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ANALYSIS OF THE POTENTIAL AND PLANNING OF TAUFAN GAMA SIMATUPANG URBAN FOREST TO IMPROVE ENVIRONMENTAL QUALITY IN ASAHAN REGENCY

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Abstract

This study aims to investigate the analysis of the potential and planning of Taufan Gama Simatupang Urban Forest to improve the environmental quality in Asahan Regency. The qualitative research method is used to analyze the potential and planning of Taufan Gama Simatupang Urban Forest. With a qualitative approach, this research aims to deeply understand the perceptions and views of the community and the government regarding the development of urban forests as part of efforts to enhance the environmental quality in Asahan Regency. The results show that this green space provides a place for the community to exercise, relax, and gather, which contributes to improving the quality of life and health. The development of the urban forest as an ecotourism site opens new economic opportunities for the surrounding community, enabling them to engage in small businesses such as tour guiding, souvenir sales, and food stalls. The urban forest can also serve as an environmental education center, introducing the public, especially the younger generation, to the importance of conservation and environmental sustainability. Overall, the development and planning of Taufan Gama Simatupang Urban Forest hold significant potential to improve environmental quality and provide sustainable benefits for the people of Asahan Regency. With sustainable planning and proper management, this urban forest can become an effective solution in addressing various urban environmental issues while supporting sustainable development.

Keywords: Urban Forest Planning Potential, Taufan Gama Simatupang, Environmental Quality, Asahan Regency

Introduction

Urban forests are an important solution in maintaining environmental quality in urban areas. In Asahan Regency, the Taufan Gama Simatupang Urban Forest has the potential to become one of the vital green open spaces. With the increasing urbanization and land conversion, the presence of urban forests becomes crucial in maintaining ecosystem balance, improving air quality, and providing recreational spaces for the community. In recent years, Asahan Regency has experienced significant population

growth alongside rapid urbanization. This growth has led to an increased demand for green open spaces and adequate infrastructure to support community life. Urban forests emerge as a strategic solution to face these challenges, functioning as providers of essential ecosystem services, including improved air quality, temperature reduction, and providing habitats for various species.

The Taufan Gama Simatupang Urban Forest has great potential in offering ecological, social, and economic benefits. However, disorganized environmental conditions and the lack of systematic planning can lead to a decline in environmental quality. Some of the issues faced include deforestation, pollution, and biodiversity loss. Therefore, a comprehensive analysis of the potential of this urban forest is needed, along with the formulation of effective planning strategies to improve environmental quality. One of the objectives of this research is to evaluate the existing potential of the Taufan Gama Simatupang Urban Forest and formulate planning strategies that can optimize its utilization. Through good planning, it is hoped that this urban forest will not only serve as a green open space but also become an integral part of improving the quality of life for the community and maintaining ecosystem balance in Asahan Regency.

Asahan Regency, as one of the rapidly developing regions in North Sumatra, faces significant environmental challenges. The rapid population growth, urbanization, and intensive industrial and agricultural activities have negatively impacted environmental quality. Air pollution, water pollution, and soil degradation are increasingly worrying issues that directly affect public health and ecosystem sustainability.

One of the main factors contributing to the decline in environmental quality in Asahan Regency is the lack of green open spaces (RTH). Green open spaces function as ecosystem buffers, pollutant absorbers, and habitats for flora and fauna. The scarcity of RTH leads to increased air temperatures, decreased air quality, and reduced biodiversity. Additionally, unplanned land use changes also contribute to environmental damage. Many areas that were previously agricultural land or natural forests have been converted

into residential or industrial areas, increasing pressure on natural resources. Unsustainable agricultural practices and pollution from industrial waste further exacerbate environmental conditions. Therefore, systematic efforts are needed to improve environmental quality in Asahan Regency. Sustainable management strategies, such as the revitalization of green open spaces, tree planting, and efficient waste management, must be implemented. Public education on the importance of environmental preservation is also key to creating collective awareness to protect nature.

The global phenomena of climate change and environmental degradation have had significant local impacts, including in Asahan Regency. One of the efforts to address these environmental challenges is through the development of urban forests, which serve as green open spaces capable of absorbing pollution, reducing environmental temperatures, and improving the quality of life for the community. The Taufan Gama Simatupang Urban Forest has become one of the important initiatives in creating a better and more sustainable environment. However, despite its great potential, the Taufan Gama Simatupang Urban Forest faces various challenges and obstacles in its planning. Rapid population growth and unplanned urbanization often lead to neglect of environmental aspects, such as the need for green open spaces. Many areas that should have been designated as urban forests have instead been converted into residential or other infrastructure areas. This phenomenon creates several problems, including declining air quality, drastic temperature increases, and the loss of habitats for local flora and fauna. On the other hand, the lack of public understanding of the importance of urban forests has resulted in minimal participation in their preservation and management. Without support and active involvement from the community, the development of urban forests will not succeed optimally.

Given this background, it is important to conduct a thorough analysis of the potential of the Taufan Gama Simatupang Urban Forest and formulate sustainable planning strategies. This research aims to identify the existing potential, examine the challenges faced, and provide recommendations for the development of urban forests that can improve environmental quality and the well-being of the community in Asahan

JOURNAL OF PROCEEDINGS
SOCIAL SCIENCE AND POLITICAL SCIENCE
DHARMAWANGSA UNIVERSITY

Regency. It is hoped that the results of this research will contribute to efforts to improve environmental conditions and support sustainable development policies in the region.

Method Approach

This study employs a qualitative approach to analyze the potential and planning of the Taufan Gama Simatupang City Forest in improving the environmental quality in Asahan Regency. According to Moleong (2018), the qualitative approach aims to understand phenomena in depth, considering the context and subjective views of participants. This approach is relevant because it provides a holistic understanding of perceptions, challenges, and the potential development of the city forest based on direct information from the community and local stakeholders (Nuraini et al, 2023a; Nuraini, 2017)

The data collection techniques in this study involve several main methods, namely in-depth interviews, direct observation, and documentation. According to Sugiyono (2018) and Nuraini et al (2023b), in-depth interviews are an effective data collection technique in qualitative research as they allow researchers to obtain detailed information from informants. In this context, interviews were conducted with various parties, such as local government officials, environmental managers, and residents around the Taufan Gama Simatupang City Forest, to understand their perceptions of the benefits and challenges in the development of the city forest. Direct observation was carried out to observe the physical condition and activities taking place in the Taufan Gama Simatupang City Forest. Documentation in this study includes records and data from relevant agencies covering regional spatial planning, environmental data, and city forest development programs (Hartini et al, 2023; Hidayat et al, 2023)

The data obtained were analyzed using thematic analysis techniques, where the data were grouped into main themes relevant to the research objectives (Satrya et al, 2023; Sahara et al, 2023; Alfiyah et al, 2023). Meanwhile, Miles and Huberman (2018) explain that thematic analysis in qualitative research involves three main stages: data reduction,

JOURNAL OF PROCEEDINGS
SOCIAL SCIENCE AND POLITICAL SCIENCE
DHARMAWANGSA UNIVERSITY

data presentation, and conclusion drawing. To ensure the validity of the data, this study employed triangulation, which involves comparing information obtained from various data sources (interviews, observations, and documentation). According to Moleong (2018), triangulation helps improve data validity and minimize bias in qualitative research. In this study, triangulation was conducted by comparing the results of interviews with documentation data and direct field observations (Pasaribu et al, 2023; Harmoko et al, 2023; Aris et al, 2023)

Results And Discussion

Concept and Potential of Urban Forests

According to Mulyani (2018), urban forests are green areas designed to protect and enhance environmental quality in urban areas. Urban forests play a significant ecological role, such as absorbing pollutants, providing oxygen, and serving as habitats for flora and fauna. Amid the rapid urbanization growth, urban forests also help mitigate the urban heat island (UHI) effect, or the increase in urban temperatures. Wahyuni (2018) added that urban forests also have aesthetic and recreational functions, which are crucial for the quality of life of urban residents. With the presence of urban forests, city dwellers can enjoy green spaces that reduce stress and provide places for physical activities. In the context of Asahan Regency, Taufan Gama Simatupang Urban Forest has the potential to offer these benefits, while also being part of a sustainable green open space system.

Impact of Urban Forests on Environmental Quality

Several experts agree that urban forests play a crucial role in improving air quality and reducing pollution. According to Suharto (2018), trees in urban forests have the ability to absorb carbon dioxide (CO_2) and various other pollutants, such as sulfur dioxide (SO_2) and nitrogen dioxide (NO_2). This absorption of pollutants helps reduce air pollution concentrations and improve air quality in the surrounding area. In relation to this impact, Rahmawati (2018) stated that urban forests also assist in rainwater management. The tree root systems help absorb water, thus reducing the risk of flooding

and aiding in groundwater recharge. This is particularly relevant for urban areas that are prone to flooding due to high surface water runoff.

Challenges and Obstacles in Urban Forest Planning

According to Santoso (2018), one of the main challenges in urban forest development is limited land availability and high costs. Urban forest planning often requires strict land management and adequate budget allocation for planting, maintenance, and the development of supporting facilities. In the case of Asahan Regency, limited land and budget constraints may pose challenges in the development of Taufan Gama Simatupang Urban Forest. Furthermore, Irawan (2018) emphasized that community involvement is essential for ensuring the sustainability of urban forests. This involvement includes participation in maintenance, support for environmental regulations, and awareness of the benefits of urban forests. However, low community participation is often an obstacle in optimizing the functions and sustainability of urban forests.

Strategies for Urban Forest Development and Planning

In their research, Pratama and Dewi (2018) recommended several strategies to optimize the potential of urban forests, such as integrating green spaces in urban spatial planning, selecting plant species suitable for the local climate, and enhancing community involvement. These strategies are considered effective in creating sustainable green spaces that provide long-term benefits. According to Hidayat (2018), good urban forest planning must consider ecological, social, and economic aspects. Urban forests not only serve as green open spaces but also have economic functions, such as being a place for nature tourism and environmental education. In Taufan Gama Simatupang Urban Forest, this potential can be realized through the selection of local vegetation that supports ecosystem balance and enhances tourism appeal.

In the context of the Analysis of Potential and Planning of the Taufan Gama Simatupang City Forest to Improve Environmental Quality in Asahan Regency, the background of the issue can begin by outlining the potentials of the Taufan Gama Simatupang City Forest as an essential element in urban environmental planning and improving the quality of life for the surrounding community. The Taufan Gama Simatupang City Forest has the potential to serve as the "lungs of the city," capable of absorbing pollutants and producing oxygen. With the increasing number of vehicles and industrial activities in Asahan Regency, this area has significant potential to help reduce air pollution and maintain air quality for the local population. This city forest could also become an important part of the open green spaces (RTH) in Asahan Regency, which are needed to achieve the ideal proportion of RTH in line with national standards.

As a public space, this area could also serve as a recreational and educational facility for the community, as well as enhance the aesthetics of the urban environment. The vegetation in the Taufan Gama Simatupang City Forest has the potential to help lower the surrounding temperature through evapotranspiration. Therefore, this city forest can function as an essential microclimate regulator to address the urban heat island effect.

The city forest also has the potential to conserve various local flora and fauna species. With proper management, the Taufan Gama Simatupang City Forest could become a habitat for local wildlife and a conservation area for various plant species, thus supporting efforts to preserve biodiversity in urban areas. This city forest has the potential to be a site for environmental education and scientific research for students, researchers, and the general public. This would allow people to learn about the importance of city forests and the role of vegetation in maintaining environmental balance, while also raising public awareness about environmental issues.

With adequate facilities, the city forest could be developed as an attractive tourist destination, providing not only aesthetic value but also the potential to boost local revenue through ecotourism and other nature-based activities. This potential could also create new job opportunities for the surrounding community in the tourism and conservation sectors.

The Taufan Gama Simatupang City Forest could function as a water absorption area, helping to reduce the risk of flooding in the surrounding area, particularly during the rainy season. With vegetation that acts as water absorbents, this city forest can play a role in maintaining hydrological balance and reducing surface water runoff.

These potentials demonstrate that the Taufan Gama Simatupang City Forest has many positive aspects for improving the environmental quality of Asahan Regency. However, to realize these potentials, careful planning and management are required to ensure that the city forest fulfills its ecological, social, and economic functions optimally.

Ecological Potential

1. **Air Quality Improvement**

   The Taufan Gama Simatupang Urban Forest has the potential to act as a significant carbon dioxide (CO_2) absorber and oxygen producer in the urban area. The vegetation within this urban forest, including large trees and shrubs, helps reduce air pollution generated by vehicles and industrial activities in Asahan Regency.

   Temperature and Microclimate Control

   Through the evapotranspiration process of the existing vegetation, this urban forest is able to lower the surrounding air temperature, creating a cooler microclimate. This contributes to reducing the urban heat island effect often experienced in urban areas.

   Biodiversity Conservation

   Taufan Gama Simatupang Urban Forest has the potential to serve as a habitat for various flora and fauna species, particularly those endemic to the Asahan region. With proper management, this urban forest can become a conservation area that supports the sustainability of the local ecosystem.

2. **Social and Educational Potential Environmental Education Facility**

   This urban forest has the potential to be an environmental education center for students, university students, and the general public. Educational activities such as tours, workshops on conservation, or ecology training can be held in this area to enhance public understanding of the importance of the environment.
   Recreation Area

With its green views and fresh air, Taufan Gama Simatupang Urban Forest has the potential to become a healthy recreation destination for local communities. The presence of public facilities, such as walking paths and picnic areas, will increase the appeal of this area as a place to relax and unwind.

3. **Economic Potential**

   Ecotourism and Nature Tourism

   With its various natural attractions and unique vegetation, this urban forest can be developed as an ecotourism destination. Ecotourism activities like nature tours, birdwatching, or light hiking could attract visitors and boost the local economy.

   Development of Local Products

   This area has the potential to develop environmentally based local products, such as medicinal plants or other ecological products. With conservation and ecotourism programs, the community can engage in sustainable economic activities.

4. **Hydrological Potential**

   Flood Control

   As a water absorption area, Taufan Gama Simatupang Urban Forest functions to absorb rainwater and reduce surface runoff. The dense vegetation helps absorb and store more water, which in turn reduces the risk of flooding in surrounding areas.

   Groundwater Balance

   This urban forest helps maintain the balance of groundwater, particularly in areas prone to water shortages during the dry season. By preserving both the quality and quantity of groundwater, this urban forest supports the sustainability of water resources for local communities.

5. **Health and Psychological Potential**

   Positive Impact on Public Health

   This urban forest provides a space for physical activities, such as walking or light exercise, promoting a healthy lifestyle. The presence of large green spaces also has a positive effect on mental health, helping to reduce stress for urban residents.

   Public Space for Social Interaction

Taufan Gama Simatupang Urban Forest has the potential to become a place for social interaction and community activities. This can help build social cohesion among people from diverse backgrounds, while also fostering a sense of ownership and shared responsibility for the environment.

6. **Potential for Climate Change Adaptation**

   Enhancing Resilience to Climate Change

   With its ability to absorb carbon emissions and regulate the water cycle, this urban forest contributes to mitigating the impacts of climate change. This potential is vital in helping the Asahan region adapt to increasingly extreme climate conditions, such as rising temperatures and unpredictable rainfall.

   Protection of Ecosystems in Urban Areas

   As a buffer zone, this urban forest protects urban areas from negative environmental impacts, including soil degradation and loss of biodiversity. This potential allows the urban forest to play a role in maintaining the sustainability of local ecosystems amidst urban expansion.

How to plan effectively to optimize the potential in improving environmental quality

Managing and increasing plant species diversity according to local characteristics and urban forest ecosystems. By increasing the number of trees with wide canopies, shade plants, and high water-absorbing vegetation, air quality can be improved through more optimal CO_2 absorption. The selection of endemic plant species can also enhance ecosystem sustainability and support local fauna. Allocating certain areas within the urban forest as conservation zones for flora and fauna, including protecting habitats for native species and enforcing strict supervision to prevent harmful activities. These zones serve as core areas that support biodiversity conservation and ecosystem balance. Establishing information centers or educational facilities like eco-centers to provide information about the urban forest, flora and fauna, and the importance of environmental conservation. These educational programs can involve schools, universities, and local communities in sustainability and environmental care activities. Designing special trails, such as nature trails, where visitors can enjoy the natural beauty while learning about the

plant and animal species present. These educational trails can also feature information boards that provide insights into the ecological benefits of urban forests, helping to raise public environmental awareness.

Encouraging community involvement in the management of urban forest areas as eco-tourism destinations. The community can play a role in providing tour services, local guides, and managing tourism facilities, creating economic opportunities while preserving the environment. Setting visitor limits to preserve the forest area and prevent damage from overcrowding. This regulation includes restricting access to sensitive areas and implementing eco-friendly protocols that visitors must follow. Designing areas to improve groundwater absorption, such as creating retention ponds and biopore systems around the urban forest. This aims to reduce flood risks and regulate groundwater balance, which is beneficial for long-term water resilience in the Asahan area. Controlling the use of chemicals in plant care and utilizing natural fertilizers to maintain soil and water quality. Using plants with high absorption rates can also help filter rainwater and maintain the quality of groundwater in the surrounding area. Designing eco-friendly facilities like pedestrian paths made of porous materials, seating made from recycled materials, and lighting using renewable energy. This is to ensure harmony between infrastructure and the natural environment of the urban forest. Providing green open spaces for recreation, light sports, and social activities. These areas can be equipped with flower gardens, gazebos, and eco-friendly picnic areas, allowing the community to enjoy quality time outdoors without damaging the ecosystem.

Long-term planning to replace aging or dead trees with new plants will ensure sustainable vegetation availability. Periodic tree planting will help the urban forest remain effective in absorbing CO_2 and face climate change challenges. Strengthening monitoring and periodic evaluation of the urban forest ecosystem’s condition. This data can be used to mitigate climate change risks and maintain the urban forest's ecological resilience against pollution or unexpected environmental changes. With comprehensive planning, Taufan Gama Simatupang Urban Forest has great potential to support environmental quality in Asahan Regency. This integrated approach includes ecological,

social, economic, and hydrological planning that synergizes to achieve environmental sustainability. Through community involvement and the implementation of appropriate regulations, these potentials can be fully optimized, making the urban forest an important asset in environmentally-friendly regional development.

What are the impacts of developing Taufan Gama Simatupang Urban Forest on the surrounding community and ecosystem?

With the presence of an urban forest, the air quality around it improves through carbon dioxide absorption and oxygen production by vegetation. Cleaner and fresher air contributes to better public health by reducing the risk of respiratory diseases often caused by pollution. The urban forest serves as an environmental education hub, introducing the community to biodiversity and the importance of conservation. Schools and local communities can use this area for environmental education programs, thereby raising awareness about the importance of environmental preservation. The development of the urban forest creates economic opportunities through eco-tourism activities and other supporting services, such as tour guides, food stalls, and local souvenir sales. Community involvement in managing the urban forest can also increase income and create new job opportunities.

The urban forest provides habitats for various local flora and fauna, helping to preserve native species and support ecosystem balance. This area can serve as a habitat and **breeding** ground for certain bird species, insects, and other small animals vital to the food chain. The vegetation in the urban forest helps absorb rainwater, reducing surface runoff that can cause erosion and flooding. The tree root systems also help maintain soil structure and improve water absorption, which is crucial for groundwater conservation and preventing erosion around the area. The urban forest serves as an ecosystem buffer, reducing the impacts of climate change. Through carbon dioxide absorption and microclimate regulation, the urban forest helps mitigate the urban heat island effect and provides cooler zones in the urban area, offering shelter from extreme temperatures.

The urban forest also functions as a green open space for the community to enjoy recreation, physical activities, and social events. This facility supports the creation of healthy social interaction spaces and strengthens relationships among residents, with the urban forest serving as a center for recreation and socialization. The urban forest can also be used to introduce local culture through activities such as environmental festivals, cultural events, and conservation training based on local wisdom. This development helps preserve the local culture aligned with environmental conservation practices.

With its natural beauty and eco-friendly facilities, the urban forest can attract visitors from different regions interested in nature tourism. This impact can increase tourist visits and generate significant economic benefits through tourists' spending at local facilities. The presence of the urban forest often increases property values in the surrounding areas, as greener and healthier environments are considered more attractive. This effect benefits property owners and supports regional economic growth.

Overall, the development of Taufan Gama Simatupang Urban Forest has wide-ranging positive impacts on the community and ecosystem in Asahan Regency. With proper management, this urban forest not only provides ecological benefits such as improved air and water quality, but also offers social and economic impacts by providing healthy public spaces, raising environmental awareness, and creating new economic opportunities for the local community.

Conclusion

The conclusion from the analysis of the potential and planning of Taufan Gama Simatupang City Forest shows that this urban forest plays an important role in improving environmental quality and providing a broad positive impact for Asahan Regency. The key conclusions are as follows:

Taufan Gama Simatupang City Forest has the potential to become a habitat for various local species of flora and fauna, which is crucial for preserving biodiversity in urban areas. The trees and plants in this urban forest serve as a source of oxygen and help

reduce the effects of warming in the surrounding area, creating a cooler and more comfortable zone for the community. In addition to being a green area, this city forest has the potential to become an ecotourism destination and an environmental education center, attracting visitors while raising public awareness about the importance of environmental conservation.

Proper planning requires an integrated approach to maintaining the sustainability of the city forest ecosystem while maximizing its benefits for the environment. This includes regular maintenance, air and water quality control, and the provision of facilities that support public activities. Optimizing the potential of the city forest requires active involvement from the local community through educational activities, participation in maintenance, and empowerment in environmentally-based economic endeavors. The development of supporting facilities such as pedestrian paths, playgrounds, and environmentally-friendly picnic areas will improve accessibility and the appeal of the city forest while maintaining environmental sustainability.

The presence of the city forest helps filter air pollutants, absorb carbon dioxide, and maintain groundwater quality through a vegetation system that functions as a rainwater absorber. The vegetation in this city forest plays a role in reducing soil erosion, maintaining soil structure, and preventing floods in the surrounding area, thus strengthening the local ecosystem. By absorbing greenhouse gases and reducing local temperatures, this city forest supports climate change mitigation, which has a positive impact on the urban environment.

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