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MORALITY BEFORE KNOWLEDGE

Building agricultural potential: Utilization of former land use rights by spatial planning

HESTU ADI HARMOKO[1], RULLY NOVIE WURARAH[2]*, THOMAS F. PATTIASINA [3]
[1] *Master's Degree in Environmental Science, University of Papua*
[2] *Economics Department, University of Papua, Indonesia*
[3] *Faculty of Fisheries and Marine Sciences, University of Papua*
*Correspondence: r.wurarah@unipa.ac.id

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ABSTRACT
Background: Areas that were once Cultivation Rights (HGU) in Manokwari Selatan District are the subject of this research. Residents must follow the Regional Spatial Plan (RTRW) to use the land. This study aims to identify the potential for land development and analyze the current spatial allocation and arrangement in the former HGU area. **Methods:** Using system dynamic analysis, the study combined qualitative and quantitative approaches through observations and interviews. **Result:** The results show that once HGU areas could be developed into plantations or agriculture. This finding is based on land capability evaluated by considering ecological factors and local wisdom. Land use policies should be tailored to the potential and availability of land in this context. To increase the use of agricultural and plantation land, crop types suitable for soil capability can be selected based on land suitability. This research emphasizes the effect of policies on Kampung Gedi Merah's population growth. Using strategies to suppress the population growth rate is expected to reduce land conversion that is not by the RTRW spatial pattern. In 2023, 904 lived in this area without indicating land conversion. One of the critical challenges identified is the projected 33% decrease in land availability by 2030. Therefore, its land use needs to remain cording to RTRW directives. This research also provides recommendations to the local government to develop the potential of this land further so that interference with community use and control can be avoided.

KEYWORDS: land availability; land capability; land use rights; spatial planning

1. Introduction

Spatial development contains land utilization and allocation, which is an integral part of the concept of space in the implementation of development as well as the desired development plans and directions. Land use planning provides an overview of land that has the potential to be developed following its use based on scientific studies that consider the allocation of space in the Regional Spatial Plan. The role of spatial planning is intended to sustainably achieve optimal resource utilization, avoid conflicts in resource utilization, and prevent environmental damage to produce balanced harmony in an area.

Along with the increase in population and development that continues to grow, the use of space will change according to the phenomena that occur. The increase in population can cause new products as a facility to meet the needs of human living space for housing and functions to develop in the periphery because the availability of space in the city is fixed and limited (Prihatin et al., 2015). Rapidly growing development activities will significantly

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impact changes in the function of an area or land. The new development can encourage the transfer of space utilization functions not supported by the spatial pattern and potential of the land, resulting in land use problems.

The rapid urbanization that is not controlled will lead to higher land demand due to a large number of housing built on productive land without careful planning, causing flooding in every rainy season (Mamengko, D. V. et al., 2023; Wahyunindyawati & Dyanasari, 2016). Therefore, careful thought is needed in decision-making to be profitable and appropriate for the arrangement of existing and limited resources in changing the function of space utilization to meet land use needs.

The ecological view in spatial planning is to realize spatial planning that favors environmental sustainability and justice in terms of natural resource management. In addition to ecological sustainability, which is prioritized in spatial planning, people's interests must also be the leading choice in spatial planning. Spatial planning must be carried out with a structured and planned approach, giving the impression of being professional and efficient. Berry, J. M. (2015) and Astri, A. N. (2018) added that in organizing public interests, it is essential always to prioritize the people's interests. This can be achieved by collaborating and working closely with the people to ensure that all actions and policies reflect their needs and aspirations.

Aspects of local community wisdom that apply to the community's way of life, including protecting and managing the environment sustainably, are also one of the inputs and considerations in spatial planning. The utilization of space for local communities as a business in improving their economic standards must also be planned so that the financial aspects and environmental sustainability can run in balance.

In connection with the validity period of the Cultivation Rights Title and information that the company is no longer actively operating and is considered to have abandoned the land in question, the issue that is developing in the community states that customarily, the land returns to customary land so that its status returns to traditional rights controlled by ordinary rights owners.

The philosophical understanding of land in customary law is that land is a soulful object and is not separated from its fellowship with humans. Land and humans are a unity that affects each other. For the Papuan people, land is not a commodity; the land is considered sacred and even likened to a mother who has an inner relationship with her child that is so close that the mother gives birth, feeds, nurtures, educates, and raises (Hammar, 2017; Ramandey,2023).

One location is a former Cultivation Rights Title land in Manokwari District, precisely in the Gedi Merah expansion village, Warmomi Village, which is an island in the former PT—Nusa Irianjaya Indah area, whose rights expired on December 21, 2018. The former land, namely the land of former business use rights, is land of Business Use Rights that cannot be renewed due to several things, including the expiration of the period as stipulated in the decision to grant or extend it and abandonment (Government Regulation No. 18, 2021). The company obtained a Forest Area Release Decree by the Minister of Forestry No. SK. 371//KPTS-II/1993 so that it became a Non-Forest Area or Other Use Area (APL) for plantation cultivation. Based on information from the Manokwari Regency RTRW, the direction of the spatial pattern of the location is the location of plantation cultivation.

By custom, the customary rights owner has controlled the location. Residents currently use the area function for residences and gardens, and most of it is still in the form of tree stands or secondary forests. Therefore, it is necessary to research to obtain information about the potential that can be developed according to the direction of the RTRW spatial pattern based on the ability and availability of land, namely as a cultivation area, especially plantations and agriculture.

2. Literature Review

Spatial planning is a system of planning, utilization, and control of spatial utilization that cannot be separated from one another and is carried out following spatial planning rules. Hammar (2017) stresses the importance of effectively utilizing space to meet plan expectations. It can support sustainable environmental management, prevent wasteful use of space, and prevent a decrease in environmental quality.

According to Sinaga, E. J. (2020), technological support based on a spatial arrangement's characteristics, carrying capacity, and environmental capacity can improve harmony, harmony, and balance of subsystems of spatial planning. Spatial planning based on characteristics, carrying capacity, and compatibility will enhance the balance of subsystems, improving the quality of space (Ferricha et al., 2017). Through rapidly growing development activities, it will significantly affect the change in the function of an area or land (Harewan, 2022; Wahyu, 2012). Therefore, spatial planning aims to achieve optimal resource utilization by avoiding conflicts in resource utilization as much as possible, thus preventing environmental damage and creating harmony (Tijjani S. et al., 2023).

Land allocation and utilization in spatial planning is an inseparable part of the concept of space in development, both as a result and outcome of development, as well as a plan or direction of the desired sustainable development, which can be illustrated as follows:

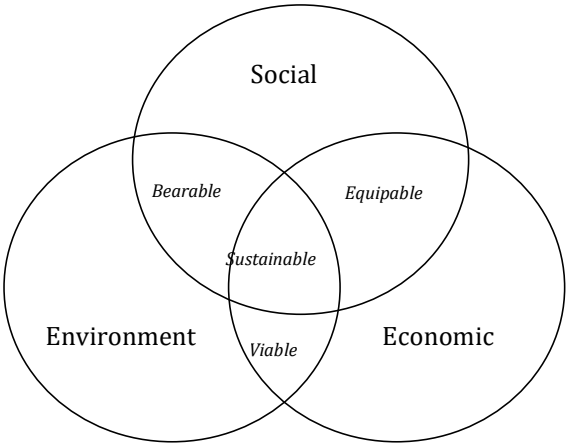


Fig 1. Sustainable development concept

This Venn diagram illustrates the important concept of sustainable development, which is an effort to meet the needs of the present without compromising the ability of future generations to meet their needs. With the three circles representing the social, environmental, and economic dimensions of development, the diagram emphasizes that sustainability can only be achieved through the harmonious integration of these three elements.

Seralgerdin I. et al. (1994) emphasize that several types of capital are essential for sustainable development. To achieve sustainable development, each type of capital must be integrated (Wurarah, 1998), even over a while. To achieve sustainable development, human and social capital must increase in value compared to artificial and natural capital. This shows how vital the development of human resources and social relations is to promote sustainable and environmentally sound economic development.

Spatial planning is technically and conceptually one of the means to conserve natural resources, especially soil and water conservation (Anita, 2009). Spatial planning is expected to ensure the preservation of natural resources and be helpful in the future. Natural resources such as water, land, and their contents must continue functioning after experiencing spatial planning. This is intended to achieve a safe, comfortable, productive, and sustainable national spatial area. Therefore, Law No. 26 of 2007 concerning Spatial

Planning, part of which has been amended into Law No. 11 of 2020 concerning Job Creation and its implementing regulations in Government Regulation No. 21 of 2021 concerning the Implementation of Spatial Planning to ensure development in Indonesia following sustainable principles.

The need for land in Indonesia, especially in former Cultivation Rights (HGU) areas, is increasing along with population growth and economic development. HGU is a land right that authorizes a person or legal entity to use state land for agricultural, plantation, or forestry purposes. When the HGU expires or is declared void, it presents challenges and opportunities for effective and sustainable land use planning. HGU is regulated in Law No. 5/1960 on Basic Agrarian Principles (UUPA) and its implementing regulations. According to Article 28 of UUPA, HGU is granted on state land or land whose management rights are in the hands of the state for a certain period, which can be extended or renewed (Article 19 PP No. 18 of 2021). Spatial planning in Indonesia is regulated in Law No. 26 of 2007 concerning Spatial Planning. Spatial planning aims to control the use of land and space based on sustainability, efficiency, and justice principles.

Gunawan, L. S. (2023) emphasizes that the government must ensure that all parties, especially local communities, get fair access and benefits from land use. Economic efficiency in using former HGU land must be considered to provide maximum financial benefits for the community and the state. Communities must be involved in planning to accommodate their needs and aspirations in land use decisions (Suwarli et al., 2012). Spatial planning considering ecosystem aspects will help environmental conservation and natural resource management. This includes the maintenance of green spaces and sustainable land management. Thus, using former HGU land can benefit the community and the surrounding environment.

Research by Sirfefa et al. (2023) examined the dynamics of land use change for the tourism industry and the importance of green space strategies. This is relevant for the former HGU area, where land use change must be integrated with environmental preservation strategies. This concept includes zoning, intensity of land use, and other aspects of optimal land use. Land use change occurs due to various factors, such as growth, government policies, and economic dynamics. These dynamics affect green space use strategies and spatial planning (Suwarli et al., 2012; Ramandey et al.,2023). Land use must consider the factors that influence the types of land use groupings. This concept is an essential basis for land use planning and development study. The consequences of spatial changes before mapping need to be known earlier through the use and changes in the progress of space utilization in an area. This involves delineation and overlay techniques to distinguish the use of space (Seran, E. 2023; Sirfefa et al., 2023) because an in-depth understanding of indigenous spaces before mapping respects cultural and social values and leads to more accurate mapping and sustainable planning.

Indigenous spaces often have deep historical, cultural, and social value to local communities. Mapping without adequate understanding of these aspects can ignore or disrupt these critical values. It is essential to respect and preserve cultural and social heritage (Febrianty et al., 2023). Customary spatial use is often associated with long-standing traditional rights and land use. Mapping activities that do not consider this aspect can lead to conflicts with local communities. By understanding the dynamics of customary space, mapping can be done more harmoniously and respect local communities' rights (Ramandey. 2023).

Customary space is often linked to long-standing traditional rights and land use. Mapping activities that do not consider this aspect can lead to conflicts with local communities. Haerawan (2023) explains that mapping can be done more harmoniously with local communities' rights by understanding the dynamics of customary space. Effective mapping requires a comprehensive understanding of the space to be mapped. This includes changes that have occurred over time. By understanding how an area has changed, including the use of customary spaces, mapping can be more accurate and relevant.

Understanding the use of customary spaces allows for more sustainable planning and development. This ensures that future development does not harm or destroy every day or

culturally significant areas. Meidodga et al. (2023) explain that using technologies such as delineation and overlay requires a deep understanding of the existing space. With this understanding, the technology may be used effectively. With a good knowledge of customary space, these technologies can be utilized to differentiate the use of the space.

3. Methods

Research that describes case studies can be done using a combined method (Rashid A. et al., 2021). This research design combines quantitative and qualitative methods that describe system dynamics modeling as well as the answers of interviewees through a purposive sampling of community members, village heads, and indigenous community leaders in the research location.

System dynamics models usually play three leading roles: 1) designing the system structure to identify unique characteristics, 2) designing structural characteristics to identify patterns of system behavior, and 3) changing the model to incorporate new characteristics. This model described the socio-economic and environmental situation in Manokwari Selatan District, Manokwari Regency. Space requirements, land use change, land size, crop yield, production, government support, income, labor, product price, and external demand are some factors used to evaluate the area's characteristics. Conceptualization, modeling, simulation, and validation are part of the model-building process.

Causal Loop Diagram (CLD) is a visualization tool used in system dynamics to show the relationship between variables in a system. This diagram illustrates how the variables interact and influence each other through positive (+) and negative (-) feedback loops.

In this diagram, there are two types of loops: Reinforcing Loop (R): Marked with the symbol 'R,' this loop indicates a mechanism where a change in one variable will increase another variable, which then further increases the first variable, thus creating a reinforcing effect or exponential growth. Balancing Loop (B): Marked with the symbol 'B,' this loop indicates a mechanism where a change in one variable will try to balance or stabilize the system, often to achieve a goal or maintain a stable state.

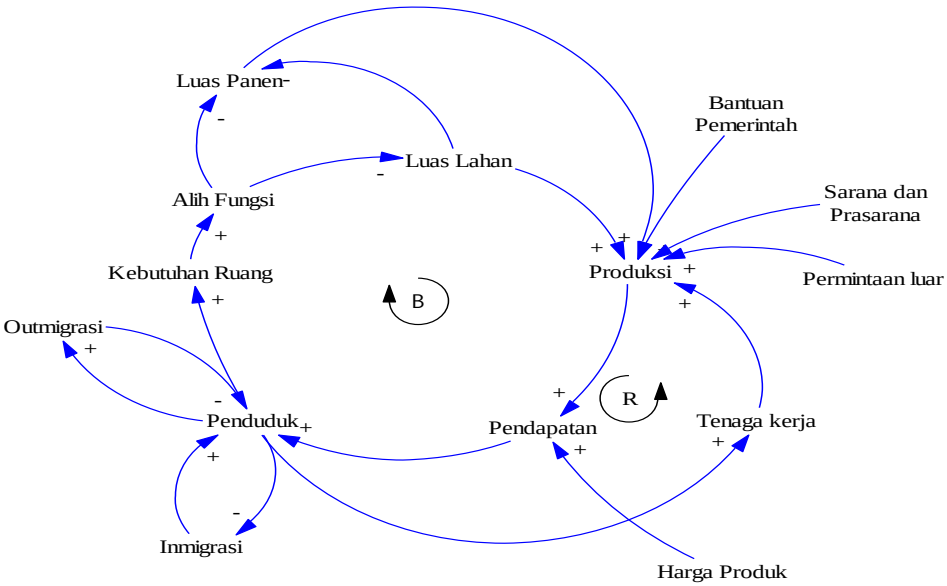


Fig 2. Hypothesized CLD space utilization

The loops are interrelated, showing how government interventions, population dynamics, and production capacity influence each other regarding land use and agricultural production. The CLD can be a valuable tool for planning and evaluating policies in the context of agriculture and natural resource management. The Stock Flow Diagram (SFD) is a further stage in the system dynamics modeling development cycle. The SFD is a derivative

of the Causal Loop Diagram (CLD) that represents the main predictive factors in the CLD. In the SFD, additional variables required for modeling can be explicitly added as indicators that are important for influencing the flow in the model (see Fig 2).

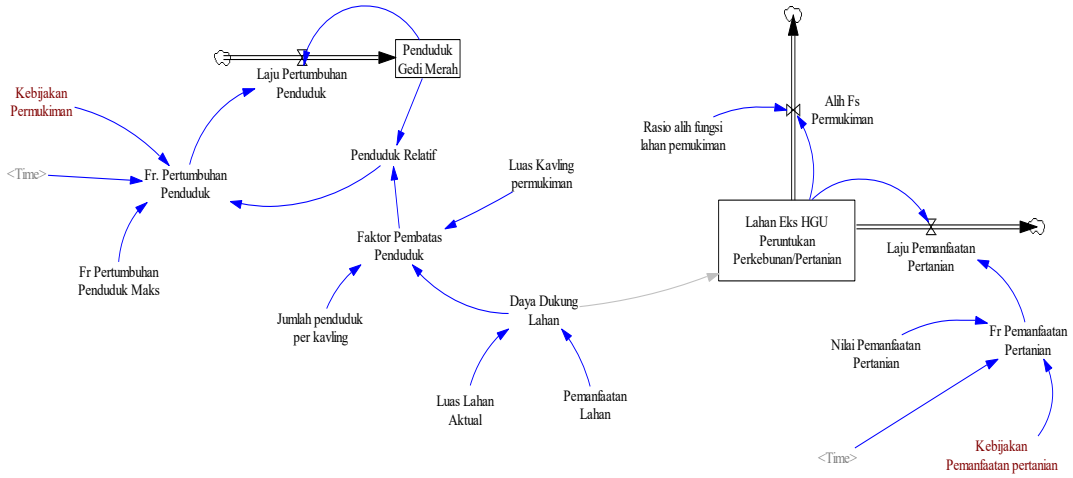


Fig 3. Hypothesized SFD Space Utilization

Model validation by conducting statistical tests to verify empirical data with the model's output, namely comparing the average value and calculating the percentage error of the average value (Barlas, 1996; Wurarah et al., 2022). The formula used for the validation test is the formulation:

$$Ei = \frac{|S - A|}{A} \times 100$$

S is the simulated value, and A is the actual data value. The calculation of the average of the time-based data is used to help the above formula, which is :

$$S = \frac{1}{N}\sum_{i=1}^{N} Si,\ A = \frac{1}{N}\sum_{i=1}^{N} Ai$$

N is the actual data and the model being compared, and the model is considered valid if the value of Ei < 10%.

4. Result and Discussion

The opening of a new village in the former Land Use Rights area increased the village's population. As the population increases, the need for space for housing will also increase so that land use change increases, resulting in the land's carrying capacity decreasing in area and increasing settlement land. Land use for agriculture/plantations is in line with the land's carrying capacity so that the area used will increase in size and by the spatial pattern of the RTRW. Utilization of agricultural/plantation land will increase the production of agricultural / plantation products by external market demand, supported by attention from the government and the private sector, and affect the increase in income, which will attract more people to work as labor.

At this point, the model is gradually validated through data and structure validation by analyzing the results. System structure validation refers to the system's boundaries, variables, and assumptions. It involves the logical validity of the model structure and the validity of the model structure with the real-world system. AME uses a limit of 30 percent, which corresponds to the number of variables that cannot be managed. The results are:

Table 1. Validation from population and land

	Year	2016	2017	2018	2019	2020	Ave.	AME
Population	**Ref.**	60	164	292	472	696	1,398	3.35%
	Sim.	60	103,671	178,964	308,457	530,211	1,392	
Land	**Ref.**	278,260	267,020	264,55	260,510	256,610	263,00	0,78%

Sim.	278,259	271,302	264,52	257,907	251,459	261,00

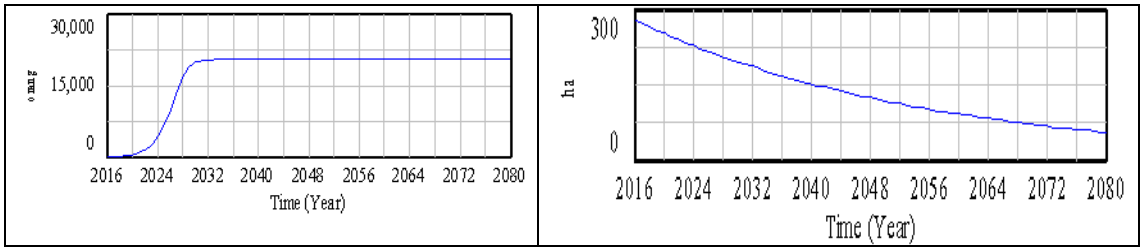
According to the Population and land validation results, the AME values of 3.35% and 0.78% are below the 30% limit (Table 1). This indicates that the simulation model is valid.

Furthermore, the model can be developed to simulate policy scenarios. Influencing variables with interventions from related sectors are used to carry out the simulation. The following is a scenario of land use and population based on the policy.

Table 2. Policy scenario of population and HGU land

Policy Scenario	Scenario 1 (no policy)	Scenario 2 (attractions)	Scenario 3 (attractions)
Implementation of population restrictions	0	0,150	0,25
Application of land utilization	0	0,025	0,10

Scenario I is a fixed condition by existing conditions, the system's behavior describing the dynamics of population growth, the dynamics of land use change for settlements, and the dynamics of land use presented in Figure 4.

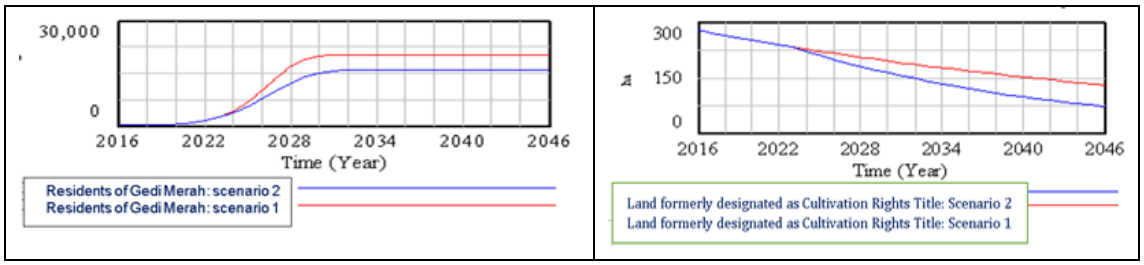


(a) (b)

Fig 4. Dynamics of population growth (a) and land use change (b)

Building Agricultural Potential: Utilization of Former Hak GuThe simulation project results show that Kampung Gedi Merah's population growth from 2016 to 2021 will be 234 families or 936 people. Furthermore, the availability of land with a carrying capacity of 278.26 ha as a cultivation area will slowly decrease due to land conversion for settlements.

In Policy Scenario 2, intervention on the population growth rate in Gedi Merah Village triggers additional land conversion into settlements. Intervention of the rate of land use following the spatial pattern of the RTRW as a cultivation area where land use is by the spatial pattern.

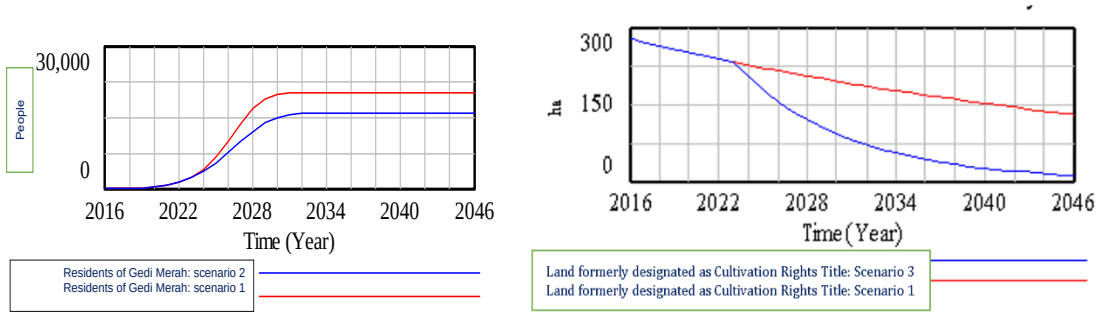


(a) (b)

Fig 5. Population growth dynamics (a) and farmland (b)

Based on the graph above, scenario 2, namely the acceleration of land use by 0.025, will increase land use following the direction of the spatial pattern of the RTRW. In 2030, it can be described that land use for cultivation will increase by 28% of the land availability area.

Furthermore, in the graphic image of scenario 3, the acceleration of land use by 0.1 will increase land use following the direction of the spatial pattern of the RTRW. In 2030, it can be illustrated that land use for cultivation will increase by 67% of the land availability area.



(a) (b)

Fig 6. Population (a) and Land Use (b) Scenarios

The effect of policies on population growth in Kampung Gedi Merah is that suppressing the population growth rate can minimize the occurrence of land conversion that does not follow the RTRW spatial pattern. In 2023, with a population of 904 people and no land conversion.

Policies on land use following the availability of land and the potential that can be developed in agriculture or plantations can be implemented to increase land use for various commodities that follow the type of plant or the soil's ability. In this case, land's carrying capacity is the availability of land that will decrease in area until 2030 by 33%, where its utilization must be by the direction of spatial utilization contained in the RTRW space pattern.

The opening of new villages in the former Hak Guna Usaha land area has increased population flow. As a result, the need for residential space increases and triggers land conversion, which can reduce the carrying capacity of land. The availability of land can be known based on the land capability of the spatial analysis of the former Cultivation Rights Land by the RTRW spatial pattern.

Considering the above simulation, the policy to be pursued focuses on controlling population growth through population inflows and land utilization by the potential and availability of land. Restrictions on land use designated for agriculture/plantations can minimize land conversion that does not follow the direction of the RTRW. This mechanism will provide hope that by 2030, land use will increase following land needs and potential. In essence, the importance of population growth management through migration flows and sustainable land use. Based on the detailed analysis and policy scenarios designed to ensure effective and sustainable land use, the HGU land use will be based on the regional spatial plan.

A systematic approach is necessary to ensure the efficient and sustainable exploitation of land in various regions of Indonesia, including West Papua. Examining land use and policy scenarios using dynamic systems analysis can provide valuable insights into managing Hak Guna Usaha (HGU) land about regional spatial plans. Hak Guna Usaha refers to land ownership that allows the possessor to use state-owned land for agricultural, fishery, or cattle-related economic activities (Harewan, Y. et al., 2023). Eko and Rahayu (2012) emphasize the significance of complying with the designated regional spatial plan when using HGU land. The spatial design should consider land utilization, zoning rules, and strategies for environmental conservation.

Dynamic system analysis approaches examine the many constituents and their interconnections. Land use is determined by two primary factors: land availability, which measures the amount of land suitable for the desired purpose, and government policy, which assesses how existing policies either support or hinder land use for high-quality utilization. Socio-economic dynamics investigates the impact of economic, social, and cultural factors on land use and management, whereas environmental implications concentrate on the utilization and maintenance of land.

Despite its abundant natural resources, West Papua faces challenges in efficiently monitoring sustainable land utilization. Based on the most recent data from BPS (2021), approximately 33% of the agricultural land that is now accessible has been exploited. This

suggests a discrepancy between the theoretical and practical utilization of land. The exploitation of land designated as HGU in West Papua must adhere to the spatial plan set forth by the local authority. Illustrative instances encompass the conservation of woodlands, the advocacy of sustainable farming methods, and the protection of the entitlements of indigenous populations.

The West Papua Provincial Government has enacted steps to promote sustainable development, particularly in agriculture, by highlighting the importance of environmentally conscious land management. Indigenous knowledge and cultural practices significantly influence land utilization in West Papua. The Arfak community applies ecological concepts in resource management, specifically agricultural land. This emphasizes the importance of integrating indigenous knowledge and a flexible systems approach in land utilization.

An analysis of the dynamic land use processes in HGU is essential for advancing sustainable development in West Papua. This methodology allows for a more accurate identification of potential opportunities and obstacles, making it easier to create policy scenarios that can support ecological sustainability and improve the socio-economic well-being of communities. This entails consolidating data from multiple sources and researching to construct accurate and contextually relevant dynamic system models. Furthermore, its objective is to augment the engagement of indigenous communities in the planning and decision-making procedures related to land allocation.

To ensure effective and long-lasting land utilization, the administration of HGU land requires a systematic and flexible approach. The land use practices in West Papua have the potential to make a beneficial contribution towards sustainable development by considering the specific local conditions and including many essential variables.

5. Conclusion

Opening new villages on former Cultivation Rights Title land has increased the population and demand for residential space, resulting in land conversion and reduced land carrying capacity. This is by the spatial pattern of the RTRW. It is, therefore, imperative to implement policies that control population growth and ensure efficient land use by local potential. This policy should include interventions on land use for agriculture and plantations according to the type of crops suitable for the soil capability.

This is done to reduce land conversion that is not following the RTRW so that by 2030, land use can increase significantly and follow land needs and potential. This policy is expected to balance population growth and land availability and increase agricultural/plantation production per market demand, with government and private sector support.

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Author Contribution

Conceptualization, H.A.H. and R.N.W.; methodology, H.A.H, T.F.P and R.N.W.; software, H.A.H. validation, H.A.H. and R.N.W.; formal analysis, H.A.H.and T.F.P. investigation, H.A.H. and R.N.W.; data curation, T.F.P writing-original drafting, H.A.H. and R.N.W; writing-reviewing and editing, T.F.P., R.N.W; visualization, T.F.P.,R.N.W; supervision, H.A.H and R.N.W.; acquisition of funding, H.A.H..

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Data Availability Statement

Not applicable.

Conflicts of Interest

The authors declare no conflict of interest.

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Biographies of Author(s)

HESTU ADI HARMOKO, master's degree in Environmental Science, University of Papua.
- Email: -
- ORCID: -
- Web of Science ResearcherID: -
- Scopus Author ID: -
- Homepage: -

RULLY NOVIE WURARAH, Economics Department, University of Papua, Indonesia.
- Email: r.wurarah@unipa.ac.id
- ORCID: https://orcid.org/0000-0001-6709-1486
- Web of Science ResearcherID:
- Scopus Author ID: https://www.scopus.com/authid/detail.uri?authorId=57222899721
- Homepage: https://sinta.kemdikbud.go.id/authors/profile/6673286

THOMAS F. PATTIASINA, Faculty of Fisheries and Marine Sciences, University of Papua.
- Email: -
- ORCID: https://orcid.org/0000-0001-9477-4397
- Web of Science ResearcherID: -
- Scopus Author ID: https://www.scopus.com/authid/detail.uri?authorId=56731273400
- Homepage: https://sinta.kemdikbud.go.id/authors/profile/5982131