substances, energy, and / or other components into or incorporated into it. Liu and Chen (2006) suggests that the forest cover and a thick grass vegetation types are more effective in controlling runoff and erosion, when compared with multi-cropping, crop corn and other agricultural crops.

the restored watershed carrying capacity is watershed land conditions as well as quantity. quality and continuity of water, socio-economic, investment waterworks and spatial use is not working properly. whereas that needs to be preserved is a watershed that is still functioning properly and to realize the improvement of people's welfare can be achieved. Based on the above, then in order to utilize, prevention, pengedalian and maintenance of natural resources, it is necessary to determine the carrying capacity and the capacity of watersheds Tabunio to realize the conservation of natural resources that can ensure the balance of environment and water management as well as providing social and economic benefits real for the community.

Objectives and Benefits

The purpose of watershed Tabunio Tnah District Seafood aims to Determine the carrying capacity and environmental carrying capacity Tabunio watershed. The results of this study are expected to be useful as a reference in order to rehabilitate forests and land (watershed restoration Tabunio)

MATERIALS AND METHODS

Places and Objects Research

Place of research can be conducted in the watershed Tabunio in Tanah Laut regency area of 62.558.56 ha which is geographically located at 30 44 '14:47 "LS and 1140 37' 2:25" BT. Tabunio watershed consists of 44 villages. Location of the study are presented in Figure 1.

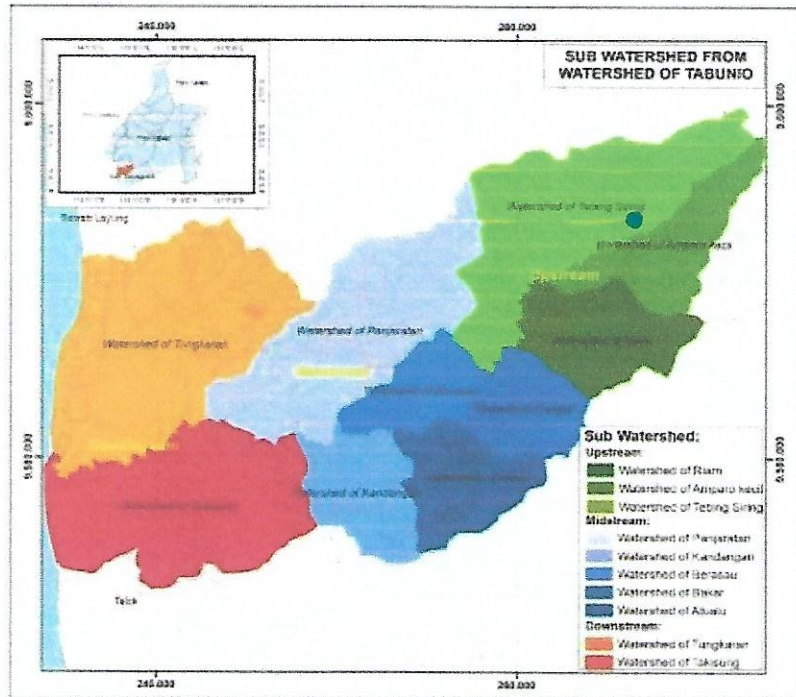


Figure 1. Location of the watershed study Tabanio Tanah Laut

Materials and Equipment

Materials and tools are well-prepared in order to study the carrying capacity of the watershed Tabunio determination are as follows:

- Terdiri map above; Map Morphology DAS. Administration. Citra SRTM (Shuttle Radar Topography Mission).
- Hardware: The computer (CPU, monitor, Plotter, Printer)
- Software: Arc GIS 9 ArcMap version 9.3. Global Mapper 11 and. Simulation Model DAS to conduct hydrological modeling and for the modeling of watersheds.
- Currentmeter to determine the flow of water in a watershed
- Water level to determine changes in water level
- GPS (Global Positioning System) and Stop watch to count time

- g. Meter to measure the distance
- h. Computer and printer for input data, processes and analyzes the data and print out.
- i. Camera for documentation and stationery

Technical Data and Parameter

This study uses the watershed ecosystem approach that the process of analysis and spatial presentation done by utilizing the technology of Geographic Information Systems (GIS).

Capability and Capacity of water service provision availability

Ecosystems provide the benefits of clean water supply is the availability of clean water that comes from surface water and groundwater (including its storage capacity), even rain water to water availability is presented in Table 1.

Table 1. Parameter Capability and Capacity Water Availability

No	Morphology	Slope	Ch (mm)	Land use	Land systems (Ground water)	Capability and Capacity Availability of water Value	Score
1	Mountain / Mountains and Hill / Hills	>40%	1750	Primary forests (dry land, mangrove)	None or Slight	Availability of water is very low	1
2	Mountain / Mountains and Hill / Hills	25-40%	2250	Secondary forest (dry land, mangrove swamp)	>400 ppm NaCl	Availability of water is low	2
3	Hill/Hills	15-25%	2750	Forest plantations, plantation, scrub, dry land agriculture mixed scrub, scrub swamp	250 - 400 ppm NaCl	Availability of water is Moderate	3
4	Sloping	2-15%	3250	Dryland farming	<250 ppm NaCl	Availability of high water	4
5	Flat	0-2 %	3750	Open, Rice, ponds, settlements, mining, transmigration, Body of Water, Swamp	<250 ppm NaCl		5

Capability and Capacity Environment and Ecosystem Services Provider Food

Food is a basic need for every living creature to survive. This makes the availability of food in an area is important and must always be guaranteed availability. Parameter Capability and Capacity Availability of Food are presented in Table 2.

Table 2. Parameters Capability and Capacity Availability of Food

No	Land systems	Land Suitability For Foodstuff	Capability and Capacity Availability of Land Food	Score
1.	Kahayan	S2	Availability of Food High	5
2.	Lawanguwang, Kapor, Bakunan, Tanjung, Rangankau	S3		4
3.	Pakau, Klaru, Barah	S3	Availability of Food Moderate	3
3.	Puting, Kajapah	N1	Availability of Food Low	2
5.	Maput, Bukit Pandan, Beriwit, Pendreh, Teweh, Lohai, Luang, Mantalat, Sungai Seratai, Okki, Pakalunai, Honja, Gambut, Mendawai, Telawi, Tewai Baru, Gunung Diangan	N2	Availability of Food Very Low	1

a. Capability and Capacity Provisioning Ecosystem Services Genetic Resources

Ecosystems provide a variety of genetic resources are abundant and economically valuable and beneficial to human welfare. The availability and distribution of genetic resources is determined by the type of ecosystem, ie bentangalam ecoregions and land cover in particular vegetated areas. Parameters of carrying capacity and the capacity of ecosystems to Genetic Resources are presented in Table 3.

Table 3. Parameter Capability and Capacity Impacts Genetic Resources

No	Land Use	Capability and Capacity Availability Genetic Resources	Score
1	Primary forests (dry land, mangrove)	Availability of Genetic Resources is High	5
2	Secondary forest (dry land, mangrove swamp)		4
3	Scrub, dry land agriculture mixed scrub, scrub swamp	Availability of Genetic Resources is Moderate	3

No	Land Use	Capability and Capacity Availability Genetic Resources	Score
4	Plantation, Plantations, dry land agriculture	Availability of Genetic Resources is Low	2
5	Open, Rice, ponds, settlements, mining, transmigration, Body of Water, Swamp		1

Capability and Capacity Services Delivery of Biodiversity

Biodiversity is the diversity among living organisms from all sources including terrestrial, marine and other aquatic ecosystems and the ecological complexes of which are part of the diversity; this includes diversity within species, between species and of ecosystems. Parameters of carrying capacity and carrying capacity Biodiversity presented in Table 4.

Table 4. Parameters Capability and Capacity Biodiversity

No	Land Use	Capability and Capacity Biodiversity	Score
1	Primary forests (dry land, mangrove)	Availability of Biodiversity is high	5
2	Secondary forest (dry land, mangrove swamp)		4
3	Forest plantations, plantation, scrub, dry land agriculture mixed scrub, scrub swamp	Availability of Biodiversity is Moderate	3
4	Dryland farming	Availability of Biodiversity is Low	2
5	Open, Rice, ponds, settlements, mining, transmigration, Body of Water, Swamp		1

Capability and Capacity Dwelling and Living Space

Ecosystems provide positive benefits for humans, especially space to live and prosper. Ecosystem services as shelter and living space are socially influenced by the physical and geographical environment and regional development opportunities greater. Parameters of carrying capacity and carrying capacity of Housing and Living Space are presented in Table 5.

Table 5. Parameter Capability and Capacity Dwelling and Living Space

No	Mophology	Slope	Capability and Capacity Housing and Living Space	Score
1	Mountain / Mountains and Hill / Hills	>40%	Availability of Housing and Living Space is very low	1
2	Mountain / Mountains and Hill / Hills	25-40%	Availability of Housing and Living Space Low	2

No	Mophology	Slope	Capability and Capacity Housing and Living Space	Score
3	Hill/Hills	15-25%	Availability of Housing and Living Space Moderate	3
4	Sloping	2-15%	Availability of Residential and High Life Lounge	4
5	Flat	0-2 %		5

Capability and Capacity Recreation and Ekotorisme

Ecosystems provide landscaping features, uniqueness of nature, or specific values that became a tourist attraction. Variations bentangalam greatly affect the value of recreation and cultural services ekotorisme. Parameters of carrying capacity and carrying capacity of Recreation and Ekotorisme presented in Table 6.

Table 6. Parameters Capability and Capacity Recreation And ekoturisme

No	Morphology	Slope	Land Use	Capability and Capacity Recreation And Ecosystems	Score
1a	Mountain / Mountains and Hill / Hills	>40%	Primary forests dry land	Availability of Recreation and Ecosystem Very High	5
1b	Sloping Hill/Hills Mountain/Mountains	2-15% 15-25% 25-40%	Karst, (all vegetative cover on karst)	Availability of Recreation and Ecosystem Very High	5
1c	Flat	0 – 2 %	Beach (all vegetative cover on the beach)	Availability of Recreation and Ecosystem Very High	5
2	Mountain / Mountains and Hill / Hills	25-40%	Secondary forests, drylands	Availability of Recreation and Ecosystem High	4
3	Hill/Hills	15-25%	Forest plantations, plantation, scrub, mix the dry land agriculture shrubs	Availability of Recreation and Ecosystem Moderate	3
4	Sloping	2-15%	Dryland farming	Availability of Recreation and Ecosystem Low	2
5	Flat	0-2 %	Open, Rice, ponds, settlements, mining, transmigration, Body of Water, Swamp, scrub marsh, swamp forests are secondary		1

RESULTS AND DISCUSSION

Carrying Capacity Water Supply

watershed Tabuniobenefit is the availability of water supply clean water that comes from surface water and groundwater (including its storage capacity), even rain water can be used for domestic purposes, agriculture, industry and services. In addition to foodstuffs other thing which is also a major requirement for humans is the availability of clean water. Naturally, the clean water may come from surface water, such as rivers and lakes as well as from ground water. Capability and Capacity provider of water supply are presented in Table 7. Zhao et al. (2012) states that the land cover change in a watershed can affect the height of runoff during the rainy season, which may cause fluctuation abnormal and causes flooding, hence this change in use ahan according southwest dakung and environmental capacity for governance arrangements water availability of clean water.

Table 7. Capability of water supply

No	Sub DAS	Level of Capability and Capacity Water Supply					Total (ha)
		Very Low	Low	Moderate	High	Very High	
1	Amparo kecil	-	26,71	3.427,89	453,62	4,66	3.912,88
2	Atuatu	-	-	3.265,90	410,96	-	3.676,86
3	Bakar	-	370,15	2.131,71	659,49	-	3.161,36
4	Berasau	-	26,74	1.608,73	913,18	-	2.548,65
5	Kandangan	-	-	3.017,92	631,46	2,19	3.651,57
6	Panjaratan	-	113,35	5.435,18	4.303,26	45,26	9.897,05
7	Riam	-	247,15	3.654,23	387,53	-	4.288,91
8	Takisung	-	-	3.956,35	5.721,82	96,94	9.775,12
9	Tebing Siring	-	754,52	4.952,23	3.583,52	50,77	9.341,04
10	Tungkaran	-	-	5.448,18	6.706,57	150,38	12.305,14
	Total	-	1.538,63	36.898,31	23.771,42	350,20	62.558,56

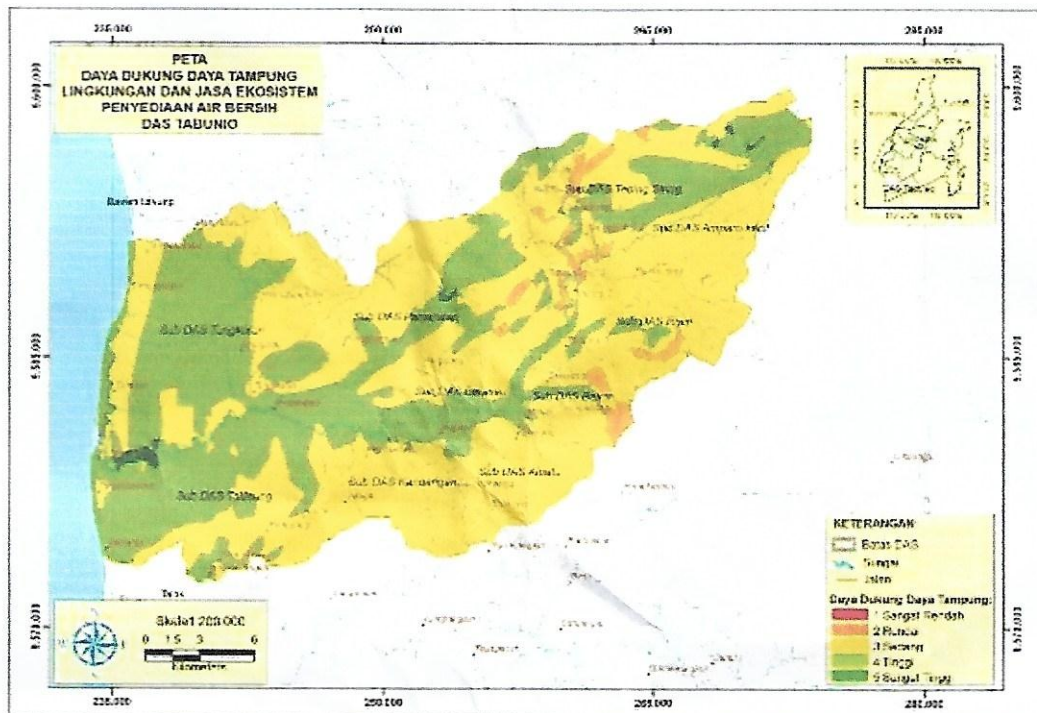


Figure 2. The carrying capacity of water supply capacity

In Tabel 7 shows that the carrying capacity and the capacity of water supply in the watershed Tabunio lower classification 1538.63 ha and 350.20 ha very high classification. Map carrying capacity and the capacity of water supply. presented in Figure 2. Sajikumar and Remya (2015) considers that there are effects of land use and land cover on the characteristics of surface runoff that can affect water quality on every river in a watershed. Fox, et al. (2012) the impact of changes in land cover and management of drainage channel to discharge runoff.

Capability and Capacity Provisioning food

Natural resources in the watershed Tabunio benefit provision of food yaitusegala something that comes from biological sources (plants and animals) danair (fish), whether treated or untreated, which is applied as a food or beverage for consumption manusia. Jenis-type food in Indonesia varied such as rice, maize, cassava, wheat, corn, all kinds of fruit, fish, meat, eggs and so forth. The provision of food by the ecosystem can be derived from agricultural and plantation, livestock food products, marine products and include food from the forest

Kadir (2014) reported that the rehabilitation of mined land vegetative including food crops and mechanically is one of the best alternatives to control the level of vulnerability to flooding biophysical and economic improvement of public welfare

Table 8. Capability and Capacity Provisioning food

No.	Sub DAS	Level of Capability and Capacity provision of food					Total (ha)
		Very Low	Low	Moderate	High	Very High	
1	Amparo kecil	-	2.769,96	-	1.142,91	-	3.912,88
2	Atuatu	-	1.394,03	-	2.084,12	198,71	3.676,86
3	Bakar	-	1.326,40	-	1.834,95	-	3.161,36
4	Berasau	-	165,00	-	2.174,64	209,01	2.548,65
5	Kandangan	-	394,85	-	2.658,44	598,28	3.651,57
6	Panjaratan	-	3.444,39	-	4.098,36	2.354,30	9.897,05
7	Riam	-	3.117,70	-	1.171,21	-	4.288,91
8	Takisung	-	772,17	3.270,11	2.822,70	2.910,14	9.775,12
9	Tebing Siring	-	7.622,46	-	1.718,58	-	9.341,04
10	Tungkaran	-	236,92	2.925,43	3.145,98	5.996,81	12.305,14
	Total	-	21.243,89	6.195,53	22.851,89	12.267,25	62.558,56

In Tabel 8 shows that the carrying capacity and carrying capacity of the food supply in the watershed Tabunio lower classification and the classification of 21243.89 ha ha very high 12267.25.

Food sector is a basic necessity for human life so that the availability of foodstuffs into aspects penting. Ekosistem benefit provision of food is everything that comes from biological sources (plants and animals) and water (fish), whether treated or untreated, which applied as a food or beverage for human consumption. Sriwongsitanon and Taesombat (2011) found a significant correlation between the type of land cover to the behavior of rainfall-runoff for flood events and the impact on food crops. Map carrying capacity and the capacity of the food supply is presented in Figure 3.

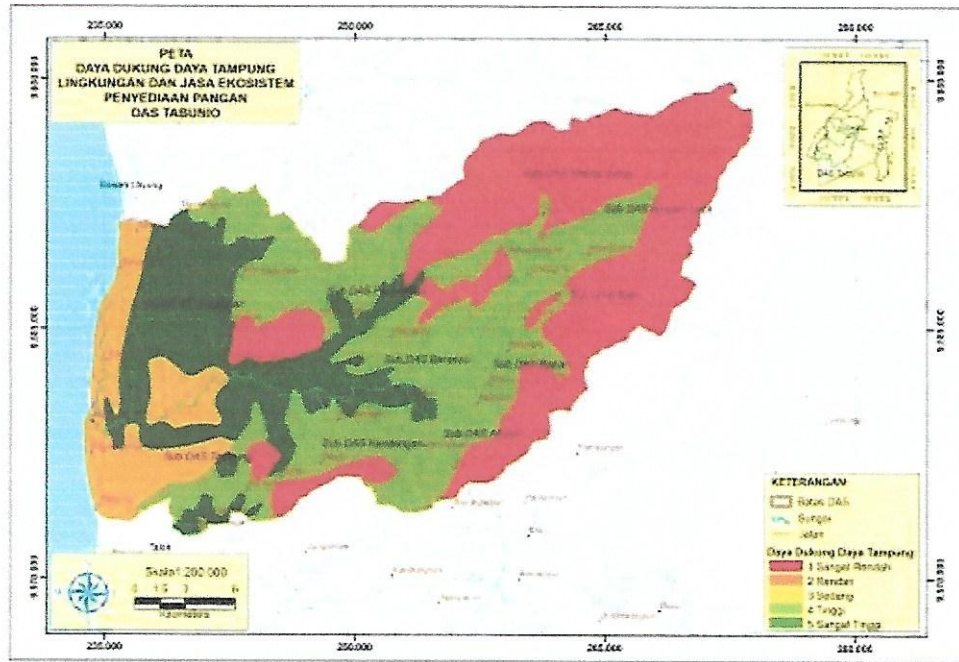


Figure 3. The carrying capacity of the capacity to provide food

Capability and Capacity Provisioning Genetic Resources

The result of the calculation of the carrying capacity of the environment with the capacity genetics genetics ecosystem services in South Kalimantan can be shown in Table 9.

In Tabel 9 shows that the carrying capacity and the capacity of providing genetic resources in the watershed Tabunio very low classification 12822.08 ha and higher classification 3.783,44ha. Peng and Shi-jie Wang (2012) found that the amount of runoff and loss of soil on the hillside karst turned out to be very small compared to the area of non-karst, this happens because the structure of the hydrology double in karst areas, including the quality of the soil and drainage system underground , can influence the process of infiltration (infiltration) and the formation of rain water runoff.

These findings provide a more thorough understanding of the influence of the type of land cover against flooding behavior in a variety of soil moisture conditions and rainfall intensity level. This can be useful in program piñata-use of land and watershed flood management and provision of genetic resources (Sriwongsitanon and Taesombat, 2011).Map carrying capacity and the capacity of providing genetic resources is presented in Figure 4.

Table 9. Capability and Capacity Provisioning Genetic Resources

No.	Sub DAS	Level of Capability and Capacity Provision of Genetic Resources					Total (ha)
		Very Low	Low	Moderate	High	Very High	
1	Amparo kecil	149,71	872,16	1.904,66	986,34	-	3.912,88
2	Atuatu	198,29	218,15	3.260,42		-	3.676,86
3	Bakar	32,51	175,87	2.749,27	203,71	-	3.161,36
4	Berasau	341,27	932,78	1.274,61		-	2.548,65
5	Kandangan	598,51	74,83	2.978,23		-	3.651,57
6	Panjaratan	2.590,14	3.362,99	3.462,87	481,05	-	9.897,05
7	Riam	153,37		3.092,82	1.042,71	-	4.288,91
8	Takisung	1.503,78	3.816,83	4.263,25	191,26	-	9.775,12
9	Tebing Siring	1.894,77	2.020,78	5.073,63	351,87	-	9.341,04
10	Tungkaran	5.359,73	2.765,95	3.652,95	526,50	-	12.305,14
	Total	12.822,08	14.240,34	31.712,71	3.783,44	-	62.558,56

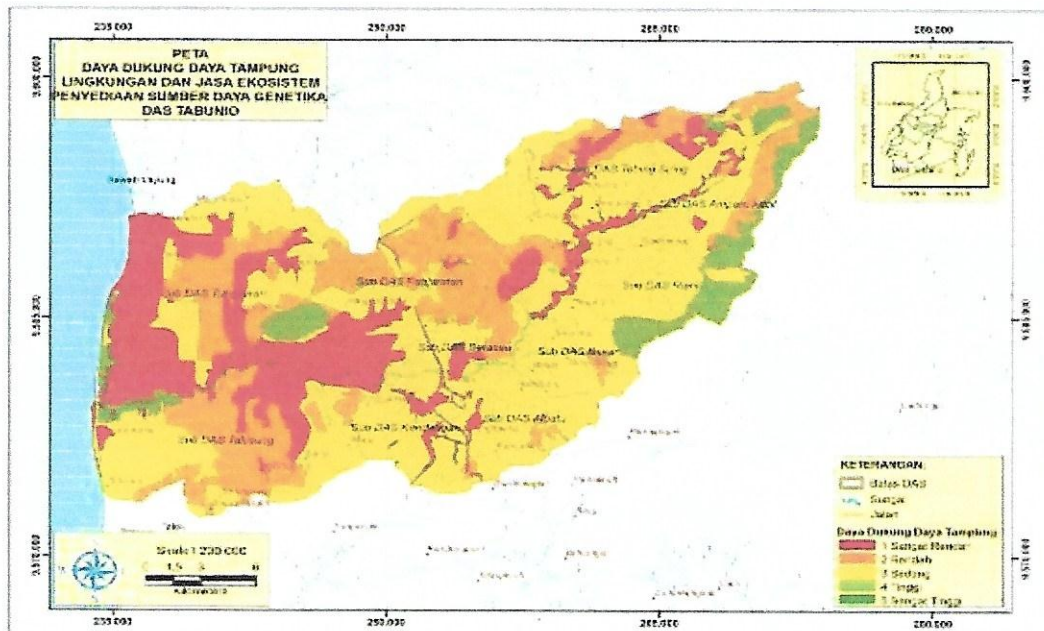


Figure 4. The carrying capacity of the supply capacity of genetic resources

Capability and Capacity Provisioning Biodiversity

Based on the results of the analysis of Capability and Capacity Provisioning Biodiversity of the determination of parameters as shown in Table 10.

Table 10. Capability Provisioning Biodiversity

No	Sub DAS	Level of Capability and Capacity provision of Biodiversity					Total (ha)
		Very Low	Low	Moderate	High	Very High	
1	Amparo kecil	149,71	84,31	2.692,51	986,34	-	3.912,88
2	Atuatu	198,29	218,15	3.260,42	-	-	3.676,86
3	Bakar	32,51	175,87	2.749,27	203,71	-	3.161,36
4	Berasau	341,27	-	2.207,39	-	-	2.548,65
5	Kandangan	598,51	21,78	3.031,28	-	-	3.651,57
6	Panjaratan	2.590,14	9,77	6.816,09	481,05	-	9.897,05
7	Riam	153,37	-	3.092,82	1.042,71	-	4.288,91
8	Takisung	1.503,78	2.270,49	5.809,58	191,26	-	9.775,12
9	Tebing Siring	1.894,77	554,27	6.540,13	351,87	-	9.341,04
10	Tungkaran	5.359,73	-	6.418,90	526,50	-	12.305,14
	Total	12.822,08	3.334,65	42.618,40	3.783,44	-	62.558,56

In Tabel 10 shows that the carrying capacity and the capacity of providing biodiversity. in DAS Tabunio very low classification and classification very high 12822.08 3783.44 ha ha. Analysis of carrying capacity with high category can be determined by land use by primary forests such as: upland and mangrove. Mainuri and Owino (2014) study the relationship between landscape and land use, land degradation, it is stated that the difference tempat and altitude affect solum differences that may affect the availability of biodiversity. Aspects of the slope proved to have a major impact on the rate of soil erosion, and the slopes exposed to the sun appeared to have a greater erosion than the shaded slopes, especially for agricultural land (Li et al., 2010).

Map carrying capacity and the capacity of the supply capacity of the supply of biodiversity is presented in Figure 5.

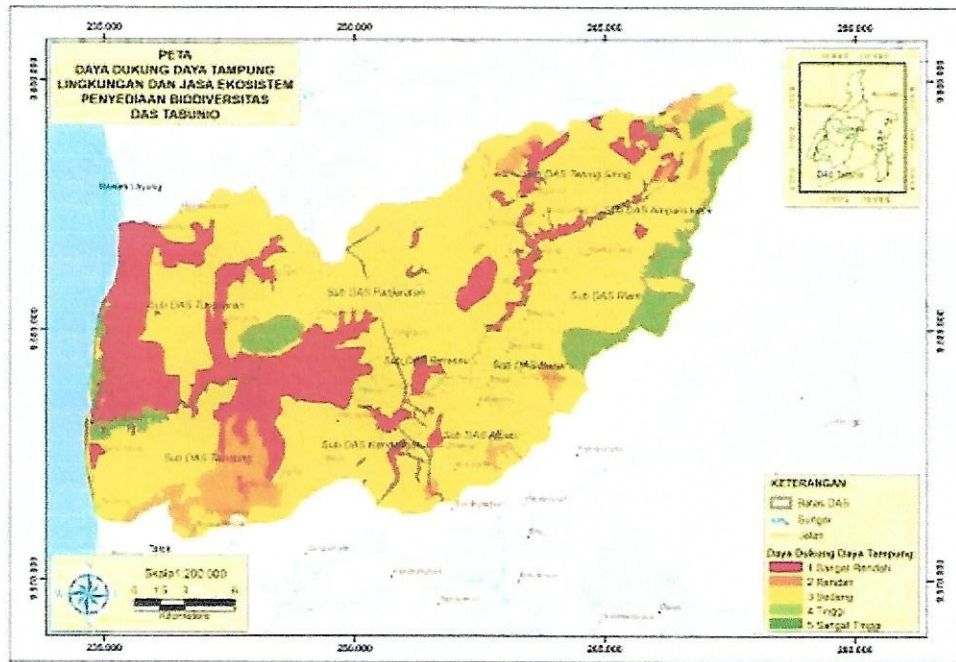


Figure 4. The carrying capacity of the supply capacity biodiverstas

Capability and Capacity Provision of Housing and Living Space

Based on the carrying capacity of the environment and ecosystem services provision of shelter and living space can be seen when the area is in the provision categorized as very low and low then the area has a tendency morphology of natural physical form of the mountainous area and per hills. Carrying capacity and the capacity of providing shelter and living space are presented in Table 11.

Lee (1986) states that the differentiated infiltrasi capacity based on the condition of land cover. Land cover is one of the factors that affect infiltration capacity, so the vulnerability of flood control measures for the provision of shelter. Infiltration is a process to reduce runoff, so the higher the lower the infiltration capacity of runoff that can increase the availability of settlement (Asdak, 2010).

One technique to reduce surface runoff of rain water in urban areas is increasing soil infiltration capacity. Olson et al. (2013) investigated the tillage and the addition of compost to improve the capacity and infiltration, and to assess the effectiveness of rehabilitated land for availability pemukiman residence.

Tabel 11. Capability and Capacity Provision of Housing and Living Space

No.	Sub DAS	Level of Capability and Capacity Provision of Housing and Living Space					Total (ha)
		Very Low	Low	Moderate	High	Very High	

1	Amparo kecil		166,31	1.234,62	2.511,94		3.912,88
2	Atuatu			249,67	645,29	2.781,91	3.676,86
3	Bakar	572,23	106,35	216,47	959,39	1.306,91	3.161,36
4	Berasau		3,30		201,99	2.343,36	2.548,65
5	Kandangan					3.651,57	3.651,57
6	Panjaratan			274,99	2.334,12	7.287,95	9.897,05
7	Riam	558,96	920,02	385,49	2.383,15	41,29	4.288,91
8	Takisung					9.775,12	9.775,12
9	Tebing Siring		177,40	1.307,30	7.346,88	509,46	9.341,04
10	Tungkaran					12.305,14	12.305,14
	Total	1.131,19	1.373,38	3.668,54	16.382,75	40.002,70	62.558,56

in Tabel 11 shows that the carrying capacity and the capacity of providing shelter and living space in the watershed Tabunio 1131.19 ha classification is very low and very high classification 40002.70 hectares. Map carrying capacity and the capacity of providing shelter and living space are presented in Figure 6.

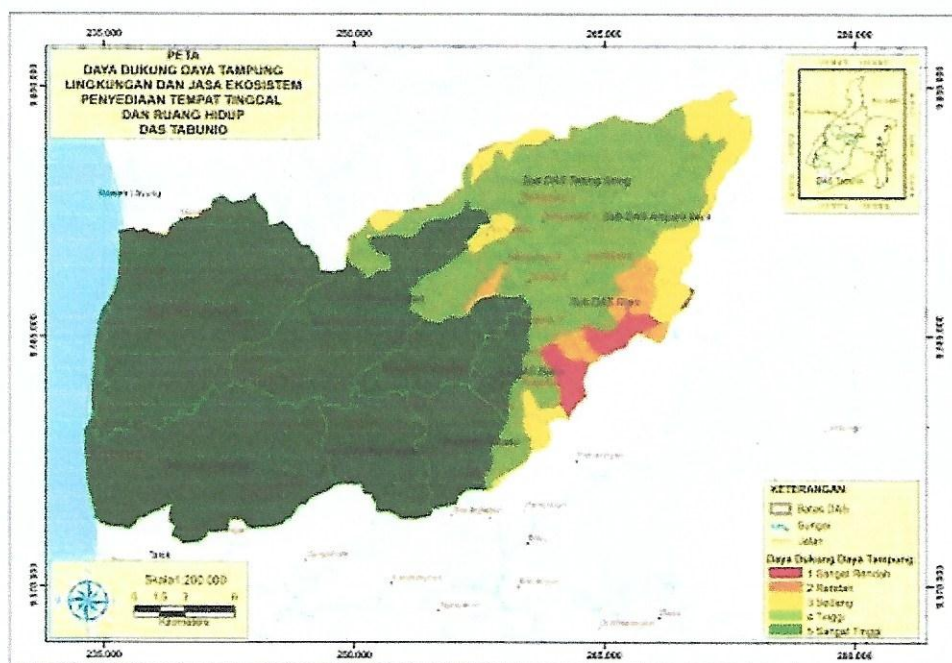


Figure 6. Map of the carrying capacity and the capacity of providing shelter and space life

Capability and Capacity Provisioning Recreation and Ekoturime

Ecosystem recreation and ecotourism are ecoregion high mountains, hills, coastal plains and plains structural. Pegununganbiasanya area has a dominant land cover in the form of forests,

thus providing a beautiful view and have air and refreshing atmosphere. Capability and Capacity Provisioning Recreation and Ecotourism presented in Table 12.

Response hydrology and soil erosion on a variety of land use and types of vegetation were analyzed to determine the effect of the variability and the characteristics of the land surface, and to assess the efficiency of alternative land uses in terms of behavior hidrogeomorfisnya to the availability of a tourist destination or recreation (Nunes, Almeida and Coelho, 2011).

Table 12. Capability Provisioning Recreation and Ecotourism

No.	Sub DAS	Level of Capability and Capacity Provision of Recreation and Ecosystems					Total (ha) Low
		Very Low	Low	Very Low	Low	Very Low	
1	Amparo kecil	-	2.497,52	1.244,64	170,71	-	3.912,88
2	Atuatu	2.775,79	647,26	253,81	-	-	3.676,86
3	Bakar	1.299,05	955,26	220,77	103,80	582,47	3.161,36
4	Berasau	2.339,59	204,98	-	4,08	-	2.548,65
5	Kandangan	3.651,57	-	-	-	-	3.651,57
6	Panjaratan	7.257,28	2.353,99	285,78	-	-	9.897,05
7	Riam	39,60	2.372,78	378,62	922,59	575,31	4.288,91
8	Takisung	9.069,56	-	-	-	705,56	9.775,12
9	Tebing Siring	504,04	7.318,62	1.330,76	187,63	-	9.341,04
10	Tungkaran	10.328,78	-	-	-	1.976,35	12.305,14
	Total	37.265,27	16.350,41	3.714,37	1.388,82	3.839,69	62.558,56

InTabel 12 shows that the carrying capacity of providing recreation and ecotourism in the watershed Tabunio very low classification and classification 37265.27 ha ha very high 37265.27. Map carrying capacity of providing recreation and ecotourism is presented in Figure 7. Moghadam et al. (2015) investigated the impact of land management practices and land use on the spark erosion in semiarid regions in Iran, stated that the availability of grass plants reduce erosion splash, it increases the availability of land for recreation.

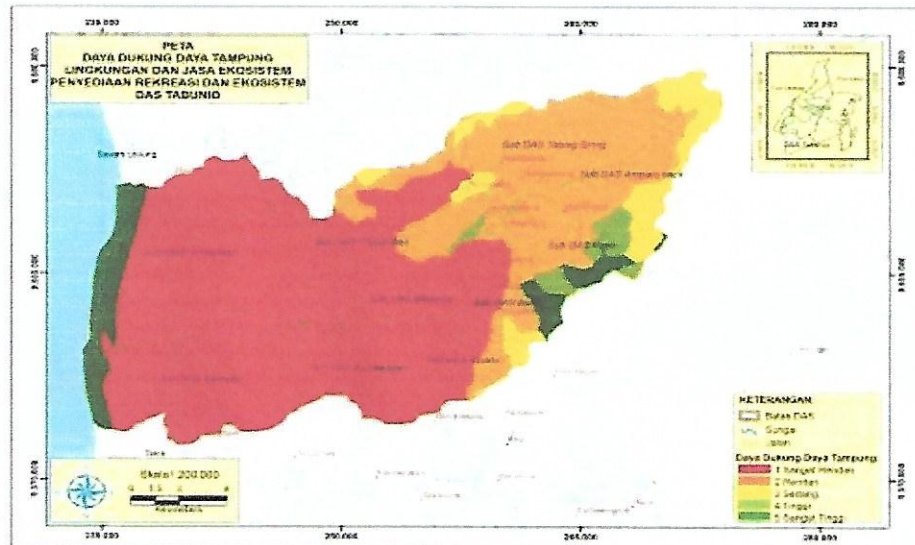


Figure 7. Map carrying capacity and eco-tourism provision rekereation

CONCLUSIONS

1. Clean water supply: low (1,538.63 ha); medium (36,898.31 ha); high (23,771.42 ha); very high (350.20 ha).
2. Food supply: low (21,243.89 ha); medium (6,195.53); high (22,851.89 ha); very high (12,267.25 ha).
3. Genetic Resource supply: low (12,822.08 ha); medium (14,240.34 ha); high (31,712.71 ha); very high (3,783.44 ha).
4. Biodiversity supply: very low (12,822.08 ha); low (3,334.65 ha); medium (42618.40 ha); (3,783.44 ha).
5. Housing and Living Space: very low (1,131.19 ha); low (1,373.38 ha); medium (3,668.54 ha); high (16,382.75 ha); very high (40,002.70 ha).
6. Recreation and ecosystem: very low (37,265.27 ha); low (16,350.41 ha); medium (3,714.37 ha); high (1,388.82 ha); very high (3,839.69 ha).

In the framework of watershed restoration suggested Tabunio be integrated multi-stakeholder, cross-regional, integrated destination for ecological and economic recovery do berdasarkan carrying capacity of the considerable ecological and economic interests

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