

## **SPATIAL BASED LAND USE ANALYSIS IN AN EFFORT TO IMPROVE ENVIRONMENTAL QUALITY IN THE SURAKARTA CITY AREA**

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### ***Abstract***

*This article discusses spatial-based land use analysis as a strategy to improve environmental quality in the Surakarta City Region. Surakarta City, like many cities in Indonesia, faces challenges in efficient and sustainable land management. This research aims to identify the potential for optimal land use in the context of urban spatial planning with a focus on environmental quality aspects. Spatial analysis and geographic modeling methods were used to evaluate existing land use and identify potential land conversions that could improve environmental quality. The results of this study include recommendations for land development strategies that can reduce negative impacts on the environment, such as uncontrolled urbanization, environmental degradation, and increased disaster risk. The article also highlights the importance of sustainable spatial planning in maintaining the city's ecosystem and ensuring that good environmental quality is maintained. The results of this study are expected to serve as a guide for authorities and decision makers in their efforts to improve environmental quality in Surakarta City Region and other similar cities in Indonesia.*

*Keywords: Spatial Land, Environmental Quality, Surakarta City*

### **INTRODUCTION**

Surakarta City, also known as Solo, is one of the important cities in Central Java Province, Indonesia. The city has a rich cultural history and is the center of Javanese culture, especially in traditional performing arts such as shadow puppets, gamelan, and Javanese dance. Surakarta is also known for its royal palace, the Kasunanan Surakarta Palace, which is a historical relic from the era of the Mataram kingdom. In addition to its cultural heritage (Abimanyu, 2015), Surakarta City also has a growing industrial sector, such as batik, textiles, and handicrafts. The city has a diverse and growing population, with increasingly modern infrastructure. However, the city's growth also faces challenges in managing population mobility, the environment, and sustainable land use.

Environmental quality in Surakarta City faces various problems that require serious attention. One of the main problems is the high level of air pollution due to an increase in the number of motor vehicles, industrial pollution, and uncontrolled burning of waste (Kadyarsi, 2006). This has the potential to harm the health of the population and damage the surrounding ecosystem. In addition, suboptimal waste management and lack of modern waste processing facilities are also important issues, causing piles of garbage that damage the aesthetics of the city and the environment. Poor drainage problems often result in flooding in some areas of the city during the rainy season, caused by uncontrolled development and shrinkage of water

catchment land (Fibrianti & Rahayu, 2022). Therefore, effective environmental monitoring and conservation measures are very important to maintain sustainable environmental quality in Surakarta City.

Land use analysis has a very important relevance in efforts to improve environmental quality, especially in the context of Surakarta City. Wise land use can lead to sustainable spatial development, which in turn can minimize negative impacts on the environment. By understanding deeply how land is used and managed, governments and stakeholders can plan special zones that promote environmental conservation such as green open spaces, conservation areas, and water catchment areas. Land use analysis can also help identify areas that are vulnerable to environmental damage and flooding, enabling the taking of appropriate preventive action. In addition, by involving local communities in spatial planning, land use analysis can facilitate the active participation of citizens in maintaining and improving their environment. Thus, land use analysis not only serves as a tool to manage land efficiently, but also as an instrument to make Surakarta City more environmentally friendly, sustainable, and comfortable for its residents.

## **RESEARCH METHODS**

This research uses qualitative research to explore an in-depth understanding of spatial planning-based land use and its impact on environmental quality in Surakarta City (Strauss & Corbin, 2003). The main data sources come from various spatial planning documents, related local regulations, and reports on land development and change. In addition, field data was obtained through interviews with relevant stakeholders, such as government officials, environmental experts, and community activists. Data collection techniques involve field observation and documentation studies. The data obtained is then analyzed qualitatively using a content analysis approach, where information from various sources is analyzed to identify patterns, findings, and implications related to land use and its impact on environmental quality in Surakarta City. This approach allows research to comprehensively understand the issues under study and provides deep insight into spatial and environmental issues in the city.

## **RESULT AND DISCUSION**

### **Spatial Concept in Surakarta City**

Surakarta City spatial planning is a key aspect in managing city development and maintaining environmental quality. First, the spatial policy of Surakarta City includes a

number of strategies and guidelines that have been formulated by the local government in order to regulate sustainable land use. This includes regulations governing urban zoning, green areas, commercial land use, and the maintenance of cultural heritage, such as the preservation of the Kasunanan Surakarta Palace (Adiyanta, 2019). This spatial policy aims to create a balance between rapid urban development with environmental protection and preservation of cultural heritage that is important to the city's identity.

Second, the spatial map of Surakarta City is an important tool in the implementation of the policy. The map reflects the physical layout of the city, which is divided into various zones based on function and land use. This zoning includes urban areas used for residential and commercial purposes, green zones that play a role in maintaining ecosystems and air quality, and cultural zones that include historical and cultural sites. Spatial maps are used as a guide for urban development planning, including infrastructure siting, open land maintenance, and cultural heritage preservation. Thus, Surakarta City's spatial policies and maps have a central role in directing sustainable city growth and maintaining environmental quality that is important for the lives of its citizens.

Spatial regulations in Surakarta City cover two important aspects: zoning regulations and spatial permits. Zoning regulations are legal instruments that regulate the division of urban areas into zones with different functions and land uses. This zoning regulates where you can and cannot build based on land type, such as residential, commercial, industrial, or green zones. Zoning regulations aim to direct land use in accordance with established spatial plans, thus creating an orderly and sustainable urban planning (Samsudi, 2010).

Spatial planning permit is an administrative procedure required for individuals or entities who want to carry out development or land use change in Surakarta City. This permit was granted by the local government after considering the spatial plan and applicable zoning regulations. Spatial permits ensure that any development or land use change is in accordance with the spatial plan that has been prepared, and meets environmental and sustainability requirements. It aims to prevent uncontrolled development, which can damage the environment and disrupt the quality of life of the population. With zoning regulations and spatial permits, Surakarta City strives to regulate orderly urban growth, maintain environmental quality, and ensure the sustainability of city development going forward.

## **Land Use in Surakarta City**

Analysis of current land use in Surakarta City reveals distribution patterns that reflect dynamic changes in land use over the past few decades. The current distribution of land use includes large urban zones with a predominance of residential areas, shopping centers, and offices. There is also a thriving commercial zone, accommodating a wide range of business ventures. However, what is most striking is the green zone that is still well preserved, including city parks, green open spaces, and several conservation areas. In addition, there are also industrial zones that are growing rapidly, triggering urbanization and economic growth (Yuniasa, 2021).

Changes in land use over time reveal Surakarta's urban evolution. At first, the city was dominated by traditional settlements and farmland. However, along with population growth and economic development, farmland began to be converted into housing, shopping malls, and industry. These changes have brought economic benefits, such as new jobs and business growth, but have also presented challenges related to environmental degradation, overcrowding, and increasingly difficult waste management. The latest changes reflect efforts to maintain a balance between rapid urban growth and environmental preservation, with the development of green open spaces and urban parks as well as increased awareness about environmental sustainability (Indah, 2014). Therefore, analysis of current land use and changes over time is important in planning sustainable policy measures for the future of Surakarta City.

## **Sustainable Settlement Planning**

The concept of sustainable settlements is an urban planning and development approach that aims to create environmental, social, and economic friendly settlements in the long term. It involves various aspects, including land use efficiency, efficient energy use, sustainable water management, efficient public transportation, access to green open spaces, and social inclusion. The concept also emphasizes the importance of improving the quality of life of the population as well as reducing negative impacts on the environment.

The implementation of the concept of sustainable settlements in the spatial planning of Surakarta City involves a number of strategic steps. First, spatial planning should prioritize the development of green zones and water catchment areas that can maintain environmental quality, reduce flood risk, and provide recreational space for residents. In addition, increased energy efficiency and the use of renewable energy should be applied in the development of

city infrastructure, such as environmentally friendly buildings and efficient public transportation. In terms of transportation, the promotion of bicycle and pedestrian use and the development of an integrated public transport system are essential to reduce air pollution and traffic congestion.

Environmental pollution is a condition in which the natural environment, be it air, water, soil, or natural ecosystems, is contaminated or polluted by harmful or unwanted substances or substances (Dewata & Danhas, 2023). The impact of environmental pollution can be devastating, not only for ecosystems and biodiversity, but also for human health as well as overall quality of life. Air pollution occurs when emissions of toxic gases, dust particles, and harmful chemical compounds such as sulfur dioxide (SO<sub>2</sub>) and nitrogen dioxide (NO<sub>2</sub>) enter the atmosphere, disrupting the quality of the air we breathe and potentially causing respiratory distress, heart disease, and other health problems.

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### **Impact of Land Use on the Environment**

Unwise land use can have a serious impact on the environment in Surakarta City. First, the main impact is environmental degradation. Uncontrolled development, deforestation, and land displacement have the potential to damage natural ecosystems, reduce biodiversity, and eliminate natural habitats for flora and fauna. This can result in the threat of several species, a decrease in air and water quality, and the loss of ecosystems that are important for maintaining the balance of nature (Setyowati, 2016).

Second, limited natural resources are a serious problem due to unsustainable land use. Surakarta City faces challenges in meeting clean water needs, especially due to groundwater pollution and rapid decline in groundwater levels. In addition, improper land use can result in decreased agricultural land productivity, cause food supply instability, and increase pressure on increasingly limited natural resources.

Third, environmental pollution is also a serious impact of uncontrolled land use. Industrial development and transportation that do not comply with environmental standards can cause air pollution, water pollution, and accumulation of hazardous waste. This can damage air quality which can disrupt population health, affect the quality of water used for domestic purposes and agricultural irrigation, and threaten freshwater and marine ecosystems. Thus, awareness of the impact of land use on a sustainable environment is very important for Surakarta City. Efforts for wise land management, preservation of natural ecosystems, and pollution reduction need to be strengthened to maintain good environmental quality for the welfare of residents and urban sustainability in the future.

### **Efforts to Improve Environmental Quality through Spatial Based Land Use**

Land use in Surakarta City has a significant impact on the environment. First of all, there is environmental degradation due to uncontrolled development. Deforestation and conversion of agricultural land to urban zones have resulted in the loss of natural habitats for various species, decreased biodiversity, and damaged natural ecosystems. The impacts include a decline in air and water quality, as well as threats to the preservation of nature that are important for maintaining the balance of ecosystems. Furthermore, limited natural resources became a serious problem in Surakarta City. The rapid decline in groundwater levels and groundwater pollution have threatened the supply of clean water to communities. Unsuitable land use can also result in decreased agricultural land productivity, instability in food supply, and increase pressure on increasingly limited natural resources.

Land use in Surakarta City has a significant impact on the environment. One of its main impacts is environmental degradation, where deforestation, conversion of agricultural land to urban zones, and uncontrolled development have led to loss of natural habitats, decreased biodiversity, and damage to ecosystems. This results in a decrease in air and water quality, and threatens the sustainability of essential natural ecosystems. In addition, limited natural resources are a serious concern due to the rapid decline in groundwater levels and groundwater pollution that threatens the supply of clean water to the population. Finally, environmental pollution is another serious impact, especially through industrial and transportation activities that do not comply with environmental standards. This pollution includes air pollution, water pollution, and the accumulation of hazardous waste, which can damage air and water quality, affect public health, and threaten freshwater and marine ecosystems. Serious efforts in managing land use wisely, maintaining nature conservation,

and reducing pollution are needed to maintain good environmental quality for the residents of Surakarta City and a sustainable urban future.

The impacts of uncontrolled land use are also linked to climate change. Unsustainable development, such as the clearing of new land for settlements and industry, as well as land-use changes that reduce green areas, can exacerbate the effects of global warming. This is because land loss serves as a carbon dioxide (CO<sub>2</sub>) sink and water store, which is needed to mitigate the effects of climate change.

In order to overcome these negative impacts, Surakarta City must take sustainable actions in managing land use. These include thoughtful spatial planning, preservation of green zones and water catchment areas, as well as reduction of pollution and the effects of climate change. Collaborative efforts between the government, community, and private sector are essential to maintain good environmental quality and make Surakarta City a sustainable and comfortable urban environment to live in.

The implementation of the concept of sustainable settlements in the spatial planning of Surakarta City has included a number of strategic steps. First, spatial planning must prioritize the development of green zones and water catchment areas that can maintain environmental quality, reduce flood risk, and provide recreational space for residents.

Finally, social inclusion is the focus in the implementation of sustainable spatial planning. Planning affordable housing for different levels of society, increasing access to health and education services, and increasing community participation in the planning process are important steps to ensure that sustainability applies not only to the physical environment, but also to social and economic aspects.

## **CONCLUSION**

Land use in Surakarta City has a significant impact on the environment. Unwise land use has led to environmental degradation, limited natural resources, and environmental pollution. These include loss of natural habitats, deterioration in air and water quality, and pressure on natural ecosystems that are important for environmental sustainability. Uncontrolled land use change has resulted in decreased groundwater levels, ecosystem damage, and threats to natural resources. Environmental pollution is also a serious problem because air, water, and soil pollution disrupt the quality of life and public health.

The importance of spatial planning in improving environmental quality in Surakarta City cannot be overstated. Wise and sustainable spatial planning plays a key role in

overcoming environmental problems such as degradation, limited natural resources, and pollution. By planning a spatial plan that prioritizes green zones, the use of renewable energy, efficient public transportation, and social inclusion, Surakarta City can achieve a balance between sustainable urban growth and environmental preservation. By involving various stakeholders, the implementation of sustainable spatial concepts can create an environmentally friendly, healthy, and comfortable environment for its residents, while maintaining the sustainability of the natural environment for the future.

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