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FORMULATION OF ENVIRONMENTAL POLICY FOR THE UTILISATION OF PALM OIL MILL WASTE USING SWOT-QSPM ANALYSIS (STUDY: PT. MUSIRAWAS CITRAHARPINDO SERUYAN REGENCY)

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ABSTRACT

The increase in the area of oil palm plantations will always be accompanied by an increase in the amount of waste produced. Utilisation of palm oil mill waste will reduce the negative impact on the environment. Environmental policies for the utilisation of palm oil mill waste need to be carried out to prevent and overcome pollution and environmental damage from these wastes, as a sustainable effort towards zero emission. This study aims to analyse the environmental policy for the use of palm oil mill waste. The palm oil mill of PT Musirawas Citraharpindo in Seruyan regency is the research location, and the SWOT (stands for Strengths, Weaknesses, Opportunities, and Threats) dan QSPM (Quantitative Strategic Planning Matrix) method is used as an analysis tool. The results of the SWOT Quadrant Matrix analysis show that the intersection of IFAS and EFAS is at the coordinates (2.190, 2.619) or the first quadrant, so the company has enormous strengths and opportunities to carry out the policy of utilising palm oil mill waste. The SWOT strategy matrix provides thirteen policy formulation strategies, and QSPM analysis produces the highest TAS value is the most priority strategy. Where the first highest order is in the formulation of strategy SO2 with a TAS value of 6.125 followed by strategy SO4 with a value of 6.107.

Keywords: Environmental Policy, Musirawas Citraharpindo, Palm Oil Mill, QSPM, SWOT.

INTRODUCTION

Oil palm has high economic value and is the largest contributor to Indonesia's foreign exchange compared to other plantation commodities. Until now, oil palm plants have been widely used as a business in the form of plantations and palm oil processing plants to become oil and various derivative products (Fauzi, 2012.). Oil palm is an industrial crop that produces cooking oil, industrial oil and fuel (biodiesel). In addition, oil palm is a raw material for various industries such as the candle industry, soap industry, cosmetics industry and tin sheets manufacturing industry (Lubis, Efendi, and Widarnako, 2011). The main products of oil palm are palm cooking oil (CPO - Crude Palm Oil) and palm kernel oil (PKO - Palm Kernel Oil) (Barcelos *et al.,* 2015). In addition to producing oil, palm oil mills also produce waste that reaches 75%, in the form of solid waste and liquid waste (Pandapotan and Marbun, 2017).

The oil palm commodity has a strategic role in the Indonesian economy, namely as a mainstay of non-oil and gas exports that can create employment opportunities while improving the welfare of the community (Mandung, 2012). However, the positive impact of the development of oil palm plantations is also followed by negative impacts on the environment, such as the generation of liquid, solid and gas waste (DG PPHP, 2006). Palm oil mill waste is characterised by its high organic matter content, which can be used as organic fertiliser - a substitute for inorganic fertiliser to improve soil physical and chemical properties (Darmosarkoro, *et al.,* 2003; Budianta, 2005; Susilawati and Supijatno, 2015).

The production of one tonne of oil palm will be able to produce waste in the form of empty palm bunches as much as 23% or 230 kg, shell waste as much as 6.5% or 65 kg, wet decanter solid (palm mud) 4% or 40 kg, fibre 13% or 130 kg and liquid waste as much as 50% (Abnisa *et al.,* 2013; Yanti and Lestari, 2020; Mandiri, 2012). Solid waste produced by palm oil mills can be in the form of empty baskets which amount to about 20% of the processed FFB and are organic materials that are rich in nutrients (DG PPHP, 2006). Empty palm oil bunches contain various macro and micro nutrients that are very important for plant growth, including: 42.8% C, 2.9% K2O, 0.8% N, 0.22% P2O5, 0.30% MgO, 23 ppm Cu, and 51 ppm Zn. The application of empty baskets has high potential as a soil improver, improving soil physical and chemical properties, and increasing oil palm production (Darmosarkoro *et al.,* 2003).

Every one tonne of CPO production from fresh fruit bunches (FFB) will also produce liquid waste of about 2.5-3 tonnes (Wu, 2010). While Morad *et al.,* (2008) stated that the production of palm oil mill liquid waste can reach around 0.75 - 0.9 m3/tonne of FFB. The liquid waste comes from various water sources, namely 60% clarification drab water (350-450 kg/tonne FFB), 36% decoction condensate (150-175 kg/tonne FFB) and 4% hydrocyclone water (100-150 kg/tonne FFB) (Wu, 2010). The brownish coloured liquid waste contains about 95-96% water, about 0.6-0.7% oil and total solids derived from fruit debris of about 4-5% (Bala *et al.,* 2014). Liquid waste from palm oil mill processing is thicker and cloudy, better known as sludge (Kurniawan *et al.,* 2019). The content of nutrients in sludge, including total N as much as 0.18%, total P as much as 0.07%, K as much as 0.06%, C-Organic as much as 5.52%, C/N of 30.81, COD of 10,082 mg L-1, BOD of 7,333 mg L-1, TSS of 7,928 mg L-1 and pH 6.1 (Neutral) (Nursanti *et al.,* 2013).

The management of palm oil mill waste refers to the Decree of the Minister of Environment No. 28 of 2003 concerning Technical Guidelines for the assessment of the utilisation of Wastewater from the Palm Oil Industry on the Land of Oil Palm Plantations, as well as the Decree of the Minister of Environment No. 29 of 2003 concerning guidelines for Terms and Procedures for Licensing the Utilisation of Palm Oil Industry Wastewater on Land in Oil Palm Plantations. This

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policy shows the government's attention to environmental conditions due to pollution from palm oil processing waste. Efforts to realise a sustainable palm oil industry in Indonesia emerged through the push to conduct an environmental certification process.

Environmental certification of the palm oil industry in Indonesia appears in two different forms, namely RSPO (Round Table Sustainable Palm Oil) and ISPO (Indonesia Sustainable Palm Oil). RSPO and ISPO are mechanisms that involve local communities/indigenous peoples affected by oil palm plantation development in the process of land acquisition until plantation operations are carried out. RSPO (Round Table Sustainable Palm Oil) and ISPO (Indonesian Sustainable Palm Oil) certifications are sustainable global standards and parameters for products produced from palm oil. RSPO and ISPO have Principles and Criteria (PandC) that focus on legal, economic, environmental, social needs for sustainable palm oil production (Aikanathan *et al.,* 2011).

Palm oil is important to the government because it generates foreign exchange, develops commodities with comparative advantages, and contributes positively to education and health. The growth of oil palm plantations in Indonesia to date has been very rapid, this is thought to be due to several reasons. Firstly, the demand for vegetable oil due to population growth. Second, an increase in the amount of vegetable oil consumption per capita. Third, oil palm is a crop with the highest potential for vegetable oil production. Fourth, the development of palm oil-based industries such as oleochemicals and biodiesel (Cahyadi and Waibel, 2016). In addition, palm oil has the lowest production cost of all vegetable oils in the global commodity market, and palm oil is expected to meet growing global demand to reach 240 million tonnes by 2050 (Corley, 2009).

In 2022, it was recorded that the area of oil palm plantations in Seruyan Regency reached 438 thousand hectares. The area of oil palm plantations in Seruyan Regency is spread evenly across all sub-Regencys in Seruyan Regency. The area of oil palm plantations is divided into large oil palm companies, plasma and smallholder plantations. Seruyan Regency has around 35 large private plantations (PBS), where there are 7 large PBS groups with 28 companies that control the entire oil palm plantation area, namely Wilmar Group Plantation, Agro Plantation, Sinar Mas Group, Minamas Group, Best Group, Tri Putra Agro Persada and Musirawas Citraharpindo Group.

Musirawas Citraharpindo has two mills with a capacity of 30 and 60 tonnes per hour. Both mills are capable of producing crude palm oil (CPO) and palm kernel oil (PKO). For the 30 tonnes per hour capacity mill, in one year it is able to produce an average amount of 43,863 tonnes of CPO and 8,374 tonnes of kernels. Meanwhile, the 60 tonnes per hour capacity mill produces 73,689 tonnes of CPO and 12,598 tonnes of kernel. Musirawas Citraharpindo is capable of producing an average FFB (Fresh Fruit Bunch) production of 207,354 tonnes per year.

Musirawas Citraharpindo Group in carrying out its plantation activities pays close attention to various plantation management policies and regulations. Until now, Musirawas Citraharpindo Group has implemented ISPO principles and criteria. It also participates in the Seruyan Regency jurisdictional entity, and has Green Corporate Performance Rating Programme in Environmental Management (PROPER) criteria, and has carried out HCV (High Conservation Value) assessments.

The increase in palm oil mill activities will always be accompanied by an increase in waste that can cause various negative impacts on environmental sustainability, so various efforts to control and manage waste are needed to have a positive impact on the environment. According to Hardjosoemantri (1993), environmental damage caused by development must be overcome by carrying out environmental management. Soemarwoto (1999) suggests that environmental problems are changes in the environment that can directly or indirectly cause negative impacts on human health and welfare.

Chavalparit, *et al.,* (2006) stated that palm oil mills produce many by-products and large amounts of wastewater that may have a significant impact on the environment if not managed properly. Environmental management with an industrial ecosystem approach for the CPO industry can be done through reuse and recycle efforts through solid and liquid waste utilisation and proper energy management. This aims to achieve near-zero discharge of pollutants. Such an approach can contribute to the transformation of palm oil mills into more environmentally friendly industrial activities (Septiawan H., 2015).

Environmental management activities need to be carried out to implement various applicable laws and regulations, one form of environmental management is the reuse of waste from palm oil mills. Musirawas Citraharpindo, as one of the oil palm plantations in Seruyan Regency, has a high commitment in implementing various regulations/policies issued by stakeholders. Various efforts have been made by Musirawas Citraharpindo in the context of environmental management by implementing various obligations contained in various policies issued by stakeholders. So that all policies developed by Musirawas Citraharpindo will be pre-emit (controlling), preventive (preventing) and proactive (responding) in an effort to prevent a decrease in the carrying capacity and environmental capacity of the company's performance in the field of oil palm plantations.

RESEARCH METHODS

The research was conducted at the palm oil mill owned by PT Musirawas Citraharpindo. The research material was sourced from data collected through the environmental department of PT Musirawas Citraharpindo and the operational part of the palm oil mill activities supplemented by literature studies from various reference sources. Equipment used in this research include stationery, cameras, computers and data processing equipment. Quantitative descriptive analysis method with SWOT analysis (stands for Strengths, Weaknesses, Opportunities, and Threats) and QSPM (Quantitative Strategic Planning Matrix). QSPM is a tool that allows strategising to objectively evaluate strategy alternatives, based on previously identified internal and external critical success factors (David and Forest, 2019). The steps in the SWOT-QSPM analysis in this study were followed by several stages, namely:

1. Identify influential internal and external indicators, then classify these indicators;
2. Analysing using the IFAS (Internal Factor Analysis Summary) matrix and EFAS (External Factor Analysis Summary) matrix;
3. Determining the relative position of the organisation on the SWOT quadrant matrix and alternative SO-WO-ST-WT strategies;
4. Conducting an analysis using QSPM (Quantitative Strategic Planning Matrix) to decide on the best strategic alternative.

RESULTS AND DISCUSSION

As with the analysis steps presented in the research method, the research results are as follows:

1. SWOT analysis in this study aims to find out the position of strengths, weaknesses, opportunities, and threats by describing the company's internal and external factors in utilising palm oil mill waste by PT Musirawas Citraharpindo. The results of the identification of internal and external factors in the utilisation of waste from the Musirawas Citraharpindo palm oil mill are as presented in table 1 below.

Table 1. Internal and External Factors

	Strenghts (S)
1	The company understands various regulations/policies in the management and utilisation of waste from the Palm Oil Mill.
2	The company has regulations/policies in the form of a quality control system which is a reference in monitoring products and quality.
3	The company has carried out ISPO assessment and has a commitment to implement it consistently.
4	The company has regulations / policies to implement zero waste waste in the form of work instructions. SOP in the management and utilisation of waste from the Palm Oil Mill.
5	The Company regularly evaluates the management and utilisation of waste from the Palm Oil Mill in accordance with applicable regulations.
6	The Company has a Waste Water Treatment Plant and waste utilisation permit for Land Application.
7	The company has the availability of funds for the management and utilisation of waste from the Palm Oil Mill.
	Weaknesses (W)
1	The BOD value generated from the liquid waste from the Palm Oil Mill is not optimum,
2	The company has not involved / empowered the surrounding community to utilise the waste from the Palm Oil Mill.
3	The company does not have a regulation/policy to utilise the waste from the Palm Oil Mill into renewable energy.
4	The company still lacks the application of high technology for the management and utilisation of waste from the Palm Oil Mill.
	Opportunities (O)
1	Proper assessment with green colour and has a commitment to implement and improve to Gold consistently.
2	The company maintains good relations with the community, stakeholders and government agencies.
3	Established cooperation with third parties in the management and utilisation of waste from the Palm Oil Mill.
4	Many alternatives for the management and utilisation of solid and liquid waste.
5	Increased or refreshed knowledge and understanding of waste management implementers.
6	The company has work instructions to innovate in environmental management.
	Threats (T)
1	Demands for fulfilment of environmentally friendly sustainable palm oil standards from stakeholders,
2	Changes in environmental management regulations/policies

Source: Primary Data, Organised (2024)

2. The results of the identification of internal and external factors (point 1) above are continued by analysing the internal factor analysis summary (IFAS) matrix and the external factor analysis summary (EFAS) matrix. The IFAS and EFAS matrices show the scores, weights, and total values of each internal and external factor. The results of the IFAS and EFAS matrix for the utilisation of palm oil mill waste from PT Musirawas Citraharpindo are shown in tables 2 and 3 below.

Table 2. IFAS Matrix

No	Strenghts (S)	Bobot	Rating	Total
1	The company understands various regulations / policies in the management and utilisation of PKS waste products	0.115	4	0.430
2	The company has regulations / policies in the form of a quality control system which is a reference in monitoring products and quality	0.115	4	0.416
3	The company has carried out ISPO assessment and has a commitment to implement it consistently.	0.107	3	0.318
4	The company has regulations / policies to implement zero waste in the form of work instructions. SOP in the management and utilisation of PKS waste	0.122	4	0.478
5	The company regularly evaluates the management and utilisation of PKS waste in accordance with applicable regulations.	0.092	3	0.300
6	The company has a WWTP and waste utilisation permit for Land Aplication	0.105	3	0.333
7	The company has the availability of funds for the management and utilisation of PKS waste products	0.106	3	0.336
	Skor Strenghts (S)	**0.762**		**2.611**
No	**Weaknesses (W)**	**Bobot**	**Rating**	**Total**
1	The BOD value generated from PKS liquid waste is not yet optimal	0.059	2	0.103
2	The company has not involved / empowered the surrounding community to participate in utilising PKS waste products	0.053	2	0.113
3	The company does not yet have regulations / policies to utilise PKS waste into renewable energy	0.061	2	0.108
4	The company still lacks the application of high technology for the management and utilisation of PKS waste products	0.065	2	0.097
	Skor Weaknesses (W)	**0.238**		**0.421**
	IFAS			**2.190**

Source: Primary Data, Organised (2024)

The results of the IFAS (internal factor analysis summary) matrix calculation which is the overall value of the strengths and weaknesses of Musirawas Citraharpindo. The IFAS matrix shows that the strength factor gives a value of 2,611 and the weakness gives a value of 0.421. Overall, this gives an IFAS value of 2.190. The IFAS value indicates that the rating scale states that the company provides a fairly good response internally.

Table 3. EFAS Matrix

No	Opportunities (O)	Bobot	Rating	Total
1	Proper Assessment with green colour and has a commitment to implement and improve to Gold consistently	0.157	3	0.509
2	The company maintains good relations with the community, stakeholders and government agencies	0.162	4	0.578
3	Established cooperation with third parties in the management and utilisation of PKS waste products	0.137	3	0.389
4	Many alternatives for the management and utilisation of solid and liquid waste	0.135	2	0.317
5	Increasing or refreshing the knowledge and understanding of waste treatment implementers	0.154	3	0.485

6	The company has work instructions to innovate in environmental management	0.149	3	0.515
	Skor Opportunities(O)	**0.893**		**2.793**
No	**Threats (T)**	**Bobot**	**Rating**	**Total**
1	Demands for compliance with environmentally friendly sustainable palm oil standards from stakeholders	0.053	2	0.086
2	Changes in environmental management regulations/policies	0.054	2	0.088
	Skor Threats (T)	**0.107**		**0.174**
	EFAS			**2.619**

Source: Primary Data, Organised (2024)

The results of the EFAS matrix calculation which is the overall value of opportunities and threats owned by PT Musirawas Citraharpindo. The EFAS matrix shows that the opportunity factor provides a value of 2.793 and the weakness provides a value of 0.174. Overall, it gives an EFAS value of 2,619. The EFAS value shows a rating scale stating that the company responds very well to existing opportunities and threats.

3. Relative position of the organisation on the SWOT quadrant matrix and strategy alternatives SO-WO-ST-WT.

   The results of the IFAS matrix show a number 2.190, with a strength score of 2.611 and a weakness score of 0.421, so that the internal factor coordinates are on the x axis = 2.190. Meanwhile, the EFAS matrix shows a number 2.619, with opportunity and threat scores of 2.793 and 0.174 respectively, so the external factor coordinates on the y axis = 2.619. So, the intersection of IFAS and EFAS is at the coordinates (2.190, 2.619) or quadrant I (positive, positive). PT Musirawas Citraharpindo SWOT quadrant matrix is presented in Figure 1 below.

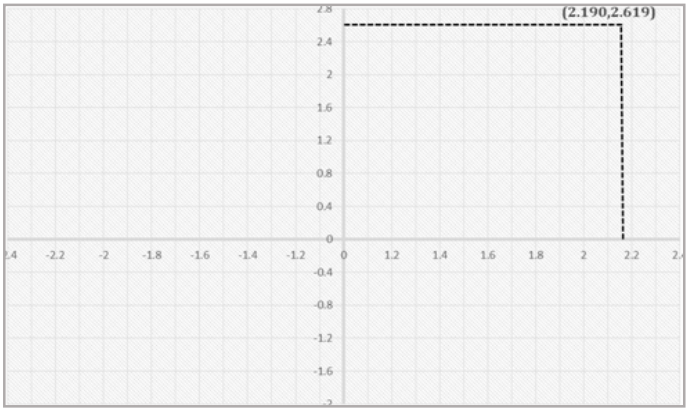

Fig.1 PT MusirawasCitraharpindo SWOT Quadrant Matrix

Source: Primary Data, Organised (2024)

The position of quadrant I in the SWOT matrix identifies that Musirawas Citraharpindo is in a very favourable position, namely using strengths to take advantage of opportunities. So that the company has enormous strengths and opportunities to develop the utilisation of waste products from the palm oil industry. However, the coordinates (2,191; 2,619) show that the company has almost the same strengths as the opportunities it has to grow.

The results of the quadrant matrix require that the strategy that Musirawas Citraharpindo must implement in this condition is to support an aggressive growth policy (Growth oriented strategy). Using strengths to take advantage of existing opportunities is absolutely necessary not only for reasons of the company's strategic position, but more importantly than that, only with a growth strategy, the company can develop which in turn is able to achieve sustainable palm oil companies. So it can be seen that the position of utilising waste from the palm oil industry in Musirawas Citraharpindo is expected that all programmes and activities must support the growth strategy of the current development. After knowing the internal and external factors and the position in the SWOT quadrant matrix, to get a more detailed picture of what strategies Musirawas Citraharpindo should implement, a SWOT matrix is used. By using the SWOT matrix, the company can choose various possible strategy alternatives (SO, ST, WO and WT) which can then be adjusted to various alternative growth strategy options, as presented in table 4 below.

Table 4. Alternative Strategy SO-WO-ST-WT PT Musirawas Citraharpindo

Strategy SO (Strengths and Opportunities)	
SO1	Maintain consistency in the implementation of ISPO assessment for better environmental management.
SO2	Improve the implementation of PROPER assessment to gold.
SO3	Establish cooperation in developing innovations with third parties for the utilisation of waste from Palm Oil Mills and community involvement in utilising solid waste.
SO4	Evaluate, improve and repair the performance of the Wastewater Treatment Plant so that the wastewater outlet produced is in accordance with the provisions.
SO5	Develop a plan for the construction of methane capture in the area of the Palm Oil Mill Wastewater Treatment Plant.
SO6	Organise training to improve the competence of employees who handle environmental management and monitoring activities.
SO7	Develop a programme to meet sustainable palm oil standards.
Strategy ST (Strengths and Threats)	
ST1	Provide input and persuasive approaches in the establishment of government policies so as not to burden the company.
ST2	Establishing strategies and programming for the fulfilment of sustainable palm oil standards in Palm Oil Mills.
Strategy WO (Weakness and Opportunities)	
WO1	Involving the neighbouring community in solid waste utilisation activities for various community activities.
WO2	Collaborate with third parties in improving the technology of waste utilisation from the Palm Oil Mill.
Strategy WT (Weakness and Threats)	
WT1	Maintain and improve the company's communication with stakeholders and government agencies as well as the community by increasing active participation in environmental empowerment and management programmes.
WT2	Make adjustments to environmental management and monitoring activities following the latest environmental regulatory policies.

Source: Primary Data, Organised (2024)

The SWOT strategy matrix above outlines various possible strategic alternatives that can be chosen by PT Musirawas Citraharpindo. Of the four alternative strategy options (SO, ST, WO and WT), the most appropriate strategy to use is the SO (strength-opportunity) strategy. This is due to the company's position in quadrant I where the company has good opportunities and strengths. The SO (strength-opportunity) strategy which is considered the most appropriate to implement, does not mean that PT Musirawas Citraharpindo ignores the other three alternative strategy options (ST, WO and WT). So that the formulation of a strategy for utilising palm oil mill waste is by creating a strategy that uses the basis of internal strengths to take advantage of existing opportunities and overcome the weaknesses and threats faced.

4. The final stage of the Environmental Policy Formulation for the Utilisation of Palm Oil Mill Waste of PT Musirawas Citraharpindo is the selection of the best strategy using QSPM sequentially arranged by considering the results of the SO-WO-ST-WT strategy alternatives in table 4.

   QSPM is the final stage of strategy formulation analysis in the form of selecting the best alternative. From the QSPM matrix, the TAS (Total Attractiveness Score) value can be seen, which is the most suitable alternative strategy to be implemented, as presented in Figure 2 below.

QSPM (Quantitative Strategic Planning Matrix)																											
Strategy		**SO1**		**SO2**		**SO3**		**SO4**		**SO5**		**SO6**		**SO7**		**WO1**		**WO2**		**ST1**		**ST2**		**WT1**		**WT2**	
Code	**Weight**	**AS**	**TAS**	**AS**	**TAS**	**AS**	**TAS**	**AS**	**TAS**	**AS**	**TAS**	**AS**	**TAS**	**AS**	**TAS**	**AS**	**TAS**	**AS**	**TAS**	**AS**	**TAS**	**AS**	**TAS**	**AS**	**TAS**	**AS**	**TAS**
Strengths																											
S.1	0.11	4	0.46	4	0.46	4	0.46	3	0.34	2	0.23	2	0.23	3	0.34	2	0.23	2	0.23	3	0.34	2	0.23	3	0.34	4	0.46
S.2	0.11	3	0.34	2	0.23	1	0.11	3	0.34	2	0.23	3	0.34	3	0.34	2	0.23	2	0.23	3	0.34	2	0.23	2	0.23	3	0.34
S.3	0.11	4	0.43	2	0.21	2	0.21	2	0.21	2	0.21	3	0.32	3	0.32	2	0.21	2	0.21	2	0.21	2	0.21	3	0.32	3	0.32
S.4	0.12	4	0.49	3	0.37	3	0.37	3	0.37	3	0.37	3	0.37	3	0.37	4	0.49	2	0.24	3	0.37	2	0.24	2	0.24	4	0.49
S.5	0.09	3	0.28	3	0.28	1	0.09	4	0.37	2	0.18	2	0.18	2	0.18	4	0.37	2	0.18	3	0.28	2	0.18	2	0.18	4	0.37
S.6	0.11	3	0.32	3	0.32	2	0.21	3	0.32	3	0.32	2	0.21	2	0.21	3	0.32	3	0.32	2	0.21	2	0.21	2	0.21	3	0.32
S.7	0.11	2	0.21	3	0.32	2	0.21	3	0.32	4	0.42	3	0.32	2	0.21	2	0.21	4	0.42	2	0.21	2	0.21	2	0.21	3	0.32
Weaknesses																											
W.1	0.06	3	0.18	3	0.18	3	0.18	4	0.23	4	0.23	3	0.18	2	0.12	2	0.12	2	0.12	1	0.06	1	0.06	2	0.12	3	0.18
W.2	0.05	2	0.11	3	0.16	3	0.16	3	0.16	2	0.11	3	0.16	2	0.11	4	0.21	4	0.21	1	0.05	1	0.05	1	0.05	3	0.16
W.3	0.06	3	0.18	2	0.12	1	0.06	3	0.18	4	0.25	3	0.18	3	0.18	4	0.25	4	0.25	1	0.06	2	0.12	1	0.06	3	0.18
W.4	0.06	3	0.19	2	0.13	3	0.19	4	0.26	4	0.26	3	0.19	3	0.19	4	0.26	4	0.26	1	0.06	2	0.13	1	0.06	3	0.19
	1.00																										
Opportunities																											
O.1	0.16	4	0.63	4	0.63	3	0.47	3	0.47	3	0.47	3	0.47	3	0.47	3	0.47	2	0.31	2	0.31	3	0.47	3	0.47	3	0.47
O.2	0.16	2	0.32	3	0.49	3	0.49	3	0.49	3	0.49	2	0.32	2	0.32	4	0.65	3	0.49	2	0.32	2	0.32	3	0.49	3	0.49
O.3	0.14	2	0.27	3	0.41	3	0.41	2	0.27	3	0.41	3	0.41	2	0.27	3	0.41	4	0.55	3	0.41	3	0.41	3	0.41	3	0.41
O.4	0.14	2	0.27	3	0.41	3	0.41	4	0.54	4	0.54	3	0.41	3	0.41	2	0.27	4	0.54	1	0.14	2	0.27	3	0.41	2	0.27
O.5	0.15	2	0.31	3	0.46	3	0.46	3	0.46	2	0.31	4	0.61	2	0.31	2	0.31	3	0.46	1	0.15	3	0.46	2	0.31	2	0.31
O.6	0.15	2	0.30	4	0.59	4	0.59	3	0.45	3	0.45	3	0.45	2	0.30	3	0.45	3	0.45	1	0.15	3	0.45	3	0.45	2	0.30
Threats																											
T.1	0.05	4	0.21	4	0.21	2	0.11	3	0.16	3	0.16	3	0.16	4	0.21	3	0.16	3	0.16	4	0.21	4	0.21	3	0.16	4	0.21
T.2	0.05	4	0.22	3	0.16	3	0.16	3	0.16	3	0.16	3	0.16	4	0.22	3	0.16	3	0.16	4	0.22	3	0.16	3	0.16	4	0.22
	1.00																										
			5.713		**6.125**		**5.356**		**6.107**		**5.790**		**5.679**		**5.091**		**5.767**		**5.790**		**4.119**		**4.643**		**4.889**		**5.999**

Fig.2 QSPM Matrix PT Musirawas Citraharpindo

Source: Primary Data, Organised (2024)

Based on the TAS value presented from Figure 2, the total attractiveness score (TAS) can be sorted, where the highest TAS value is the most priority strategy and the smallest as a strategy that can be ended, as presented in the following table 5.

Table 5.Order of Highest to Lowest TAS Score

Code Strategi	TAS score	Rating
SO2	6.125	1
SO4	6.107	2
WT2	5.999	3
WO2	5.790	4
SO5	5.790	5
WO1	5.767	6
SO1	5.713	7
SO6	5.679	8
SO3	5.356	9
SO7	5.091	10
WT1	4.889	11
ST2	4.643	12
ST1	4.119	13

Source: Primary Data, Organised (2024)

As the results of the quadrant matrix show that the SO (strength-opportunity) strategy is considered the most appropriate to implement, it does not mean that Musirawas Citraharpindo ignores the other three alternative strategy options (ST, WO and WT). Based on the results of the QSPM matrix (figure 2) from the TAS (Total Attractiveness Score) value (table 5), the 5 highest TAS values that are recommended to be carried out in the formulation of the Environmental Policy for the Utilisation of Palm Oil Mill Waste of PT Musirawas Citraharpindo are:

1. Increase the implementation of PROPER assessment to gold (SO2).
2. Evaluate, improve and repair the performance of the Wastewater Treatment Plant so that the resulting wastewater outlet is in accordance with the provisions (SO4).
3. Make adjustments to environmental management and monitoring activities following the latest environmental regulatory policies (WT2).
4. Establish cooperation with third parties in improving technology for the utilisation of Palm Oil Mill waste (WO2).
5. Develop a methane capture development plan in the area of the Palm Oil Mill Wastewater Treatment Plant (SO5).

CONCLUSION

Based on the SWOT quadrant matrix analysis, it is known to be in quadrant 1 which requires strategies that support aggressive growth policies (Growth oriented strategy). The formulation of the SWOT matrix strategy on the SO-WO-ST-WT alternative Environmental Policy Formulation of Utilisation of Palm Oil Mill Waste Results of PT Musirawas Citraharpindo provides 13 strategies with 7 SO strategies, and 2 WO-ST-WT strategies each. The results of the TAS (Total Attractiveness Score) value of the QSPM matrix of 13 strategies show the highest value is the most priority strategy and the smallest as a strategy that can be terminated in the following order: SO2, SO4, WT2, WO2, SO5, WO1, SO1, SO6, SO3, SO7, WT1, ST1 and ST2.

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Compliance with ethical standards

Conflict of interest: Authors do not have any conflict of interests to declare.

Ethical issues: " None "

Author's contributions

Each author in this paper made a contribution in the form of writing: AF was the principal investigator, made the proposal and conducted the research, wrote the research results and discussion, participated in harmonising the sequence and drafting the manuscript. BJP participated in the research design. DB participated in sequence alignment. DEA participated in the design and coordination. All authors have read and approved the final manuscript.

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