

# West Papua Mangrove Management Strategy (Case Study of Oransbari Mangrove Area in South Manokwari Regency)

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# West Papua Mangrove Management Strategy (Case Study of Oransbari Mangrove Area in South Manokwari Regency)

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## 8 ABSTRACT

This study aims to identify internal factors, namely strengths and weaknesses and external opportunities and threats in managing mangrove areas. Furthermore, identifying internal and external factors is mapped in SWOT Analysis (Strength, Weakness, Opportunity, Threats) and AHP Analysis (Analysis Hierarchy Process) to ensure appropriate management strategies and designs to protect and preserve West Papua mangrove areas. The results showed that the factors resulted in the mangrove area's management strategy: (1) SO strategy, utilization of regional potential to improve the community's welfare with a comparative value of 0.550. (2) ST strategy, social-cultural value and economic benefits to protecting the region with a comparative value of 0.540. The combination of external factors resulting in regional management strategies are (1) WO strategy, take advantage of government support for the improvement of facilities and infrastructure, provision of human resources managers with a comparative value of 0.540, (2) WT strategy, intervention in providing economic alternatives for local communities with a comparative value of 0.590. Combining various mangrove management strategies is an essential recommendation for the local Government and all parties in managing the West Papua mangrove area. In the future, efforts to preserve mangrove natural resources can be made while maintaining ecological and economic balance.

**Keywords:** Management Strategy, Internal and External Factors, Mangrove Areas, SWOT Analysis, Analytical Hierarchy Process

## 1. INTRODUCTION

One of the mangrove areas in West Papua is the Oransbari Mangrove Area in South Manokwari Regency. Land cover map based on Landsat image analysis results in 2017 of 149.3 Ha (primary mangrove) and 329.4 Ha (secondary mangrove). The area's location is very strategic, on homecoming transportation, community economy, settlements and urban development in South Manokwari Regency. Development activities in South Manokwari Regency, a New Autonomous Region, have a real impact on the region. The pressures in question are the retrieval and theft of mangrove resources, the opening of areas for boat moorings and coconut plantations, the construction plan of container ports, illegal logging and settlements [1]. According to Presidential Decree No. 32 of 1990

concerning The Management of Protected Areas, it is mentioned that mangrove forested coastal areas are coastal areas that are natural habitats that serve to protect coastal and ocean life.

Meanwhile, according to Presidential Regulation No. 12 of 2012, to establish the right management strategy, comprehensive data and information are needed as the basis for planning management and utilization to improve the community's welfare. Some research that has been done in the mangrove area of Oransbari are still limited to the disclosure of the wealth of flora and fauna and the condition of the surrounding community. No research has yet been able to provide alternative management recommendations for the region in the future, so this research is expected to provide alternative recommendations in planning this area's management





Figure 2 Mangrove vegetation in Oransbari Area



Figure 3 Utilization of Oransbari mangrove area

### 2.2.1. SWOT Analysis (Strengths, Weaknesses, Opportunities, and Threats)

SWOT analysis is used to systematically identify various factors to formulate multiple management strategies that form the basis for managing and utilizing, and preserving the Oransbari mangrove area. The elements in question consist of internal environmental

factors (including sub-factors of strength and weakness) and external environment (covering the sub-factors of opportunity and threat). The stages carried out consist of (1) the data retrieval stage is the evaluation of internal and external factors, (2) the analysis stage is the creation of an internal and external factor evaluation matrix as well as a TOWS/SWOT matrix (3) decision-making stage.



### 2.2.2. AHP Analysis (Analytical Hierarchy Process)

AHP is an analysis used in decision making with a system approach where decision-makers try to understand a system condition and make predictions in making decisions [2]. The decision-making process is choosing an alternative. The leading equipment of AHP is a functional hierarchy, with its primary input being human perception. With AHP, a complex and unstructured problem solved into its groups; the group is organized into a hierarchy. The use of AHP is intended for the process of tracing questions to help decision-making choose the best strategy by (1) observe and re-examine the objectives and alternative approaches or ways of acting to achieve goals, in this case, acceptable policy, (2) quantitatively comparing in terms of cost/economy, benefits and risks of each alternative, (3) choose the best option to implement, (4) making policy strategies for mangrove area management optimally, by determining the priority of activities, where the use of AHP to give weight or priority strategy of SWOT results carried out on the problems of mangrove area Oransbari. It can then be recommended as a management strategy by all stakeholders.

### 3. RESULT AND DISCUSSION

Figure 2 shows the mangrove forest area, which is administratively located in the Oransbari District. Based on its geographical location, the Northern Oransbari District is bordered by Tanah Rubuh District, west of Membey District, east of Cenderawasih Bay Sea and South bordered by Ransiki District. This area is landscaped or physiographically has a type of lagoon mangrove area. This can be seen from the physical condition, and the shape of the area is unique and not watered by the river flow. Land in the Oransbari mangrove area has a pH value between 7.34–7.70 with an average of 7.40. Mangroves grow on mud and clay mixed with an organic matter with mud thickness that varies between 35-100 cm.

Mangrove vegetation types are found to grow and develop well, namely: *Rhizophora mucronata*, *R. stylosa*, *Avicennia alba*, *A. marina*, *A. lanata*, *Sonneratia alba*, *S. caseolaris*, *Bruguiera gymnorrhiza*, *B. parviflora*, *B. sexangula*, *Ceriops decandra*, *C. tagal*, *Xylocarpus granatum* and *X. mulucensis*. There are several changes in the landscape in the mangrove area. The changes in question occur geomorphologically, both spatially and temporally. The change in the landscape, resulting in the utilization carried out by the surrounding community (Figure 3). Some of them as boat moorings, fungi transfer part of the land into coconut plantations and port development in the mangrove area.

### 3.1. Internal and External Strategic Factors of Mangrove Management in the Oransbari Area

Based on SWOT analysis results, obtained identification and evaluation of internal strategic factors (strengths and weaknesses) and external strategic factors (opportunities and threats) management of Oransbari Mangrove Area. The identification results are presented in Table 1. Based on IFE (Internal Factor Evaluation) matrix and EFE (External Factor Evaluation) matrix in Table 1, it can be known the internal and external position of Oransbari Mangrove Area management efforts as follows (Figure 4).

Figure 4 indicates that the management position of the Oransbari mangrove area is in quadrant III. This suggests that the Oransbari Mangrove Area management has many opportunities (based on the total threat-chance-factor score of 2.04 above the average of 2) and faces a considerable weakness (based on the total score of the strength-weakness factor of -0.60). Given these conditions, the strategy must be done to take advantage of opportunities to overcome weaknesses (WO Strategy) through diversification strategies (Marimin, 2004). Wo's strategy aims to rectify internal shortcomings by exploiting opportunities from outside environments. Any options that cannot be fulfilled due to lack of them must be sought out by utilizing other available forces [3].

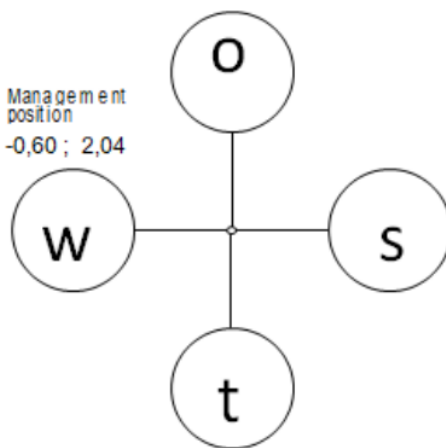


Figure 4 Management position of Oransbari mangrove area

**Table 1.** Internal Factor Evaluation (IFE) and External Factor Evaluation (EFE) Matrix of Oransbari Mangrove Area Management

Description of Internal and External Factors	Weights	Rating	Score
<b>Strengths</b>			
● Strategic location and easy to reach	0.18	3	0.54
● Ecotourism Potential	0.32	3	0.96
● Unique landscapes, also flora and fauna	0.23	3	0.69
● Local Socio-Cultural Values	0.04	1	0.04
● Dependence on Mangrove SDA	0.23	2	0.46
<b>Weaknesses</b>			
● Lack of regional data and information	0.25	4	1.00
● HR Management.	0.17	2	0.34
● Lack of sarpras	0.08	3	0.24
● Lack of funding	0.21	4	0.84
● Lack of education and counseling	0.29	3	0.87
<b>Total Strength-Weakness Factor Score</b>			<b>-0.60</b>
<b>Opportunities</b>			
● Declaration of West Papua as a Conservation Province	0.27	3	1.08
● Government support for mangrove protection and conservation	0.27	3	1.08
● Community economic development	0.23	2	0.69
● Close to the city center and government	0.09	2	0.27
● The existence of rules on mangrove protected areas	0.14	1	0.42
<b>Threats</b>			
• Increasing Population around high areas	0.29	2	0.58
• Economic motives / transfer of land functions for the benefit of housing and offices	0.17	1	0.17
• Illegal logging and theft of natural resources	0.21	2	0.42
• Weak law enforcement	0.25	1	0.25
• Landfill	0.08	1	0.08
<b>Total Threat-Opportunity Factor Score</b>			<b>2.04</b>

### 3.2. Management Strategy of Oransbari Mangrove Area

#### 3.2.1. Strategy Determination Based on SWOT Analysis

Based on the reference to the issues in the matrix IFE and EFE (Table 1), various strategies were obtained based on SWOT Analysis results for managing the

Oransbari Mangrove Area. The strategy is presented in Table 2. Table 2 has produced various SO, ST, WT and WT strategies. These strategies were developed based on the results of internal and external studies (Rangkuti, 2017) related to the condition of the Oransbari mangrove area management efforts. The SO strategy developed given regional management efforts by the authorized agency (Environment Agency of South Manokwari Regency) has many strengths and opportunities. The SO strategy includes Regional has

**Table 2.** SWOT Analysis Matrix of Oransbari Mangrove Area Management Strategy

	<p><b>Strengths:</b></p> <ol style="list-style-type: none"> <li>1. Strategic location and easy to reach</li> <li>2. Ecotourism potential</li> <li>3. Unique landscape, flora and fauna</li> <li>4. Strong socio-cultural values in local management</li> <li>5. Economic benefits for local people's income</li> </ol>	<p><b>Weaknesses:</b></p> <ol style="list-style-type: none"> <li>1. Lack of regional data and information</li> <li>2. Lack of human resource management</li> <li>3. Lack of facilities</li> <li>4. Lack of funding</li> <li>5. Lack of education and counseling</li> </ol>
<p><b>Opportunities:</b></p> <ol style="list-style-type: none"> <li>1. West Papua as a conservation province</li> <li>2. Government support for the protection and preservation of the area</li> <li>3. Close to offices and city centers of South Manokwari</li> <li>4. Community economic development</li> <li>5. The existence of rules on mangrove protected areas</li> </ol>	<p><b>SO Strategy</b></p> <ol style="list-style-type: none"> <li>1. Conservation and regional development supports West Papua as a conservation province</li> <li>2. Utilization of regional potential to improve the welfare of the community</li> <li>3. Socio-cultural value and uniqueness and natural potential for the protection and preservation of the area</li> </ol>	<p><b>WO Strategy</b></p> <ol style="list-style-type: none"> <li>1. Increased studies and research in supporting West Papua as a conservation province</li> <li>2. Take advantage of government support for the improvement of facilities, the provision of human resources managers</li> <li>3. Encourage funding for education and counseling</li> </ol>
<p><b>Threats:</b></p> <ol style="list-style-type: none"> <li>1. The increase in population around the area is quite high</li> <li>2. Economic motives/transfer of land functions for other purposes</li> <li>3. Illegal logging and theft of natural resources</li> <li>4. Weak law enforcement</li> <li>5. Landfill</li> </ol>	<p><b>ST Strategy</b></p> <ol style="list-style-type: none"> <li>1. Development of nature tourism for residents</li> <li>2. Socio-cultural values and economic benefits to protect the region</li> <li>3. Community involvement to maintain and maintain the</li> </ol>	<p><b>WT Strategy</b></p> <ol style="list-style-type: none"> <li>1. Empowerment of local customary institutions</li> <li>2. Intervention in providing economic alternatives to local communities</li> <li>3. Institutional forms for managing the region</li> </ol>

some strengths and opportunities. The SO strategy includes Regional Conservation and Development to support West Papua as a Conservation Province, utilize regional potentials to improve community welfare and promote Socio-Cultural Value and Uniqueness and Natural Potential for the region's protection preservation.

WO strategy developed considering the efforts to manage the region has several weaknesses and opportunities, thus giving birth to several strategies including (1) improving studies and research in supporting West Papua as a Conservation Province, (2) utilizing government support for facilities improvement, (3) provision of human resources management, (4)

funding for education and counselling. Furthermore, a strategy developed based on consideration of the strength and threat in the management of Mangrove Area Oransbari. Strategies developed in this condition are developing natural tourism for residents, and socio-cultural values and economic benefits to protecting the region and community involvement to maintain and maintain the region. This is also the case in Perak and Selangor that community involvement in maintaining the area is significant, especially raising awareness that should be done starting from the village (grassroots), district, and provincial levels; with the division of authority and responsibility between policymakers and non-governmental organizations [4]. Furthermore,

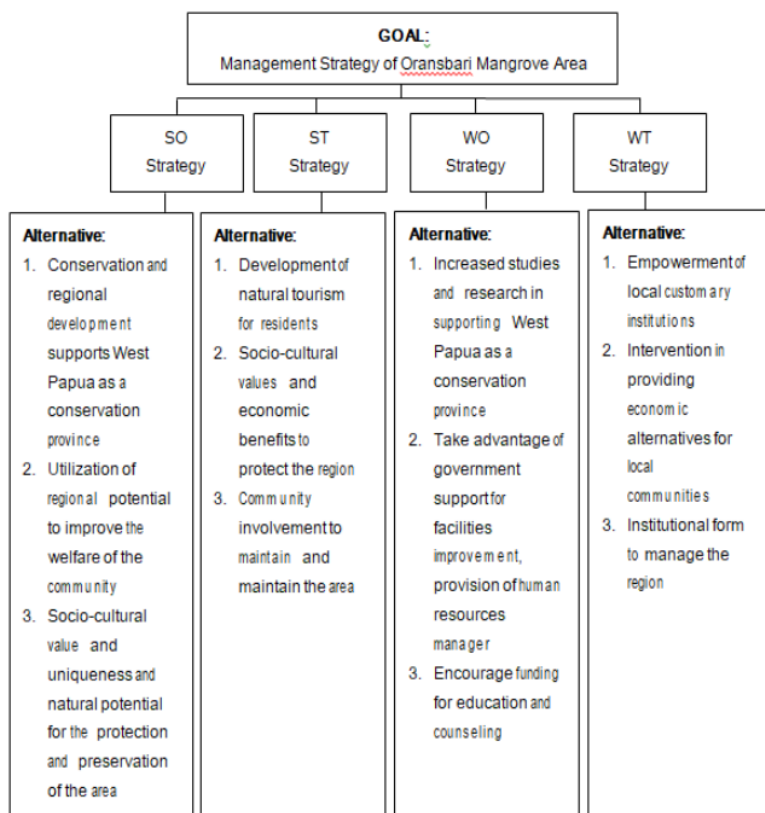


Figure 5 Composition of Oransbari Mangrove Area Management Problems

active local community engagement should start from the planning stage to the reporting stage, and this process is documented to facilitate tracking and replication elsewhere [5].

Lastly, WT strategy was developed based on various weaknesses and threats that have in regional management efforts. The appropriate strategies applied to these conditions are (1) empowerment of local customary institutions, (2) intervening in providing economic alternatives for local communities, and (3) establishing institutions to manage the Oransbari Mangrove Area. Furthermore, suppose all of these strategies are applied in the management efforts of the Oransbari Mangrove Area. In that case, it is expected to increase the economic growth of local communities and positively impact welfare while maintaining the stability and sustainability of the Oransbari mangrove area. On the other hand, institutional and local government support is necessary for preserving local mangrove

areas. The existence of inappropriate and ineffective laws and policies will result in failures in sustainable mangrove management in West Africa [6]. The lack of rules regarding agencies that handle mangrove management causes many agencies involved, but the planning is not coordinated. This resulted in a lack of consideration of mangrove forests in management decisions [6]. Following the research's objectives, the goal in the hierarchical structure is the management strategy of the Oransbari mangrove area. Furthermore, the criteria and alternatives to achieve these goals are derived from four strategies (SO, ST, WO, WT). Simply decomposition is as follows (Figure 5).

3.2.2. Priority Strategy Determination in Mangrove Oransbari Area Management

Alternative strategies based on SWOT analysis results are followed up with AHP to determine each strategy's priorities used as a reference in mangrove



**Table 3.** SO Strategy Priority of Oransbari Mangrove Area Management

No.	SO Strategy	Comparative Value
1.	Utilization of regional potential to improve the welfare of the community	0.550
2.	Regional conservation and development supports West Papua as a conservation Province	0.240
3.	Socio-cultural values and uniqueness and natural potential for the protection and preservation of the area	0.210

**Table 4.** ST Strategy Priority of Oransbari Mangrove Area Management

No.	SO Strategy	Comparative Value
1.	Socio-Cultural Values and Economic Benefits to protect the Region	0.540
2.	Community Involvement to Maintain and Maintain The Area	0.257
3.	Natural Tourism Development for Residents	0.163

**Table 5.** WO Strategy Priority of Oransbari Mangrove Area Management

No.	SO Strategy	Comparative Value
1.	Take advantage of government support for facilities improvement, provision of human resources managers	0.540
2.	Encourage funding for education and counseling	0.297
3.	Improvement of studies and research in supporting West Papua as a conservation province	0.163

**Table 6.** WT Strategy Priority of Oransbari Mangrove Area Management

No.	SO Strategy	Comparative Value
1.	Interventions in the provision of economic alternatives to local communities	0.594
2.	Empowerment of local indigenous institutions	0.249
3.	Institutional forms for managing the region	0.157

area management efforts Oransbari. The strategy priority analysis with AHP shows that the SO strategy for managing the Oransbari mangrove area is arranged like Table 3.

Table 3 shows that the highest comparative value in the Regional Potential Utilization strategy for Community Welfare Improvement is 0.550, with an inconsistency of 0.02 for all three management strategies. This shows that the priority of regional management is to use and manage the area for the welfare of the surrounding community, where the economic level of the local community becomes a problem point so that the pressure on mangrove natural resources tends to be high. The community needs to improve living standards by increasing household incomes that depend on mangrove areas so that appropriate strategies and efforts are required to manage mangrove areas while still supporting the economic benefits of resources for local communities [7]. Furthermore, the next strategy is to preserve and

develop the region in supporting West Papua as a Conservation Province. Since October 19, 2015, West Papua has been declared a Conservation Province; thus, the Conservation Province's absolute requirement is that protected areas or conservation areas must be maintained or improved. Attention to conservation policy is carried out without compromising economic benefits for the future of people in West Papua, especially people living around conservation areas. The protection of conservation areas requires commitment and policy of partiality from the Government as implemented in the Wain River Protected Forest (HLSW) of Balikpapan City [3]. The following strategies that need to be carried out in the management efforts are socio-cultural values, uniqueness, and natural potential for protecting and preserving the area. The Oransbari area also has customs and social values, and cultural values related to the surrounding forest areas. Given these values as customs and beliefs hereditary, it is essential to be maintained and used in maintaining existing mangrove areas. This will benefit the region's

sustainability and preserve its condition in providing positive benefits for the surrounding community's lives. The priority of ST strategy following the AHP calculation results in the Oransbari Mangrove Area can be prepared as follows.

Based on Table 4, the strategy's priority is on socio-cultural values and economic benefits to protect the region with a comparative value of 0.540. The second and third strategies with comparative values of 0.257 and 0.163, respectively. The inconsistency between the three strategies is 0.24. The priority is due to the socio-cultural value that becomes a positive habit in the community's view of the mangrove area, also strengthened by the economic benefits that can be felt by the community with the availability of natural resources, will be the power to maintain and preserve the mangrove area. Furthermore, community engagement strategies to keep the area is also an essential strategy in management efforts, considering the involvement of local communities as owners to be absolute in the planning stage until evaluation and monitoring of various actions and programs that will be carried out in the management of the Mangrove Area Oransbari. Local communities' involvement as owners of the area is absolutely carried out in efforts to manage mangrove areas to achieve optimal success, especially when planning to monitor and evaluate regional management [8].

The third strategy is the development of natural tourism for residents, intended because this area's natural potential can be used as a tourist attraction or developed to be enjoyed by locals and residents from outside or in the city of South Manokwari and its surroundings. The change of primary mangrove forest to secondary mangrove forest is caused by logging activities for the firewood, charcoal and pond areas and agricultural areas [9]. This is triggered by the increase of population around the mangrove area so that the need for land and utilization of mangrove resources for household needs can harm this area's sustainability. Suppose the area is not managed correctly to give a positive impact on the population. In that case, there will be bad prejudices against the area, which is not controlled and marginalized so that anyone can freely take natural resources unilaterally. This will impact damage and other benefits that will damage the area and the Oransbari Mangrove Area's future. It is expected that the government and local communities' cooperation to maintain and maintain this area as the only mangrove asset in South Manokwari Regency while preserving its benefits in a balanced manner between ecological and economic benefits.

WO Strategy Priorities based on the table above shows that the importance of the benefits of government support for the improvement of facilities and infrastructure in the mangrove area of Oransbari and the

provision of Human Resources Managers with a comparative value of 0.540, strategies for the provision of human resources managers, especially in authorized agencies (0.297), or conservation cadres both from the Government and volunteers and local communities. This is intended so that this area as a protected area still gets full attention from the Government, especially in terms of supporting facilities and infrastructure for the management of local mangrove areas. Another management effort in the WO strategy is funding and education, and counselling efforts to be an essential strategy to do, considering that budget is often the main obstacle in a region's management efforts. All planning will be done if not supported by sufficient funding. Funding can be pursued through NGOs, governments or private sectors who want to manage and even have programs and activities directly related to the region. These efforts can be made in conjunction with education and counselling for management staff and local communities so that they are more aware of the importance of existing protected/conservation areas to be managed to fulfil community welfare. Mangrove management efforts can be successful if done with good planning, the continuous implementation of activities and adequate financing available to support all programs and plans made [10].

The third fundamental strategy is improving research and study of the region, where regional information is still very minimal. The existence of universities and several institutions of study in the region can be used to conduct a thorough review of the area so that complete data and information can be obtained to become the planning and management of the region. The availability of data and information about an area's natural resources is necessary as the basis for planning and managing the local area [11]. The completeness of data and information about a conservation area's natural resources will ensure the success of the area's management due to the programs and activities to be carried out supported by a complete database of the area.

Based on the table above shows that the order of strategic priorities that is an intervention in providing economic benefits to local communities is a priority strategy that needs to be carried out in the management efforts of the Mangrove Area Oransbari. Considering the financial demands are the main reason for the community in meeting their needs, which are sourced from the natural resources of the surrounding mangroves. Thus, intervention in providing economic alternatives for local communities becomes an important strategy because it will give financial options in meeting people's living needs, not to impact the destruction and excessive pressure on the natural resources of mangroves around them. Economic factor (poverty) is one of the main factors that encourage the utilization of mangrove natural resources. This is due to

the availability of natural resources lacking in a region, combined with socio-cultural factors, and the population will cause excessive pressure on the utilization of mangrove natural resources [12].

Furthermore, the strategy of empowerment of local customary institutions is also the second priority considering that there are customary institutions or clans in charge of solving various indigenous problems in local indigenous communities. So far, the issue has been resolved more on buying and selling customary land, family problems and other customary problems unrelated to preserving the Oransbari mangrove area. Therefore, customary institutions' empowerment to organize and manage and become local institutions that are also fully responsible for the conservation and management of mangrove areas is vital to do [13]. It is expected that local institutions understand a sense of responsibility and attention to the problems and efforts made in maintaining, maintaining, and managing the Oransbari mangrove area. Other strategic actions that need to be done is empowering local customary institutions. It can also be carried out by establishing regional management institutions derived from various elements of society/environmentalists, Government and private. It is expected that the established institutions can specifically manage and maintain existing mangrove areas such as those in Bali and Bontang. Until now, management institutions have not been formed in the management of mangrove areas in Oransbari, so in the future institutional managers need to be created by the Government to plan and manage the Oransbari mangrove area specifically.

#### 4. CONCLUSION

Internal factors of the strength of mangrove areas the Oransbari is a strategic location and easy to reach, eco-tourism potential, uniqueness of landscapes and flora and fauna, essential values of local socio-culture, dependence on mangrove resources. Internal factors in the form of weaknesses are lack of data and regional information, human resource management, lack of facilities and infrastructure, lack of funding and lack of education and counselling. External factors of opportunity are the Declaration of West Papua as a Conservation Province, the Government's support for mangrove protection and conservation, community economic development, close to the city centre and the Government, and rules on mangrove protected areas. External factors are increase or growth of the population around high areas, economic motives/land transfer for offices/housing/plantations, illegal logging and theft of mangrove natural resources, weak law enforcement. Management of mangrove areas the Oransbari following the order of priority strategies produced is the utilization of regional potential to improve the welfare of the community, socio-cultural values and economic benefits

to protecting the region, utilization of government support to improve facilities and infrastructure and the need for intervention in providing economic alternatives for local communities.

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