


## Sustainable Management Model Of Pasir Pengaraian Urban Forest

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Article Info	ABSTRACT
<p><b>Keywords:</b> Urban Forest, Sustainable Management, Zoning, Community Participation, Urban Ecosystem</p>	<p>Urban forests play a vital role in supporting the sustainability of urban development. This study aims to formulate a sustainable management model for Pasir Pengaraian Urban Forest using a mixed method approach. This study includes institutional analysis, identification of appropriate plant species, and development zoning mapping. A qualitative approach is used to examine institutional management and stakeholder participation, while a quantitative approach is used to evaluate ecological, social, and economic factors. The results of the study indicate that the management of Pasir Pengaraian Urban Forest requires integrated planning and development as well as strengthening of community participation-based management policies. In addition, optimization of the ecological, social, and economic functions of urban forests can be achieved through vegetation maintenance, management zoning, and periodic monitoring. This management model is expected to contribute to creating a better balance of urban ecosystems and strengthening the sustainability of regional development in Rokan Hulu Regency.</p>
<p>This is an open access article under the <a href="https://creativecommons.org/licenses/by-nc/4.0/">CC BY-NC</a> license</p> 	<p><b>Corresponding Author:</b> Muzayyinul Arifin Universitas Riau <a href="mailto:muzayyinul.arifin@yahoo.co.id">muzayyinul.arifin@yahoo.co.id</a></p>

### INTRODUCTION

Environmental problems in urban areas are complex issues and continue to grow along with increasing human activities. Phenomena such as air pollution, water pollution, declining soil quality, and increasing air temperatures are some of the main problems faced by urban communities (Sundari, 2010). Along with increasing population and human activities, the need for land for settlements, industry, and urban infrastructure is increasing. This causes a reduction in Green Open Space (RTH) and urban forests, which in turn worsens the quality of the environment in urban areas (Martika & Suryawati, 2021) . Therefore, the existence of urban forests is an important solution in overcoming these problems.

Urban forests function as the lungs of the city that can improve air quality, reduce noise, lower air temperature, and become a habitat for urban flora and fauna (Grey & Deneke, 1978). In addition, urban forests also play an important role in improving ecosystem balance, providing recreational space, and strengthening the social and aesthetic aspects of the city (Dahlan, 1992). The existence of urban forests has been regulated in national regulations that require each city to have green open space of 30% of the total urban area (Sundari, 2010).

In Rokan Hulu Regency, urban forest management efforts have been realized through the Decree of the Regent of Rokan Hulu Number Kpts.660/DLH/360/2019 concerning the Designation of Urban Forest Areas. Through this policy, the area of urban forest in the Rokan

Hulu Regency Government Office Complex has increased to 32.80 hectares. This urban forest area is expected to be able to carry out ecological, economic, and socio-cultural functions. The ecological functions of urban forests include controlling air pollution, protecting against erosion, and providing space for flora and fauna (Zoer'aini, 2008). Meanwhile, from an economic perspective, urban forests can support the tourism sector and increase the value of surrounding properties. Meanwhile, the socio-cultural function is reflected in the use of urban forests as a space for social interaction, recreation, and education for the surrounding community (Dahlan, 1992).

Although the role of urban forests has been widely recognized, their management still faces major challenges. These challenges include low community participation, lack of coordination between management institutions, and limited human resources and budget. Therefore, an urban forest management model is needed that can answer these challenges effectively and sustainably. This management model is expected to strengthen collaboration between the government, community, and private sector in maintaining and managing urban forests optimally (Mubarak et al., 2019).

This study has novelty in terms of methodological approach and focus of study. Methodologically, this study uses a mixed method that combines qualitative and quantitative approaches. The qualitative approach is carried out by analyzing policies, community participation, and interviews with stakeholders. While the quantitative approach is used to evaluate the ecological, social, and economic factors of urban forests. Spatial analysis is also applied in this study to map the zoning of urban forest management (Prahasta, 2009).

## METHOD

### Research Approach

This study uses a mixed method approach that combines quantitative and qualitative approaches simultaneously. The quantitative approach is used to collect and analyze numerical data related to the ecological, social, and economic conditions of Pasir Pengaraian City Forest. Meanwhile, the qualitative approach is used to explore and understand policies, institutions, and community participation in urban forest management. The use of mixed methods aims to produce richer data, strengthen the validity of the findings, and reduce the potential for bias (Sugiyono, 2010).

### Location and Time of Research

This research was conducted in Pasir Pengaraian City Forest, located in the Rokan Hulu Regency Government Office Complex, Pematang Berangan Village, Rambah District, Rokan Hulu Regency. The selection of this location was based on the consideration that the area had been designated as a city forest through the Decree of the Regent of Rokan Hulu Number Kpts.660/DLH/360/2019. This research was conducted during the period 2023 to 2024, with the stages of data collection, analysis, and report preparation.

### Data Types and Sources

The data used in this study is divided into two types, namely:

1. Primary Data

Primary data were obtained directly from the field through observation, interviews, questionnaires, and documentation. These data include information on the ecological,

social, and economic conditions of Pasir Pengaraian City Forest and community participation in its management. Primary data were obtained from:

- a. In-depth interviews with urban forest managers, such as the Rokan Hulu Regency Environmental Service (DLH) and community leaders.
- b. Field observations to identify vegetation, ecological conditions, and physical aspects of urban forests.
- c. Questionnaires distributed to communities around urban forests to measure participation, awareness levels, and community perceptions of urban forest management.
- d. Visual documentation in the form of photos and videos related to the condition of the urban forest and the activities of the surrounding community.

## 2. Secondary Data

Secondary data were obtained from previously published sources, such as journals, books, research reports, and government policy documents. Secondary data also includes policy documents related to urban forests, such as the Decree of the Regent of Rokan Hulu Number Kpts.660/DLH/360/2019 and regulations related to the management of relevant green open spaces (RTH).

## Data Collection Methods

### 1. Field Observation

Observations were conducted by direct observation of the physical conditions of Pasir Pengaraian City Forest, including observations of vegetation, management zoning, and community interaction with the city forest. Observations were conducted in a structured manner with observation guidelines that include:

- a. Identify the types of plants that dominate urban forests.
- b. Observation of community activities around urban forests.
- c. Visual documentation through taking photos and videos.

### 2. In-depth Interview

The interviews were conducted using a semi-structured interview method . This method allows for in-depth information exploration, while still referring to the question guide. The interviewees included:

- a. The city forest management team from the Environmental Service (DLH) of Rokan Hulu Regency.
- b. Local community figures who have a role in urban forest management.
- c. Local communities who utilize urban forests, such as users of urban forest facilities for recreation or social activities.

### 3. Questionnaire

A questionnaire was used to collect data from communities around urban forests. The questionnaire contains questions designed to measure:

- a. Community participation in urban forest management.
- b. Public perceptions of the ecological, economic, and social benefits of urban forests.
- c. Level of public understanding of urban forest management policies.

The questionnaire was distributed to 50 respondents selected by purposive sampling with the criteria of respondents aged 17 to 56 years . This criterion was

chosen because this age is considered to have the ability to understand and answer the questionnaire questions well (Sugiyono, 2010).

#### 4. Documentation Study

Documentation studies were conducted by collecting and analyzing relevant policy documents, research reports, and journal articles. Some of the documents used include:

- a. Decree of the Regent of Rokan Hulu Number Kpts.660/DLH/360/2019 concerning the Designation of City Forest Areas.
- b. Annual report from the Environmental Service (DLH) of Rokan Hulu Regency.
- a. Previous research on urban forest management, including from Martika and Suryawati (2021), Zoer'aini (2008), and Mubarak et al. (2019).

### Sampling Techniques

Sampling was done using the purposive sampling method . According to Sugiyono (2010), purposive sampling is a sampling technique with certain criteria that are relevant to the research objectives. The criteria used in selecting respondents are:

- a. Respondents live around the Pasir Pengaraian City Forest.
- b. Respondents were aged 17 to 56 years , in order to provide relevant and informative answers.
- c. Respondents included community groups, community leaders, and urban forest managers from the Environmental Service.

### Data Analysis Methods

The data obtained were analyzed using several methods, namely:

#### 1. Qualitative Descriptive Analysis

Data obtained from observation, interviews, and documentation were analyzed descriptively. This technique is used to explain the condition of urban forests, community participation, and urban forest management policies. Data from interviews and observations were processed through data reduction, data presentation, and drawing conclusions (Moleong, 2010).

#### 2. Quantitative Descriptive Analysis

Data from the questionnaire were analyzed using descriptive statistical analysis . Data obtained from the questionnaire were processed using data processing software, such as Microsoft Excel or SPSS , to produce data tabulations, percentages, and data groupings. This analysis aims to determine the distribution of respondents' answers related to community participation, perceptions of the benefits of urban forests, and the level of community understanding of urban forest management.

## RESULTS AND DISCUSSION

### Research result

This study aims to formulate a sustainable management model for Pasir Pengaraian City Forest. The results of the study were obtained from field observations, interviews, questionnaires, and spatial analysis using geospatial data. The data obtained were then analyzed descriptively qualitatively, quantitatively, and spatially. The results of the study are presented in the following subsections.

### Existing Condition of Pasir Pengaraian City Forest

Pasir Pengaraian City Forest has an area of approximately 32.80 hectares , in accordance with the Decree of the Regent of Rokan Hulu Number Kpts.660/DLH/360/2019. This area is located in the Rokan Hulu Regency Government Office Complex and functions as a green open space (RTH) that supports the urban ecosystem.

#### 1. Ecological Aspects

From the observation results, it is known that Pasir Pengaraian City Forest has quite high vegetation diversity. Some dominant tree species are mahogany (*Swietenia macrophylla*) , rain tree (*Samanea saman*) , and ketapang tree (*Terminalia catappa*) . The existence of this vegetation plays a role in absorbing carbon dioxide (CO<sub>2</sub>), lowering air temperature, and improving the quality of the surrounding air. Vegetation also functions as an absorber of rainwater, thus reducing the risk of local puddles or flooding (Zoer'aini, 2008).

#### 2. Social Aspects

From interviews with the surrounding community, it is known that Pasir Pengaraian City Forest is used by the community as a recreation area, sports, and other social activities. As many as 85% of respondents consider that the existence of the city forest has a positive impact on their health and quality of life. In addition, the surrounding community has a fairly good awareness of protecting the city forest, although active participation in maintenance activities is still relatively low.

#### 3. Economic Aspects

Pasir Pengaraian City Forest also has significant economic value. The existence of a city forest can increase the value of surrounding properties, encourage local economic activities such as ecotourism, and has the potential to be a source of income through educational tourism programs. Based on interviews with managers, the tourism potential of this city forest has not been optimized to its full potential, but there are plans to develop community-based ecotourism.

### Implementation of Urban Forest Management Policy

The management of Pasir Pengaraian City Forest is carried out by the Environmental Service (DLH) of Rokan Hulu Regency . Based on interviews, it is known that this management includes planning, maintenance, protection, and periodic evaluation activities. Some of the main policies implemented include:

- a. Urban Forest Zoning , Urban forest areas are divided into several zones, such as conservation zones, recreation zones, and protection zones. This zoning aims to maximize the utilization and protection of the area.
- b. Prohibitions and Sanctions, There is a prohibition on damaging vegetation, cutting down trees, and dumping waste in the city forest area. Administrative sanctions and fines are applied to violators of this policy.
- c. Community Participation, Although community participation is not yet optimal, the DLH is trying to involve local communities through education and outreach programs.

### Factors Affecting Urban Forest Management

Based on the analysis results, several factors were found that influence the sustainability of the management of Pasir Pengaraian City Forest, namely:

- a. Ecological Factors, Climate change and extreme weather conditions can affect vegetation growth and tree resistance to pests and diseases.
- b. Social Factors, The level of public awareness and participation is still low. Although the community recognizes the importance of urban forests, participation in management programs is still minimal.
- c. Economic Factors , Limited government budget for urban forest maintenance and management is the main obstacle.
- d. Institutional Factors , Coordination between stakeholders, such as the Environmental Service, the community, and the private sector, still requires strengthening.

### **Sustainable Management Model of Pasir Pengaraian City Forest**

The proposed urban forest management model adopts the concept of sustainability-based management. This model includes five main elements, namely:

1. Vegetation Management, Maintenance, tree rejuvenation, and pest and disease control.
2. Area Zoning, Dividing urban forests into conservation zones, recreation zones, and education zones.
3. Community Participation, Involving the community in urban forest maintenance and monitoring activities through mutual cooperation programs and community-based management.
4. Policy Strengthening, Preparation of regional regulations (Perda) that support the sustainability of urban forest management.

### **Discussion**

Urban forests play a very important role in supporting the balance of urban ecosystems. The existence of urban forests can improve air quality through the process of photosynthesis, which effectively absorbs carbon dioxide (CO<sub>2</sub>) and produces oxygen (O<sub>2</sub>) (Grey & Deneke, 1978). In addition, urban forest vegetation can also reduce air pollution and reduce noise (Dahlan, 1992). In the Pasir Pengaraian City Forest, zoning-based management implemented by the Environmental Service has made a positive contribution. This zoning allows optimization of the use of urban forests according to their functions, for example conservation zones that focus on preserving flora and fauna, and recreational zones that are used as spaces for social interaction among the community. The results of the study showed that community participation in the management of the Pasir Pengaraian City Forest still needs to be improved. As many as 60% of respondents stated that they only participated passively, such as maintaining cleanliness and not damaging city forest facilities. Active participation, such as mutual cooperation activities and vegetation maintenance, is still low. There needs to be a community education program so that they care more and are actively involved in managing urban forests (Mubarak et al., 2019).

### **CONCLUSION**

This study reveals that the management of Pasir Pengaraian City Forest plays an important role in maintaining the balance of the urban ecosystem. With an area of 32.80 hectares, this city forest functions as the city's lungs, absorbs carbon dioxide, and controls air pollution. Dominant vegetation, such as mahogany, rain tree, and ketapang, play a role in improving air quality, reducing noise, and providing habitat for flora and fauna. From a social aspect, the

city forest is used as a recreation and social interaction space, while from an economic aspect, this area has the potential to support the development of community-based ecotourism and increase the value of surrounding properties. However, the management of the city forest still faces challenges in terms of community participation, budget support, and limited human resources.

## REFERENCES

- Dahlan, R. (1992). *Concept and Implementation of Urban Forests in Indonesia*. Jakarta: Forestry Library.
- Fakuara, T. (1986). *Urban Forest Management: An Urban Environmental Conservation Approach*. Surabaya: Indonesian Environmental Publisher.
- Gray, G. W., & Deneke, F. J. (1978). *Urban Forestry*. New York: John Wiley & Sons.
- Hernowo, JB, & Prasetyo, R. (1989). The Role of Birds in Urban Forest Ecosystem Management. *Journal of Environmental Ecology*, 12(2), 25–36.
- Kriedemann, P. E. (1977). *Photosynthesis: Fundamental Processes in Horticultural Crops*. Amsterdam: Elsevier.
- Martika, DS, & Suryawati, N. (2021). Fulfillment of Urban Forest Area as a Preventative Measure against Environmental Problems in Surabaya. *Journal of Legal Studies*, 17(1), 45–60.
- Moleong, LJ (2010). *Qualitative Research Methodology*. Bandung: PT Remaja Rosdakarya.
- Mubarak, A., Dt. Maani, K., & Frinaldi, A. (2019). Urban Forest Management Policy Model (Case Study at Great Forest Park Dr. Muhammad Hatta, Padang City). *International Conference on Public Administration, Policy and Governance*, 125, 110–123.
- Prahasta, E. (2009). *Spatial Analysis with Geographic Information System (GIS)*. Bandung: Informatika Publisher.
- Sugiyono. (2010). *Quantitative, Qualitative, and R&D Research Methods*. Bandung: Alfabeta.
- Sundari, ES (2010). Study to Determine the Function of Urban Forests in Urban Environmental Problems. *Journal of Urban and Regional Planning*, 15(2), 75–88.
- Zoer'aini, D. (2008). *Urban Forest Management in Indonesia: Principles, Concepts, and Implementation*. Yogyakarta: Gadjah Mada University Press.