

# Sustainable Strategy of Charcoal (Panglong Arang) Management in the Bengkalis Regency

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## Abstract—

**Background and Purpose:** Charcoal is a residue that occurs from the results of decomposition of wood due to heat when most of the chemical components are carbon. One method of making wood charcoal is to use a stove. Charcoal is an important factor in determining the sustainability of the lives of surrounding communities that have long been running. Therefore the purpose of this study is to create a strategy based on the SWOT analysis to see if the charcoal business using mangrove forests can proceed or not.

**Materials and Methods:** Analysis of sustainable development strategies using SWOT Analysis which is one of the analyses used to formulate a strategy in an area of development. This analysis consists of 4 basic elements, namely strengths, weaknesses, opportunities and threats. These four elements come from two main factors: internal factors (strengths and weaknesses) and external factors (opportunities and threats). While the stages in the SWOT analysis.

**Results:** Analysis of public perception of the existence of charcoal trading business in the Bengkalis District gave a “Good response” with a score of 2.66. These results illustrate that the existence of a charcoal trading business does not provide a bad impact as long as it is in a location around a mangrove forest. The results obtained in the SWOT matrix diagram are in the fourth quadrant; show that the priority of the strategy is the Strength (S) and Threats (T) strategies. The components in these two strategies need to get more emphasis and attention so that the existence of a charcoal trading business can be sustainable.

**Conclusion:** The public perception of the charcoal long-standing regulation in the “Bengkalis Regency” is in the “Good category” which is a prerequisite in the development of continuous charcoal. The strategy for sustainable charcoal development is in quadrant IV, namely the S-T strategy.

**Keywords:** Panglong Arang, SWOT, Sustainable.

## I. INTRODUCTION AND BACKGROUND

Mangroves are found within estuarine and coastal waterways in tropical and subtropical areas. The fauna found in mangroves is therefore also associated with estuarine and coastal waters, making it difficult to separate the importance of mangroves in their life cycle with other features of these water bodies (Manson, 2005). The diversity of the mangrove species growing on this wetland ecosystem is influenced by various factors, including soil conditions, the rate of tides, salinity, levels of inundation (Ari, 2016). Charcoal is a product produced from the carbonization process of materials containing carbon, especially wood biomass. This product is mainly used as an energy source. The process of making charcoal can actually be produced differently, for example ordinary charcoal from combustion is only used as an energy source to produce heat. While charcoal through the activation process its functions can be used for health, pertanian, beauty, electronics, and other things.

Mangroves are very productive ecosystems. Various mangrove products can be produced either directly or indirectly, including: firewood, building materials, household, paper, leather, medicine and fisheries. Seeing the various benefits of mangroves, the levels and rates of rural economies in coastal areas are often very dependent on the surrounding mangrove

habitat (Mariana & Zulkarnaini, 2016). For example, coastal fisheries that are heavily influenced by the presence of mangroves are products that indirectly affect the standard of living and economy of fishing villages.

The history of traditional mangrove utilization by the community for firewood and buildings has been going on for a long time. Even the use of mangroves for commercial purposes such as exports of wood; leather (for dying) and charcoal also have a long history. Mangrove charcoal production has been going on since the past century in Riau and is still ongoing today (Fitri, 2014).

Based on the research of Onrizal & Kusmana (2008) the cause of changes in the mangrove forest cover at the study site was caused by land conversion, logging of mangrove forests for charcoal production carried out by charcoal panglong and lack of public awareness to care for mangrove forests.

**II. MATERIALS AND METHODS**

Mangrove forests in the community are often referred to as mangroves or brackish forests. However, the mention of mangroves as mangroves seems to be inappropriate because mangroves are one of the names of the species groups in mangroves. Mangrove forests is a group of plant species that grows along the tropical to sub-tropical coastline which has special functions in an environment that contains salt and land forms in the form of beaches with anaerobic soil reactions. In summary, mangrove forests can be defined as a type of forest that grows near tidal areas (especially on protected beaches, lagoons, river estuaries) which are inundated and free of puddles at low tides, whose plant communities tolerate salt (Anwar, 2010).

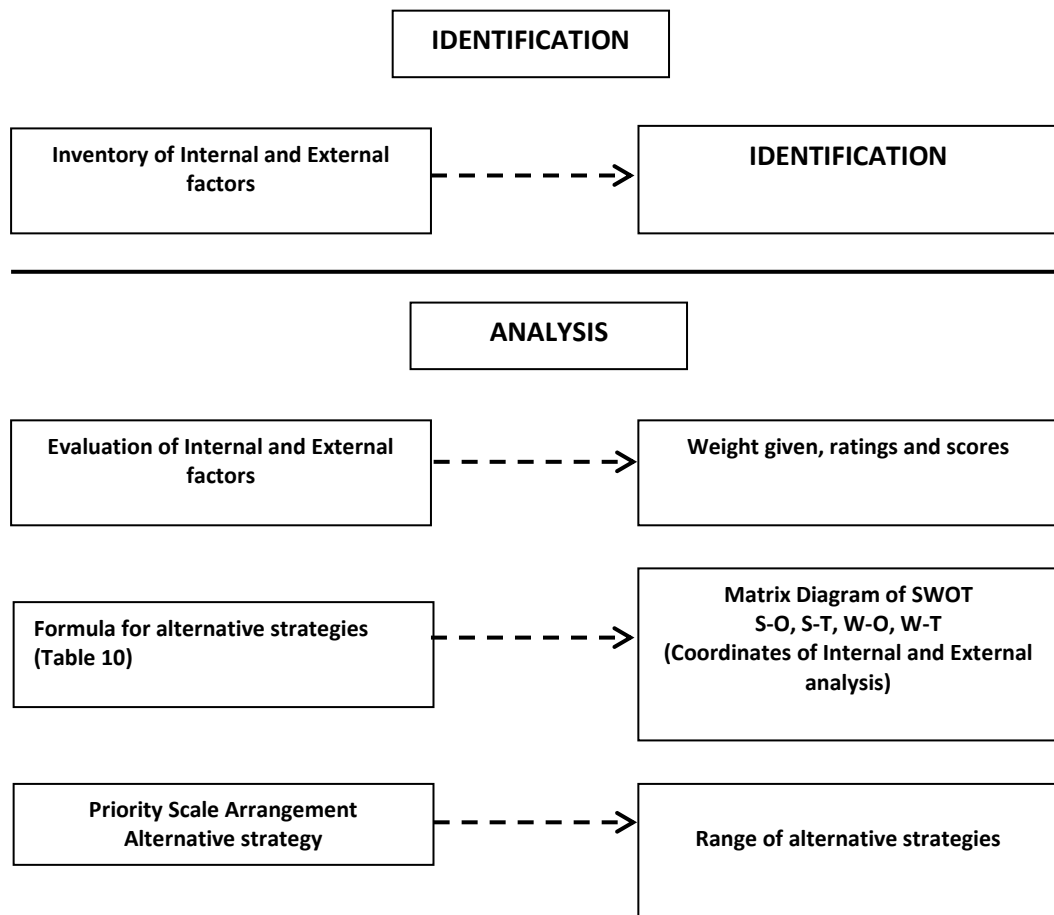
A Mangrove ecosystem is a system in nature where life takes place which reflects the reciprocal relationship between living things and their environment and between living things themselves, found in coastal areas, affected by tides, and dominated by species of trees or shrubs that are typical and able to grow in salty / brackish waters (Jhonnerie, 2014). Rhizophoraceae species such as *R. apiculata*, *R. mucronata*, and *B. gymnorhiza* are good quality firewood because they produce high heat and are durable. The selling price of firewood in the village market is Rp. 13,000 / m<sup>3</sup> which is enough to cook for a month with a family of three children. Mangrove firewood is very efficient, with a diameter of 8 cm and a length of 50 cm is enough for one cooking for 5 people. Firewood is very important for the community, especially from the poor when fuel prices soar (Bidullah, 2013).

Public perception of charcoal (Panglong Arang) is done by using a questionnaire based on a housing quality indicator (HQI) and the Likert Scale (Winarno, 2007).

**TABLE 1**  
**PUBLIC PERCEPTION CATEGORIES BASED ON THE HOUSING QUALITY INDICATOR (HQI)**

Interval	Categories
1.0 - < 1.75	Really bad (RB)
≥ 1.75 - < 2.5	Bad (B)
≥ 2.5 - < 3.25	Good (G)
≥ 3.25 - 4.0	Really good (RG)

Sustainable development strategy analysis using SWOT Analysis which is one of the analyses used to formulate a strategy in a field of development. This analysis consists of 4 basic elements, namely strengths, weaknesses, opportunities and threats. These four elements come from two main factors: internal factors (strengths and weaknesses) and external factors (opportunities and threats). While the stages in the SWOT analysis are illustrated in Figure 1.



**FIGURE 1: Illustration of the stages of the SWOT Analysis in formulating a sustainable development strategy for charcoal in the “Bengkalis Regency” (Rangkuti, 2014)**

**III. RESULTS**

**3.1 Results of Community Perception**

Analysis of public perception of the existence of charcoal long-standing business in Bengkalis gave a response of Good response with a score of 2.66 as shown in Table 1. These results provide an illustration that the existence of a charcoal trading business does not provide a bad impact during its presence in the surrounding mangrove forest.

**TABLE 1  
CRITERIA FOR MAKING DECISIONS BASED ON THE PUBLIC PERCEPTION OF PANGLONG ARANG ENTERPRISES IN THE “BENGKALIS REGENCY”**

No	Interval	Category	Results	Decision
1	1,0 - < 1,75	Really bad (RB)	2.66	<i>Good</i>
2	>= 1,75 - < 2,5	Bad (B)		
3	>=2,5 - < 3,25	Good (G)		
4	>=3,25 - 4,0	Really Good (RG)		

Further study on the existence of the charcoal-burning business according to the perception of the community around the charcoal panglong is in accordance with the results of the question-and-answers that the existence of charcoal panglong economically is quite helpful for the lives of local residents, especially for rural tribes who for years earned a living in the charcoal trading business. Therefore Table 9 reinforces that the existence of charcoal stocks needs to be maintained. On the other hand, the existence of the charcoal trading business is very helpful for the local government in fulfilling employment opportunities for the community around coal trading, the inability of the government to provide new jobs and the limited ability of the community around charcoal to move to other jobs is a big obstacle for the government to close the charcoal trading business, while the daily needs of the community must be fulfilled.

### 3.2 Results of a Sustainable Charcoal (Panglong Arang) Management Strategy

Due to the existence of the charcoal trading business which been running continuously and the results of public perception show results in the Good category (2.66), then the next step is to make an analysis of the sustainability strategy of the charcoal trading business in the “Bengkalis Regency”. The strategy developed in this study is based on the indicator of the management of charcoal panglong business. By making several strategies and alternative strategies in maintaining and developing the charcoal trading business so that the results are expected to be able to provide solutions to the sustainability of the charcoal trading business that are strong in the ecological, economic and social sectors.

This research relies heavily on the initial results obtained from the public's perception of the existence of a charcoal trading business. The purpose of the community perception in the previous analysis (sub-chapter 4.5) is the precondition that needs to be done before the SWOT analysis is carried out, so that the strategy developed really gives a better impact when applied in the field where the charcoal business is located. Community perception can be said to be new findings in the development of SWOT, AHP and the like strategies.

**TABLE 2**  
**SCORES IN DETERMINING THE COORDINATES OF THE CARTESIAN INTERNAL STRATEGY (X) AND THE EXTERNAL STRATEGY (Y)**

Internal Strategy		Weight	Rating	Score	X
Strength (S)	S1	0.199	3.7	0.736	
	S2	0.152	3.3	0.502	
	S3	0.164	3.6	0.589	
	S4	0.164	3.5	0.573	
	S5	0.164	3.5	0.573	
	S6	0.158	3.2	0.505	
				3.478	
					<b>0.02</b>
Weaknesses (W)	W1	0.169	3.3	0.558	
	W2	0.174	3.9	0.677	
	W3	0.155	3.9	0.604	
	W4	0.174	3.4	0.591	
	W5	0.164	3	0.493	
	W6	0.164	3.1	0.509	
				3.432	
External Strategy					Y
Opportunities (O)	O1	0.202	3.4	0.687	
	O2	0.176	2.6	0.458	
	O3	0.176	2.8	0.493	
	O4	0.083	2.8	0.232	
	O5	0.187	2.7	0.504	
	O6	0.176	3.4	0.599	
				2.973	
					<b>-0.26</b>
Threats (T)	T1	0.170	3.7	0.628	
	T2	0.160	3.3	0.529	
	T3	0.151	3.7	0.558	
	T4	0.189	3.5	0.660	
	T5	0.179	3.5	0.627	
	T6	0.151	3.2	0.483	
				3.487	

A strategy cannot be developed if the results of the initial study do not support the next step. In this study a strategy can be developed because it has gained initial perceptions from the community around the charcoal business in the Good category. Based on the results in Table 10, they show the x and y coordinates, so it is very easy to put positions in each quadrant on the coordinate system of the Cartesian SWOT strategy.

## IV. DISCUSSION

### 4.1 Community Perception

The charcoal “Panglong Arang” that has been built so far provides hope for the welfare of the community when they need to make a livelihood in order to fulfill their living needs, while the government's effort to provide a decent life in the aspect of employment is not yet sufficient. The proof of the response of the community is a score of 2.66 (Good), which illustrates that they still hope that the existence of a charcoal trading business has been proven to be able to provide a solution for the survival of their families. Priceless gratitude from the managers (owners) of the charcoal companies who provide sources of livelihood like those that are interrelated. The results of community perceptions in this study illustrate that the existence of the charcoal trading business only needs to be better managed by not damaging the surrounding environment so as to give great hope in the development in the ecological, economic and social sectors.

It can be said that in this case the mangrove forest is the main source of the surrounding community in running the economy and the survival of the community through mediation of the charcoal trading business, just how can this charcoal business be developed to become a sustainable charcoal business. Another effort that can be developed in this study is based on the results obtained from the questionnaire with a score of 2.66 (Good), giving the researcher an idea to develop a sustainable development strategy for charcoal in the “Bengkalis Regency”.

### 4.2 Sustainable Charcoal (Panglong Arang) Management Strategy

The results obtained in the SWOT matrix diagram in Figure 2 are in the fourth quadrant, this shows that the priority strategy is the Strength (S) and Threats (T) strategies. The components in these two strategies need to get more emphasis and attention so that the existence of a charcoal trading business can run well and be sustainable. Based on this value, where the threat factor is slightly greater than the strength factor (0.02; -0.26), this illustrates that in addition to the charcoal trading business permit, environmental damage and the existence of land conversion function constitute the biggest threat to the sustainability of the charcoal trading business. For example, the existence of land conversion into a shrimp pond has penetrated the location of a charcoal trading business.

The existence of shrimp farming business uses a small amount of land, so the supply of raw materials for charcoal, especially white mangroves (*Rhizophora apiculata*) is very difficult to find. To overcome this problem it is necessary to utilize the existing strengths as stated in the Strength (S) component. To reduce human activity in exploiting mangrove forest, it is necessary to do mangrove forest management which has legal force. Given the importance of the role of mangrove for coastal communities, either directly or indirectly, these natural resources must be managed as well as possible. The essence of good mangrove forest management is to provide opportunities for people living around the coast to participate and cooperate with government officials (Mita, 2017).

According to Costanza et al. (1997) calculated that the economic value of estuaries in terms of services and natural capital per hectare was the highest of all ecosystems. Tropical mangrove systems, in particular, are zones of high productivity (Blaber, 2000), and assuming that most of the fisheries productivity is closely linked to mangroves, a number of recent studies have emphasized the economic value of mangroves, especially in the developing world (Hamilton et al., 1989; Barbier and Strand, 1998; Nickerson, 1999; Barbier, 2000).

The strength component consists of permits to manage environmentally friendly mangrove forests by the Regulations of the Regent and the Ministry of the Environment, community support based on the results of perceptions given, the equipment used adheres to Local Knowledge and Ethno technology which are very environmentally friendly.

**TABLE 3**  
**RANKING AND PRIORITY STRATEGY DETERMINATION**

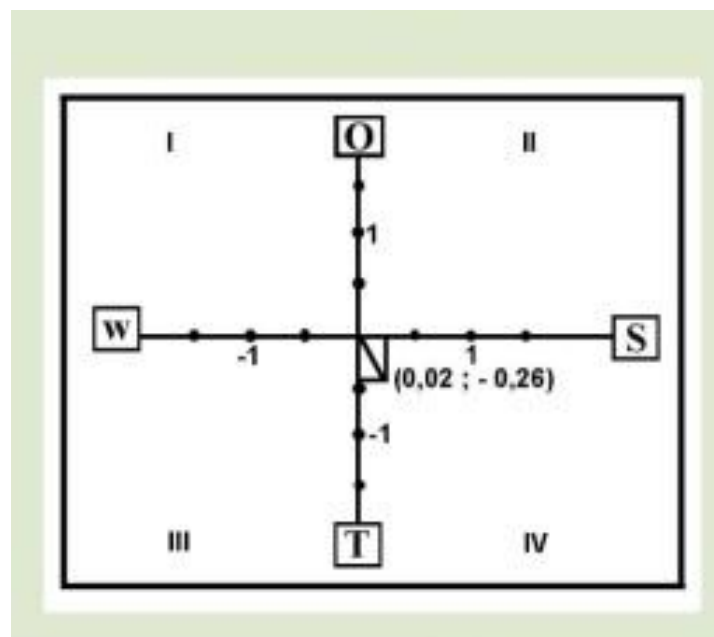
Quadrant	Position point		Area matrix	Ranking	Strategic Priority
I	3.48	2.97	10.34	3	S-O
II	3.43	2.97	10.20	4	W-O
III	3.43	3.49	11.97	2	W-T
IV	3.48	3.49	12.13	1	S-T

Based on Table 3, it can be seen that the highest strategic priority is in quadrant IV, namely S-T. In this strategy analysis, it can be detailed in the S-T components that need to be a concern in the continuous development of the charcoal-burning business in the “Bengkalis Regency”. The strength factors consist of:

1. Fertile areas with high biodiversity
2. The condition of river waters that have not been polluted by industrial waste
3. The availability of cooperative groups in the management of charcoal and mangrove forests
4. Market demand for both local and international charcoal is quite high
5. Aquatic resources for the community of freshwater organisms
6. There are local government regulations and ministerial regulations in coastal mangrove management.

While the threat factor (Threats) consists of:

1. Commercial charcoal businesses create waste that threatens the sustainability of mangroves
2. Panglong charcoal business threatens the existence of flora and fauna
3. Efforts to develop long-term businesses that benefit third parties (foreigners) such as charcoal smuggling
4. The occurrence of land conversion such as large shrimp ponds can threaten the destruction of mangrove forests and charcoal trading businesses
5. The high intensity of law violations in the use of forests and rivers
6. Excessive exploitation of mangrove resources.



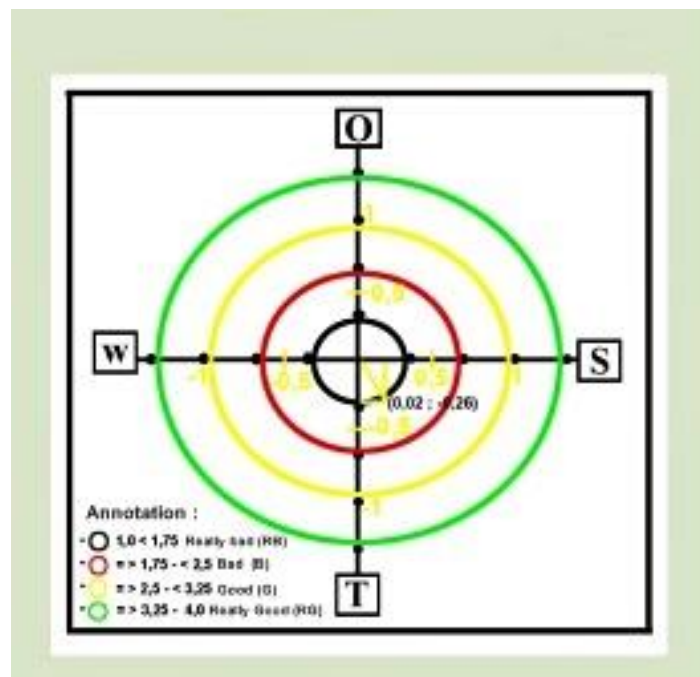
**FIGURE 2. SWOT matrix diagram for the management of charcoal long business in Bengkalis Regency**

These twelve factors can be seen in Figure 2 and 3. Figure 2 is a SWOT matrix diagram with priority and ranking scales in quadrant IV where the existence of a long-term business really needs an emphasis on quadrant IV because the existence of a charcoal trading business needs more attention because the results of the questions and answers with the surrounding community give the same picture of their desire to maintain this charcoal business. If these twelve components can be localized, the existence of a charcoal trading business in an effort to sustain the district economy and environmental sustainability, it will run well. With the spatial planning will provide the regularity in the implementation of development and will avoid the occurrence of abuse in the allocation of space and excessively use of resources without regard to aspect of sustainability (Marliana, 2012).

In the general strategy matrix diagram, the overall factors that need to be improved in the management of sustainable charcoal business are illustrated. Furthermore, it can be made a determinant of the success of the sustainable development strategy of charcoal long-standing business in Bengkalis Regency. Determinants in the sustainable development of charcoal are:

1. The existence of local government regulations and ministerial regulations in coastal mangrove management.
2. The high intensity of law violations in the use of forests and rivers

While the sustainable charcoal business development strategy model can be seen in Figure 16. In this figure there is a new model in the use of SWOT strategies that must meet the prerequisites before the SWOT strategy is used in the sustainable development of charcoal trading business. A circle consisting of 4 colors is a decisive circle that is associated with the value of public perception as a first step in developing a strategy.



**FIGURE 3. The matrix diagram of the development strategy for charcoal long business in the “Bengkalis Regency”**

This form of sustainable development of charcoal trading is a novelty in the development of strategies, because if the results of the calculation of public perception values are in the black-red circle then the strategy cannot be developed because it does not get support from the local community where they are. Whereas if the perception value of the community is in the yellow-green circle then the strategy can be continued, meaning that the initial step in the development of charcoal trading business gets support from the community in accordance with the existing perception value.

## V. CONCLUSION

The public perception of the charcoal long-standing regulation in the “Bengkalis Regency” is in the Good category which is a prerequisite for the development of continuous coal charcoal. The strategy for sustainable charcoal development is in quadrant IV, namely the S-T strategy.

## SIGNIFICANCE STATEMENT

This study found a new method in developing management strategies using the SWOT analysis, namely the existence of prerequisites that must be met before a strategy is developed, namely community perception. If the decision criteria are in the category of Good (G) or Really Good (RG) then a strategy can be developed or continued. In this study, people's perceptions are in the Good category.

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