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MANAGEMENT OF *PERI-URBAN* AREAS IN TAMBANG DISTRICT

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ABSTRACT

Background: The rapid urban expansion has caused significant changes in *peri-urban* areas, resulting in land-use conversion, increased population density, and environmental degradation. The *peri-urban* region in Tambang District is facing these challenges, with a noticeable decline in agricultural land and increased risks such as flooding.

Objective: This study aims to analyze the existing conditions of *peri-urban* management in Tambang District, identify the priority factors influencing its management, and propose appropriate strategies for sustainable development.

Methods: A quantitative approach was used surveys, questionnaires, and structured interviews with local experts and community members was conducted to gather data on environmental, economic, and social aspects of *peri-urban* management.

Results: The study found that urban sprawl has significantly impacted agricultural land and infrastructure. Key challenges include insufficient infrastructure, environmental risks like flooding, and the need for better integration of environmental, economic, and social factors in development plans.

Conclusion: Effective *peri-urban* management in Tambang requires a balanced approach integrating sustainable development principles, proper land-use planning, and active community participation. The proposed strategies aim to mitigate environmental risks and enhance the socio-economic benefits for the community.

INTRODUCTION

The rapid development of urban areas is one of the consequences of population growth, expansion of economic activities, and increasing space needs for settlements and infrastructure (Dodman et al., 2023; Kajiita & Kang'ethe, 2024; Mahtta et al., 2022; Oyalowo, 2022; Seto et al., 2014). These dynamics not only change the spatial structure of the urban core, but also put great pressure on the surrounding areas (Bagheri & Soltani, 2023; Fang et al., 2023; Niu et al., 2025; Salem et al., 2024). In this context, *peri-urban* areas emerge as transitional spaces that show a mixture of urban and rural characteristics. This region is a very dynamic arena of change because it is undergoing physical, social, economic, and environmental transformations at the same time (Bagheri & Soltani, 2023; Fang et al., 2023; Niu et al., 2025; Salem et al., 2024).

According to Yunus (2008), peri-urban areas are areas that have undergone a shift from rural to urban characteristics, which is characterized by changes in land use, increased population density, and the development of urban infrastructure (Ticau, 2023; Mulya & Hudalah, 2024). These changes are essentially part of the inevitable process of regional

development. However, if it takes place without adequate planning and management, the transformation of peri-urban areas can cause various problems, such as the conversion of agricultural land (Mulya, 2023), a decrease in environmental carrying capacity (Ticau, 2023), inequality in infrastructure provision (Salem et al., 2025), and the emergence of various socio-economic problems (Paul, 2025). Therefore, the management of peri-urban areas requires a sustainable development approach that is able to integrate environmental, economic, and social dimensions in a balanced manner (Salem et al., 2025; Paul, 2025).

Tambang District, which is located in Kampar Regency and has proximity to the city of Pekanbaru, shows the characteristics of a peri-urban area that has undergone rapid transformation due to the expansion of urban activities (Varkey et al., 2026; Mulya, 2023). This leads to a change in spatial structure, with a reduction in agricultural land and plantations that have changed their function into settlements (BPS, 2024; Saptutyningsih & Kamilasari, 2025).

The high population growth rate (5.14%) and density of 244.12 people/km² put great pressure on the need for space for settlements, public facilities, and infrastructure (Christiawan, 2024; Peri-urban studies show demographic pressure drives land-use change) (Christiawan, 2024). At the same time, the data show a decline in the area of agricultural land, such as in cayenne peppers and cucumbers, reflecting the pressure on cultivated land that is important for the region's economy and ecology (Mulya, 2023; Varkey et al., 2026).

This condition has an impact on the balance of the environment and socio-economic life, with one of the main problems being flooding, which is triggered by high rainfall and increased water discharge from hydropower dams (BPS, 2024). Flood risk is increasing due to the conversion of agricultural land and green open space into built-up areas, reducing water catchment areas and increasing surface runoff, which increases the potential for local flooding.

In addition, Tambang District also faces social and economic challenges, such as dependence on the agricultural sector and limited basic infrastructure, which have an impact on accessibility and quality of life for the community. Therefore, the management of *peri-urban* areas must integrate environmental, economic, and social aspects to achieve sustainable development.

Studies related to land use change in *peri-urban* areas show significant impacts on social, physical, and environmental conditions. Pradana et al. (2021) in their research on the change in agricultural land use to housing in the *peri-urban* area of Colomadu District found that factors such as land prices, needs/expenses, and professions outside the agricultural sector affect the decision to sell agricultural land. Rukmana and Imanullah (2021) examined physical, social, and environmental transformations in Driyorejo District, which showed an increase in land use and changes in land surface temperature from 28.8°C in 2013 to 30.1°C in 2016, as well as fluctuations in the number of people working in the agricultural sector.

Dewi and Rudiarto (2014) analyzed the impact of land conversion on environmental conditions in Gunungpati District, Semarang, and found that land conversion caused a decrease in environmental quality, such as reduced water catchment areas and an increase in surface water. Luntungan et al. (2019) also identified changes in land use in Kalawat District, North Minahasa, with the dominance of reduced plantation land and the increase in residential land, where economic factors and population growth are the main drivers of these changes. These four studies provide insights into how land conversion affects various aspects of life in *peri-urban* areas.

In the scientific context, studies of *peri-urban* areas in general have discussed a lot about regional transformation due to urbanization, land use changes, and their impact on the environment and society. However, studies that specifically examine the existing conditions of *peri-urban areas,* priority factors that affect their management**,** and appropriate management strategies at the local level, especially in Tambang District, are still relatively limited. In fact, each *peri-urban* area has different characteristics, development pressures, and problems according to the context of the region.

Tambang District has peculiarities in the form of proximity to the city of Pekanbaru, high population growth rate, decline in cultivated land, vulnerability to flooding, and limited basic infrastructure. Therefore, research is needed that not only describes regional changes, but is also able to identify the most influential factors and formulate a *peri-urban* area management strategy that is in accordance with local needs.

Based on the research gap, this research is important to be carried out because it seeks to fill the study gap on more operational and strategic aspects in the management of *peri-urban* areas. This research is directed to answer three main problem formulations. First, what are the existing conditions *of peri-urban* areas in Tambang District, which includes an actual picture of the characteristics of the area, changes in land use, socio-economic conditions of the community, and environmental problems that occur. Second, what are the priority factors that affect the management of *peri-urban* areas, both from environmental, economic, and social aspects, so that the most dominant factors in determining the direction of area management can be known. Third, what strategies can be used in the management of *peri-urban areas* in Tambang District so that regional development can take place in a sustainable, directed, and in line with the needs of the community and environmental sustainability.

Thus, research on the management of *peri-urban* areas in Tambang District is relevant and urgent to be carried out. This research is expected to be able to provide a comprehensive overview of the existing conditions of the area, priority factors that affect management, and formulate an appropriate *peri-urban* area management strategy. The results of this research are expected not only to make an academic contribution to the development *of peri-urban area studies,* but also to become practical input for local governments and stakeholders in realizing sustainable, adaptive, and oriented regional management that is oriented towards improving the quality of life of the community.

The formulation of this research problem aims to identify the existing conditions of *peri-urban* area management in Tambang District, determine priority factors that affect the success of the management of the area, and formulate strategies used for the management of *peri-urban* areas in Tambang District. This research will focus on analyzing current conditions, factors that are key to the success of *peri-urban* area management, as well as strategic measures that can be implemented to ensure effective and sustainable management.

The benefits of this research include theoretical, academic, and practical contributions. Theoretically, this study presents the sustainable management of *peri-urban* areas in Tambang District, as well as provides an overview of the application of an environment-based approach in the planning of the area to reduce ecosystem damage and improve the quality of life of the community. Academically, this research contributes to the development of environmental science, especially in the field of sustainable *peri-urban* area management, and can be used as

a reference for further research related to water management, pollution control, and biodiversity.

Practically, the results of this study provide guidance in designing sustainable *peri-urban* area management policies, which can be used by local governments and related organizations to develop environmental management policies and programs that focus on sustainable development. This research also emphasizes the importance of community involvement in maintaining environmental sustainability in *peri-urban* areas.

METHOD

Research Approach

In this study, the research approach used was a quantitative approach. The quantitative approach was a research approach that is based on the postpositivist paradigm in developing science. Some of the characteristics of the quantitative approach are: relying on the collection and analysis of quantitative (numerical) data, using survey and experimental strategies, conducting measurements and observations, carrying out theoretical tests with statistical tests.

This study used survey and sampling methods in the field, questionnaires and interviews. Field observations were carried out to collect data on the existing conditions of *peri-urban* areas in Tambang District. The closed questionnaire was conducted to obtain information and data on the priority factors of *peri-urban* area management and was carried out with experts in the field of area management. Structured interviews with the help of interview guides are conducted to collect information and data about the environment, economy and social of people living in *peri-urban* areas.

Place and Time of Research

This research was conducted in Tambang District, Kampar Regency. Tambang District has 17 villages, namely: Kuapan Village, Aur Sati Village, Tambang Village, Padang Luas Village, Gobah Village, Terantang Village, Rimba Panjang Village, Kualu Village, Teluk Kenidai Village, Parit Baru Village, Kemang Indah Village, Sungai Pinang Village, Kualu Nenas Village, Tarai Bangun Village, Palung Raya Village, Pulau Permai Village and Balam Jaya Village. The research period was carried out for 6 months, namely from July 2025 to December 2025.

Data Types and Sources

1. Data Type

The types of data used in this study are quantitative data and qualitative data. Quantitative data is data in the form of numbers that can be measured and analyzed using statistical techniques to obtain objective conclusions. This quantitative data was obtained through questionnaires distributed to respondents that included various variables, such as environmental dimensions, economic dimensions and social dimensions. Quantitative data were used to test the relationships between variables and to obtain data on priority factors for sustainable *peri-urban* area management.

Qualitative data refers to a type of data that is descriptive and cannot be measured in the form of numbers. This data describes the qualities, characteristics, or nature of the object or phenomenon being studied, often focusing on an in-depth understanding of the experiences, perceptions, and views of an individual or group. In this study, qualitative data is used to

describe the conditions or situations studied. Such as the existing conditions and the results of interviews with the respondents.

2. Data Source

The data used in this study are primary data and secondary data. Primary data is the type and source of research data that is obtained directly from the first source (not through intermediaries), both individuals and groups. The primary data used in this study were obtained from the results of field surveys, questionnaires and interviews related to the current environmental conditions from environmental, economic and social aspects. Interviews were also conducted with the guidance of interviews to the public. Then the questionnaire was distributed and filled out by experts.

Secondary data is a data source that does not directly provide data to data collectors, for example through other people or through documents. The types of data in question are the area of the research area, type of land use, basic physical conditions, maps and aerial photographs related to the research.

POPULATION AND SAMPLING TECHNIQUES

1. Population

A population is a set of objects, people, or circumstances that the researcher is concerned about and will be used by the researcher to generalize the results of his research (Fraenkel, 1990:84). Meanwhile, according to Sugiyono (2011:61), population is an area consisting of objects/subjects that have certain qualities and characteristics that are determined by researchers to be studied and then conclusions are drawn. The population in this study is the government and communities in Tambang District.

2. Sampling Techniques

Sampling techniques were used to facilitate the conduct of research. In carrying out research in the field, it is necessary to determine the number of samples. In general, there are only two types of samples, namely probability samples which are usually known as random samples and non-probable samples. Probability sampling is one of the sampling techniques that provides an equal opportunity for each element (member) of the population to be selected as a member of the sample. With probability sampling, random sampling is taken from the existing population. Nonprobability sampling is one of the sampling techniques that does not provide the same opportunity/opportunity for every element or member of the population to be selected as a sample. The sampling technique used for the collection of primary data samples such as interviews and questionnaires is purposive sampling. This technique was used to select informants who are considered representative and have knowledge or strategic positions on regional management issues.

Data Collection Techniques

Data collection techniques were methods used to collect information or data required in research. The selection of this technique depends on the purpose, the type of data desired, and the research approach used. In this study, data and information are needed that will support the research process, including primary data and secondary data. This information will be collected through literature review as well as data collection through observation, interviews and questionnaire distribution.

RESULT AND DISCUSSION

Existing Conditions of *peri-urban* Areas

1. Environmental Conditions of *peri-urban* Areas in Tambang District

a. Land Conversion

Table 1. Results of Analysis of Land Conversion in Mining District (Ha)

		2024								
		Bushes	Perkebunan	Settlements	Open Ground	Water bodies	Swamp Bushes	Mixed Dryland Agriculture	Material	Grand Total
2012	Bushes		0,9							0,9
	Perkebunan		5693,9		0,1					5694
	Settlements			107,6		3,3		3,8		114,7
	Open Ground		465,4	12,9						478,3
	Water bodies		12,5			504,2				516,7
	Swamp Bushes		1426,8	0,3					21,3	1448,4
	Mixed Dryland Agriculture	6,4	27949,8	2241,7	51,5	11,9	16	4,3	112,5	30394,1
	Grand Total	6,4	35549,3	2362,5	51,6	519,4	16	8,1	133,8	38647,1

Source: Analysis Results, 2026

Based on the results of the interpretation of the land use transfer map, Tambang District shows a pattern of land use change that moves from the dominance of mixed dry agricultural land to an increasingly strong combination between plantations and settlements. This change indicates the process of spatial transformation typical of *peri-urban* areas, namely areas that are at the transition of villages and cities, marked by increasing pressure on land needs for non-agricultural activities, especially settlements and plantation commodities.

b. Biodiversity

The government has established several forms of conservation areas including forest parks, nature reserves, wildlife sanctuaries, nature reserves, rights forests/people's forests and protected forests. Kampar Regency has a very large diversity of flora (plant) and fauna (animal) species. The biodiversity consists of: a) Wild species that have not had economic value or have not been traded economically in the market; and b) Wild species whose economic value is known or has been traded in a market economy, which are found both in land areas and in aquatic areas. Kampar Regency has protected fauna consisting of: 1) 6 types of protected mammals. 2) 5 types of aves are protected. 3) Types of protected flora as many as 31 species

c. Waste Management

Based on the results of interviews with people in Tambang District, it was found that most households produce domestic liquid waste, such as bath water and washing water, which is mostly discharged into the area around the house or directly drained into the homeland. For

people living along the river area, this household waste is dumped into the river, which has the potential to increase the burden of water pollution in the environment.

These poorly managed liquid waste disposal practices risk contaminating soil, groundwater, and rivers, which can negatively impact environmental quality and public health. The disposal of liquid waste that does not go through an adequate treatment system indicates the lack of adequate sanitation facilities in the area. It can also increase the potential spread of water-related diseases, as well as threaten the sustainability of river ecosystems and the quality of water used by local communities.

d. Air Quality

Table 2. Results of River Water Quality Monitoring in 2025

Water Quality	Number of Monitors that meet Quality Standards	% Water Quality Fulfillment	Index Value Weight	Index Value per Water Quality
Meet	63	80	70	55,8
Light Contamination	16	20	50	10,1
Medium Pollution	0	0	30	0,0
Heavy Pollution	0	0	10	0,0
Total	79			65,9
Category				Medium

Source: Kampar Regency Environnemental Management Performance Information Document (DIKPLHD) 2025

From the data, it can be seen that the condition of the river water in Kampar Regency is relatively in a lightly polluted condition (16 out of 79 observation points), while the other 63 observation points are in an unpolluted condition. Furthermore, the quality condition is also in the medium category with an IKA value of 65.9. When compared to the previous conditions (IKA value in 2020 was 58.00 and in 2021 was 63.33), there was an improvement in the condition of the river even though it was in the same category, namely in the medium category.

Overall, the water quality of drilled wells in Tambang District can be categorized quite well in terms of clarity, but it has the potential to decrease in quality based on odor parameters in the long dry season. These findings are an important note in the analysis of water quality, as they show the need for periodic monitoring and mitigation efforts (e.g. well maintenance and water source management) to maintain stable water quality throughout the year.

e. Air Quality

Table 3. Air Quality Index

Parameter	Average SO2 and NO2 in Kampar Regency (µg/Nm³)	EU Reference Quality Standard (µg/Nm³)	Table of Contents
NO2	18,85	40,00	0.47
SO2	34,33	20,00	1,72
- The EU Model Annual Air Index (NIH)			1,09
Air Quality Index (KPI)			44,79
Category			Less

Source: Kampar Regency Regional Environmental Management Performance Information Document (Dikplhd) in 2025

Based on Table 3 on the Air Quality Index in Kampar Regency, it can be seen that the average NO_2 concentration is 18.85 µg/Nm³. This value is still below the European Union (EU) reference quality standard of 40.00 µg/Nm³, resulting in an index value of 0.47. This shows that the NO_2 concentration is still within safe limits and has not exceeded the set air quality standards.

Overall, the annual Air Index of the EU Model (Ieu) was obtained at 1.09. This value is then converted into the Air Quality Index (IKU) with a result of 44.79. Based on the categories listed, the value falls into the "Less" category. This means that the air quality in Kampar Regency is not yet classified as good and requires efforts to control air pollution, especially for sources of SO_2 emissions.

In general, the results of the analysis show that although air temperature conditions tend to be stable and normal for tropical regions, air quality in Kampar Regency needs further attention, especially in controlling SO_2 emissions so that air quality can improve and provide a healthier environment for the community.

f. Green Open Space

Tambang District has 6 RTH spread across the Mining area. RTH Taman Jembatan Danau Bingkuang located in Bingkuang Lake has an area of 497.4 m2 which was built in 2017. The East and West Lake Bridge RTH is located in Bingkuang Lake has an area of 568 m2 which was built in 2018. The RTH under the Bingkuang Lake Bridge has an area of 780 m2 which was built in 2019. The RTH of the Mining Sub-district Office has an area of 345 m2 which was built in 2019. RTH Pasar Danau has an area of 480 m2 which was built in 2020. RTH ICS Area which was built in 2020.

g. Disaster Vulnerability

Several areas in Tambang District often experience flooding due to overflowing rivers and high rainfall, which causes the volume of river water to increase dramatically. Flooding usually lasts for about a week, with water levels reaching an adult's waist. During the flood, there was no evacuation process carried out by the authorities, so residents remained in their respective homes waiting for the water to recede.

The existence of inadequate disaster mitigation infrastructure and the lack of an effective evacuation system exacerbate the impact of flooding, increase the risk of property damage, and endanger the safety of people's lives. This indicates the need to strengthen the disaster management system, counselling the community on the right steps during floods, and more comprehensive mitigation efforts to reduce the impact of floods in the future. In addition, in several road networks, there are road conditions that have partially landslided.

2. Economic Conditions of *peri-urban* Areas in Tambang District

a. Sources of Community Income

Based on the results of interviews with local communities, it is known that the people of Tambang District have now experienced significant changes in their choice of work. Although previously the majority of people worked in the agricultural sector, such as rice farming or oil palm plantations, today the trade, government, and corporate sectors are starting to dominate as their main source of income. Most citizens are now involved in trade, both in traditional markets

and retail stores, giving them wider opportunities to grow. In addition, some of them work in the government sector as civil servants (PNS) or contract workers, which provides them with a fixed income and social security. The corporate sector, both private and state-owned, also provides more diverse employment opportunities for local communities, with many working in companies engaged in the industrial or service sectors.

b. Market Access

Based on the results of the field survey, it is known that access to the market in Tambang District is still limited, especially for people living in inner villages. The market is located on a main road, making it more accessible to residents who live close to the main road. However, for those who live in rural areas or further afield, the journey to market becomes a big challenge. Long travel time and high transportation costs are the main obstacles. One of the main causes of this problem is inadequate road conditions. Poor, potholed, or poorly connected roads between villages cause longer journeys and vehicles often suffer damage.

c. Infrastructure and Transportation

The road network in Tambang District is currently showing very worrying conditions, especially in rural areas that are far from the sub-district centre. Based on the field survey conducted, it was identified that most of the roads in Tambang District are still in inadequate condition, with many roads that have not been paved and are only dirt roads. This creates a major challenge in terms of community mobility, both for economic, social, and accessibility to basic facilities such as markets, education, and health services.

A large number of roads in Tambang District are still in a dirty condition, which is very vulnerable to weather damage, especially during the rainy season. When it rains, these roads become muddy, which results in travel being very difficult and hampering transportation. In addition, traveling through these dirt roads takes longer and can endanger the safety of riders, especially motorcycles which are the main mode of transportation for most of the local community. Dirt roads also cause discomfort and worsen people's quality of life because they increase the potential for traffic accidents.

Not only the roads that have not been paved, but many roads that have been paved have also suffered severe damage. Many roads have potholes, especially in densely populated areas and are the main route for transportation. These potholes not only increase the risk of accidents, but also accelerate vehicle damage, especially two-wheeled vehicles that are often used by the public. The presence of potholes in the road worsens the quality of transportation and prolongs the time it takes to get to the destination. Damaged roads also increase vehicle maintenance costs for people who use the road regularly.

Meanwhile, drainage conditions in Tambang District showed positive progress with the ongoing drainage construction in several villages. Nonetheless, the main problems related to drainage are still quite significant, and in many places, existing drainage channels are not functioning properly. The main problem faced is the accumulation of garbage that hinders the flow of water, which has the potential to increase the intensity of flooding in some areas.

In recent years, several villages in Tambang District have started building and repairing drainage to overcome the problem of waterlogging and flooding that occurs during the rainy season. The project is a positive step in managing water flow and reducing the risk of flooding, especially in areas that were previously flooded. The construction of this drainage, although it

has not completely solved the problem, is an important effort to improve the infrastructure of the area that previously received less attention.

Despite development efforts, many existing drainage channels are in poor condition. One of the main problems is the blockage of drainage by household waste, market waste, and other materials that are thrown carelessly. Garbage that settles inside the drainage channels slows the flow of water and increases the potential for flooding. In the rainy season, clogged drainage channels will cause water to overflow to the surface, which risks damaging roads, property, and endangering public health due to contaminated waterlogging. Waste in drainage is also a source of diseases, such as dengue fever, malaria, and various waterborne diseases, due to stagnant water in the drainage channels that do not function properly.

d. Local Job Opportunities

Local employment opportunities in Tambang District currently reflect changes in the work structure of the local community. Previously, the agriculture and plantation sectors were the main sectors that absorbed labour. However, based on the results of the interviews, currently many people are switching professions from the agricultural sector to the trade and service sector. This shift occurs because the trade and services sector is considered more promising in terms of income stability and career development opportunities. In addition, the sector is also more accessible, especially with the growing local market and increasing demand.

The trade and service sector is now the dominant sector in absorbing labor in Tambang District. Trade, which includes buying and selling goods in both traditional markets and retail stores, is growing rapidly and is widely followed by the local community. Small and medium-sized businesses, such as grocery stores, food stalls, and goods distribution businesses, are the main source of income for many families. The service sector, which includes a wide range of jobs in healthcare, education, transportation, and banking, is also growing and provides many job opportunities for local communities. Many people choose to work in this sector because it offers more stable and structured jobs.

Meanwhile, youth in Tambang District tend to choose to work in companies located in the area. A job in a company gives them the opportunity to earn a steady salary as well as a variety of other benefits and perks, such as health insurance and career opportunities. Although some young people also migrate to major cities in search of work, many choose to stay employed by local companies because it is more practical and offers opportunities for more structured career development. This shows that the tendency of youth to work in local companies is also influenced by the existence of increasingly open job opportunities in the industrial and service sectors in Tambang District.

This shift in the employment sector has a positive impact on the local economy. People's incomes have increased in line with the development of the trade and services sector, which has driven the growth of small and medium enterprises (SMEs). In addition, with the increasing number of youths involved in the corporate and service sectors, there is an improvement in the quality of human resources that contributes to more sustainable economic development. Although the agriculture and plantation sectors are still an important part of the economy of Mining District, this shift shows that communities are starting to rely on the non-agricultural sectors to create more diverse jobs and potentially improve their overall well-being.

e. Diversification of Livelihoods

Tambang District as a *peri-urban* area shows socio-economic dynamics that continue to develop along with the increasing urbanization pressure from the city of Pekanbaru. As a transition area between rural and urban areas, the livelihood pattern of the people in this sub-district is no longer focused on one specific sector. Instead, there has been a shift towards a more diverse economic structure, covering the primary, secondary, and tertiary sectors. This change reflects the process of economic transformation of the community which moves from agricultural activities to more complex non-agricultural economic activities.

In the primary sector, some people in Tambang District still depend on income on agricultural and plantation activities, especially oil palm, as well as on home farms and pond fisheries. However, this sector is no longer the main source of livelihood for the majority of households. The conversion of land that is increasingly expanding into settlements and commercial areas, coupled with the uncertainty of income from agricultural businesses, has caused the primary sector to shift to a side activity. This marks a decrease in people's dependence on land-based livelihoods.

As the dominance of the primary sector declines, more and more people are turning to the secondary sector, particularly jobs in construction and small-scale industry. The geographical proximity to the city of Pekanbaru allows people to become daily commuter workers in various development projects and household industrial business units. This daily mobility strengthens the economic relationship between Tambang District and the city centre, while opening up more stable and diverse job opportunities for people of productive age.

The tertiary sector is the fastest growing sector and now plays a significant role in the structure of people's livelihoods. The growth of new settlements, the intensity of traffic in the Pekanbaru-Bangkinang corridor, and the increasing demand for goods and services have encouraged the emergence of various small to medium-scale trade and service businesses. Economic activities such as culinary businesses, retail trade, transportation services, workshops, beauty services, and informal education services are growing. Young people tend to choose this sector because it is considered more prospective and does not require production land ownership like in the agricultural sector.

The diversification of livelihoods is influenced by several main factors, including changes in land use, ease of accessibility, the growth of new settlements, and shifts in the work preferences of the younger generation. This change resulted in the transformation of the socio-economic structure of the community from the original agrarian to more urban and heterogeneous. Although diversification opens up opportunities to increase income and expand business fields, this phenomenon also has implications for the reduction of agricultural land area and increased pressure on environmental sustainability.

Overall, the diversification of the livelihood of the people of Tambang District reflects the characteristics of the development of *peri-urban* areas that are in the process of intensive urbanization. The community is no longer dependent on a single source of livelihood, but has a multi-segment economic pattern that is more adaptive to changes in the spatial and economic structure of the region. This phenomenon shows that Tambang District is undergoing an evolution towards a suburban area with increasingly modern and diverse socio-economic characteristics.

3. Social Conditions of *peri-urban* Areas in Tambang District

a. Ease of Service Access

The ease of access to services in Tambang District has not been completely evenly distributed. People who live far from the main Pekanbaru-Bangkinang corridor still have difficulties in accessing services due to the poor condition of the local road network. As a result, the travel time to education and health facilities becomes longer than people who live around the main road. Thus, Tambang District can be categorized as having fairly good access to services in areas that are directly connected to the main corridor, but still needs to improve road infrastructure to strengthen the affordability of services in areas that are outside the route.

b. Community Participation in Environmental Management

Community participation is one of the important indicators in assessing the quality of environmental management, especially in *peri-urban* areas such as Tambang District. As an area that is experiencing high urbanization pressure, community participation in maintaining environmental quality is a decisive factor in preventing environmental degradation due to settlement growth, land use change, and increased economic activity. In general, the level of community participation in Tambang District shows active involvement in several aspects of environmental management, although it still faces challenges in terms of awareness, capacity, and consistency in the implementation of activities.

c. Security and Social Order

Based on the results of interviews with people in Tambang District, the security conditions in this area are still considered poor, especially related to crime incidents in the form of theft (theft). Residents' information that almost every month always hears news of theft shows that the event is not an occasional incident, but has become a pattern that occurs quite often. The frequency of repeated incidents can create insecurity in residential environments, affect living comfort, and encourage people to increase vigilance and take additional protective measures, such as tightening home security, installing double locks, or establishing environmental surveillance. In addition to having an impact on people's psychology, low security perceptions can also affect economic and social activities, for example, residents become more limited in their activities at night, or business actors become more careful in carrying out business activities.

Thus, the social condition of Tambang District can be understood to have two sides: (1) security against crime is still a problem due to the high incidence of theft which reduces the sense of security of residents, while (2) order and social cohesion between community groups are relatively good because there is no significant conflict between local residents and immigrants. These findings show that regional management efforts, especially in the social aspect, need to emphasize the strengthening of the environmental security system (e.g. the role of patrols/systems, street lighting, monitoring of vulnerable points, and coordination with the authorities), without neglecting efforts to maintain the harmony that has been formed so that social stability is maintained.

d. Quality of Life

The quality of life of the people of Tambang District in the social aspect shows the dynamics typical of *peri-urban* areas, namely areas that are in the process of transitioning from agrarian to semi-urban character. Changes in livelihood structures, settlement growth, and

increased daily mobility of the community have a direct impact on social interaction patterns and community cohesion.

Overall, the quality of life in the social aspect in the *peri-urban* area of Tambang District is in a transition phase towards a more modern and dynamic social structure, but it still requires strengthening social governance, equitable access to services, and controlling settlement growth so as not to cause inequality and social fragmentation.

e. Population Density

Tambang District, with an area of about 371.94 km² and a total population of about 97,803 people, has a population density of around 263 people per km². This density shows that Tambang District can be categorized as an area with a medium population density. Although the overall density figure is not very high, there is a significant variation in density between villages or sub-districts. Areas close to the district center or main access tend to have higher density, while more remote villages have lower density. This condition affects the distribution of basic services such as education, health, and other public facilities. In areas with higher density, the pressure on infrastructure and public services is also increasing, for example in terms of clean water, sanitation, and transportation needs.

In addition, the relatively high population density also has the potential to cause land conversion, where agricultural land or gardens that were previously open to green begin to be diverted into settlements. This can affect the environmental and socio-economic quality of the community. Therefore, there is a need for careful spatial planning to manage this dense area, taking into account the distribution of public facilities, waste management, and the arrangement of green open spaces to maintain the quality of life of the community. Direct observation from the field shows that despite increased access to services, some areas still struggle to get adequate services, especially in more remote areas.

f. Population Mobility

The mobility of the population in Tambang District shows a typical pattern of *peri-urban* areas, where movement and migration, both between villages within the sub-district and to cities/cities play an important role in socio-spatial dynamics. As a sub-district that is crossed by a national road and borders close to the provincial center, Tambang has historically received an influx of residents from various regions seeking access to better facilities, jobs, and services.

Thus, population mobility in the mine is not just a demographic aspect, but an important part of the dynamics of urbanization and social-spatial transformation in *peri-urban* areas. Therefore, in planning area management, especially those related to spatial planning, infrastructure, transportation, and social services, it is important to consider this mobility pattern so that the policies designed are able to respond to the mobility needs of the community, while maintaining environmental sustainability and quality of life.

Determination of Priority Factors Affecting the Success of *peri-urban* Area Management in Tambang District

In determining priority factors that affect the success of *peri-urban* area management in Tambang District, the Analytical Hierarchy Process (AHP) method is used. This method is used to determine the priority of influence so that the priority management that must be carried out can be known.

1. Results of Intervariable Analysis

Based on the AHP analysis, it can be found that the factor that has a high influence is the environmental factor with an inconsistency value of 0.02 which means that the error rate in the analysis is 2%. The environment has a weight value (0.425), then the second place is the economy with a weight value (0.397), and the third place is social with a weight value (0.178). Given its high influence in realizing the success of *peri-urban* area management, environmental factors should be prioritized.

Based on the results of the analysis in goal 1, the existing conditions, especially for the existing environment, have many problems such as land conversion that always occurs from year to year, then waste management that has not been properly regulated. Like there is still a lot of household waste that is dumped into the area around the house or dumped into the river. In addition, there are also green open spaces (RTH) that are not managed properly by the local government.

2. Results of Analysis Between Variable Indicators

a. Environmental Variables

Based on the results of the AHP analysis, the indicator that has a high influence on the environment is waste management with *an inconsistency* value of 0.01 which means that the error rate in this analysis is 1%. The priority variables based on their weight successively from high to low are waste management of (0.256), land conversion of (0.202), water quality with a weight of (0.157), air quality of (0.141), green open space with a weight of (0.103), biodiversity with a weight of (0.073) and disaster vulnerability of (0.067). The results of this analysis show that the majority of respondents consider waste management to be very important in the management of *peri-urban* areas.

This is in accordance with the analysis of target 1 that waste management in Tambang District is still not good. It can be seen from the existing conditions, the problem of waste management in Tambang District is quite significant. Based on the results of the interviews, a lot of household waste is dumped into the area around the house or flowed directly into the yard land. Some of them dump waste directly into the river around their homes which has the potential to increase the burden of water pollution in the environment. In addition, the problem of garbage piles at many points in Tambang District also adds to the problem of waste management.

b. Variable Economy

In the management of *peri-urban* areas, in addition to the environment, what needs to be considered is economic variables. Based on the results of the AHP analysis, the variables that have a higher influence are the infrastructure and transportation variables with an inconsistency value of 0.02%, which means that the error rate in this analysis is 2%. Most of the respondents mentioned that infrastructure and transportation have a higher influence in the management of *peri-urban* areas, namely with a weight (0.445), then the next order is the source of income of the community with a weight (0.171), access to the market with a weight (0.159), local employment opportunities with a weight of (0.126), and livelihood diversification of (0.098).

c. Social Variables

In managing *peri-urban* areas, in addition to the environment and economy, what needs to be considered is social variables. Based on the results of the AHP analysis, the variable that has a higher influence is the variable of ease of access to services with an inconsistency value

of 0.03%, which means that the error rate in this analysis is 3%. Most of the respondents stated that the ease of access to services had a higher influence on the management of *peri-urban* areas, namely with a weight of (0.247), followed by quality of life (0.244), community participation in environmental management with a weight of (0.213), security and social order of (0.140), population mobility of (0.082), and population density with a weight of (0.073).

Based on the results of the analysis, it can be concluded that the **order of priority factors for the management of *peri-urban* areas in Tambang District** based on the level of influence is as follows:

1. Environment 0.425 = 42.5%
2. Economy 0.397 = 39.7%
3. Social 0.178 = 17.8%

Meanwhile, the order of priority of the variables in each management factor based on their level of influence is as follows:

1) Environmental Factors

With the order of priority variables, namely:

a. Waste Management 0.256 = 25.6%
b. Land Conversion 0.202 = 20.2%
c. Air Quality 0.157 = 15.7%
d. Air Quality 0.141 = 14.1%
e. Green Open Space 0.103 = 10.3%
f. Biodiversity 0.073 = 7.3%
g. Disaster Vulnerability 0.067 = 6.7%

The results of the analysis show that waste management according to several stakeholders is very important and must be prioritized. This is in accordance with the analysis of goal 1, that waste management in Tambang District has not been managed properly. Many local residents still dump household waste into the area around their homes or directly into the river around their homes. This has the potential to increase the burden of water pollution in the environment. This poorly managed waste disposal practice risks polluting soil, groundwater and rivers which has a negative impact on environmental quality and public health.

For the second priority variable, namely land conversion. In Tambang District, seen from the map of land conversion above, from 2012 there has always been a change in land function which was originally intended for agriculture, but year after year it has changed to the designation of settlements and plantations dominated by oil palm plantations. This problem needs clear regulation so that there will not be many environmental problems in the future.

2) Economic Factors

With the order of priority variables, namely:

a. Infrastructure and Transportation 0.445 = 44.5%
b. Sources of Community Income 0.171 = 17.1%
c. Market Access 0.159 = 15.9%
d. Local Job Opportunities 0.126 = 12.6%
e. Diversification of Livelihoods 0.098 = 9.8%

The results of this analysis show that infrastructure and transportation are very important so that they become the main priority variables in the management of *peri-urban* areas from economic factors. Based on the results of the analysis of objective 1, the road network in this

area shows very worrying conditions, especially in rural areas that are far from the sub-district centre. It was identified that most of the roads in Tambang District are still in inadequate condition, with many roads that have not been asphalted and are only dirt roads.

For the second priority variable, namely the source of community income. Based on the results of the analysis of goal 1, the source of income of the local community has experienced significant changes in job selection. Previously people worked in the agricultural sector, now the trade, government and corporate sectors are starting to dominate their main source of income. Companies, both private and state-owned, provide more diverse employment opportunities for local communities, by working in companies engaged in the industrial or service sector.

3) Social Factors

With the order of priority variables, namely:

a.	Ease of Service Access	0.247 = 24.7%
b.	Quality of Life	0.244 = 24.4%
c.	Community Participation in Environmental Management	0.213 = 21.3%
d.	Security and Social Order	0.140 = 14%
e.	Population Mobility	0.082 = 8.2%
f.	Population Density	0.073 = 7.3%

The results of the analysis show that the ease of access to services is very important so that it becomes the main priority variable in the management of the *peri-urban* area of Tambang District from social factors. Ease of access to services was chosen as a priority because it most directly determines people's daily lives. Can they quickly and affordably reach education, health, administration, and trade/service needs. In Tambang District, this access is also uneven, areas near the Pekanbaru-Bangkinang corridor are easier to access services, while settlements outside the main route are constrained by poor road conditions and drainage so that travel time is longer, especially when it rains. Because the impact is real and widely felt, respondents rank it as the most important social factor.

For the second priority variable, namely quality of life. Quality of life is the second priority factor because respondents see that the success of *peri-urban* area management is not only about "being able to access services", but also about how comfortable, healthy, and decent daily life is in a fast-growing environment such as Mining District. The development of housing and trade and service activities increases the need for an orderly residential environment, good road and drainage conditions, security, and the availability of supporting facilities. When local infrastructure (especially environmental roads and drainage) is inadequate, the impact is quickly felt on quality of life: inundation occurs when it rains, daily commutes become uncomfortable, health risks increase, and household and business activities are disrupted. Because the quality of life reflects the final results that are directly felt by the community.

***peri-urban* Area Management Strategy based on Sustainable Principles in Tambang District**

In determining the management strategy of *peri-urban* areas in Tambang District, it is carried out by comparing the management characteristics of existing conditions with theories (*best practices*) and related policies. The resulting strategy is in accordance with the order of priority factors that have been carried out in the previous analysis through the Analytical

Hierarchy Process (AHP). So that the factors that must be prioritized and prioritized in determining the management strategy of *peri-urban* areas in Tambang District are as follows: 1) The environmental dimension, with priority variables being waste management and land conversion. 2) The economic dimension, with priority variables being infrastructure and transportation and community sources of income. 3) The social dimension, with the priority variables being ease of access to services and quality of life

CONCLUSION

Tambang District shows strong characteristics as a *peri-urban* area that is undergoing rapid environmental, economic, and social transformation because it is close to the city of Pekanbaru. The shift in land use from agriculture to settlements and plantations, increasing population density, and shifting livelihoods to the non-agricultural sector are the main indicators of the transition process. This dynamic encourages economic growth and regional integration, but at the same time increases pressure on the carrying capacity of the environment, which is reflected in the decline in water quality, poor air quality, limited green open space, and increased risk of flooding due to reduced water catchment areas.

Thus, the management of *peri-urban* areas in Tambang District cannot be categorized optimally, because the rapid development of the area has not been balanced with sustainable environmental and spatial management. The results of AHP show that the environmental dimension is the main priority factor in the management of *peri-urban* areas. In the environmental aspect, waste management and land conversion control are priority variables. Meanwhile, in the economic aspect, infrastructure and transportation are the main determinants of the effectiveness of regional growth, and in the social aspect, equal access to public services is an urgent need to ensure the quality of life of the community.

Overall, the management strategy of the *peri-urban* area of Tambang District must be implemented in an integrated, adaptive, and sustainable manner by balancing environmental, economic, and social aspects. This approach is important so that the ongoing transformation of the region does not cause excessive pressure on the carrying capacity of the environment, while still encouraging economic growth and improving the quality of life of the community in a balanced manner.

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