



# Public Policy in Managing Palm Oil Industry Environmental Waste: A Qualitative Study in Kampar Regency, Indonesia

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Article Info	Abstrak
<p><i>Kata kunci:</i> <i>Kelapa Sawit;</i> <i>Limbah Lingkungan;</i> <i>Kebijakan Publik;</i> <i>Indonesia;</i></p>	<p>Kabupaten Kampar saat ini memiliki jumlah pabrik kelapa sawit terbesar di Provinsi Riau, yang menyebabkan peningkatan pencemaran lingkungan karena produk sampingan dari aktivitas industri tersebut. Penelitian ini bertujuan untuk mengidentifikasi masalah yang terkait dengan pengelolaan limbah di pabrik kelapa sawit. Penelitian ini menggunakan metode penelitian deskriptif-kualitatif yang bertujuan untuk penggambaran yang sistematis, faktual, dan akurat mengenai data yang terkandung dalam sebuah teks berita. Hasil penelitian menunjukkan bahwa perkebunan karet dan kelapa sawit (1,8 dan 1,5 hektar) digenangi oleh limbah. Disarankan agar pabrik kelapa sawit menerapkan pengolahan limbah sesuai dengan baku mutu sebelum dibuang. Lebih lanjut, Penerapan undang-undang sebagai landasan sanksi dari limbah ini harus dibarengi dengan himbauan kepada masyarakat untuk memantau tingkat pencemaran lingkungan. Selain itu, peran aktor kebijakan publik dalam mengawasi dan menentukan sanksi hukum atas pencemaran lingkungan menjadi sangat penting.</p>
<p><i>Keywords:</i> <i>Oil Palm;</i> <i>Environmental Waste;</i> <i>Public Policy;</i> <i>Indonesia;</i></p>	<p><b>Abstract</b></p> <p>Kampar Regency currently has the largest number of palm oil mills in Riau Province, which has led to an increase in environmental pollution due to the by-products of these industrial activities. The objective of this research is to identify the issues associated with waste management in palm oil mills. The research employs a descriptive-qualitative method to systematically, factually, and accurately represent the data contained in the news text. The results indicated that rubber and oil palm plantations (1.8 and 1.5 hectares) were inundated with waste. It is recommended that palm oil mills implement waste treatment in accordance with quality standards before disposal. Furthermore, the application of the law as the basis for sanctions from this waste must be accompanied by an appeal to the public to monitor the level of environmental pollution. In addition, the role of public policy actors in monitoring and determining legal sanctions for environmental pollution is of great importance.</p>

## 1. INTRODUCTION

Oil palm (*Elaeis guineensis* Jacq.) is a plantation commodity that plays an important role in the Indonesian economy. In 2022, the export of palm oil and its derivatives reached approximately USD 40 billion, which is equivalent to approximately 600 trillion rupiah (Sirait, 2021). In 2022, the total area of oil palm plantations in Indonesia was 16.83 million hectares, with a production of 46.82 million tons of crude palm oil (CPO) (Purnamayani, 2022). Consequently, the number of processing industries has increased in tandem with the expansion of both the area of oil palm plantations and the production of CPO. The expansion of CPO production by palm oil mills (PKS) will be accompanied by an increase in the amount of waste generated, which will have a direct and indirect impact on the environment in terms of both quantity and quality (Lubis, et al., 2022).

The Kampar Regency is one of the regions in the Riau province with the second-largest area of oil palm plantations, trailing only the Rokan Hulu district (Ardhi, et al., 2018). According to the BPS 2023, the Kampar district has the second-highest number of palm oil mills and the greatest number of palm oil firms, both state-owned and private. This implies that there are a lot of chances for environmental waste resulting from the operations of palm oil mill production. Waste generated from palm oil mills is composed of solid, liquid, and gaseous materials that have the potential to cause public health issues and environmental contamination (Sasmita, et al., 2019). The solid waste produced includes empty palm bunches, shells, and fibers. The liquid waste generated from PKS activities is the residue of the CPO manufacturing process in liquid form. In addition, gas waste is generated in the form of chimney gas and exhaust water vapor from PKS (Arifandy, 2021).

The waste produced by the palm oil industry contains a multitude of organic and inorganic compounds. Organic compounds are more readily biodegradable than inorganic compounds. Bacteria can degrade organic compounds aerobically and anaerobically. The difficulty of waste to be broken down affects environmental sustainability (pollution load). Palm oil waste contains toxic substances such as heavy metals (copper, lead, silver, zinc, iron, nickel, etc.) that can adversely affect microorganisms (Sugiharto, 1987). As the palm oil processing industry assumes a more prominent role in the development of Indonesia's agro-industry, the problem of pollution caused by it also intensifies. The pollution caused by palm oil mill waste can reduce the quality of the aquatic environment, which will indirectly be harmful to the environment and human health (Aritonang, 1986).

It is estimated that for every ton of crude oil produced, palm oil will produce liquid waste to the extent of 2.5%. Palm oil liquid waste has the potential to act as an environmental pollutant due to its chemical composition, which includes Chemical Oxygen Demand (COD), Biochemical Oxygen Demand (BOD), and high suspended solids. These characteristics can lead to a reduction in the fertility of a water body (Chan et al., 2013). In the event that palm oil waste management is not effectively addressed by palm oil companies, it is likely to have a detrimental impact on forest ecosystems. From an ecological perspective, the consequences include a reduction in biodiversity, alterations to forest ecosystems, and the extinction of tropical rainforest species and animals. Furthermore, the oil palm plantation industry is responsible for pollution resulting from the burning of smoke and the disposal of waste. This can result in prolonged poisoning of animals. In the context of the oil palm industry, the negative impacts of development continue to intensify, affecting not only conversion forest areas but also producing forest areas and those with high biodiversity. (Khairunnisa, (2018).

The empirical data indicates that the palm oil industry has a negative impact on the environment. This is evidenced by a decrease in the quality and quantity of the environment due to pollution and the emergence of social problems. These problems can occur in the center of the palm oil industry, including the Kampar district, which is one of the largest oil palm plantation areas and has the most palm oil mills in Riau province. The vulnerability of this area to the problem of palm oil waste from palm oil mills is significant. This waste can threaten health and have a social impact. The significance of palm oil waste management is twofold: firstly, to ensure the continued stability of the industry, and secondly, to mitigate the potential health, economic and social impacts for the community in the Kampar district in the future. Therefore, an effective management system is required to manage this waste to prevent environmental pollution. The purpose of this study is to identify the environmental impact of the palm oil industry and the role of public policy actors in addressing this issue.

## 2. METHODS

This study was conducted in Kampar Regency, Riau (Figure 1). The selection of this location was based on the consideration that Kampar Regency is a central producing area and that palm oil mills and palm oil are among the most important commodities in Kampar Regency, which plays an important role in the local economy. Therefore, it was deemed necessary to conduct research to determine the impact and management of industrial waste on the surrounding environment.

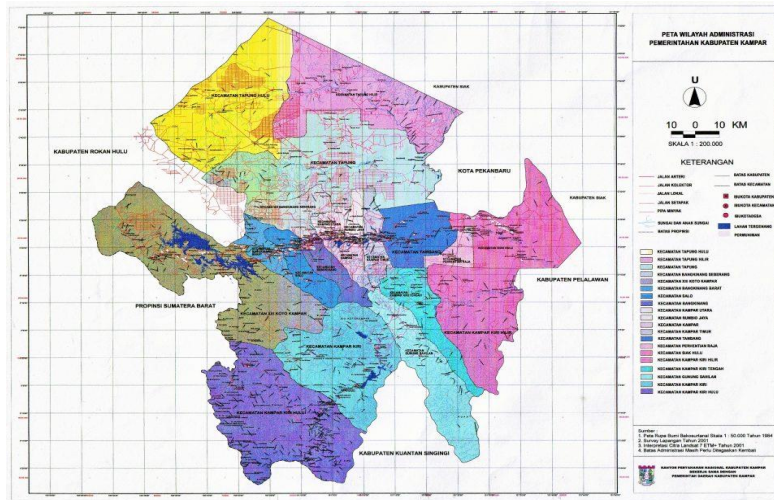
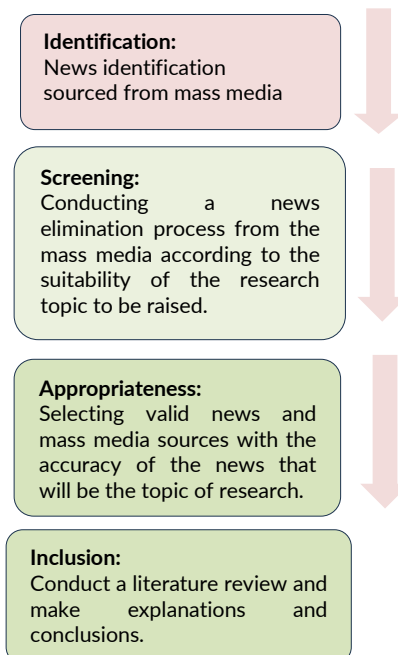


Figure 1. Map of the study area, Kampar Regency in Riau Province.  
Source: (Kominfo Kampar Regency, 2021)

The study employed is that of descriptive-qualitative research. The descriptive method employed in this research is designed to enable the systematic, factual, and accurate description of the data obtained from a news text by the mass media. Moreover, qualitative methods are employed to generate descriptive data in the form of written or spoken words from individuals and behaviors that can be observed (Taylor & Bogdan, 1984). The qualitative method is a research approach that is employed to investigate and comprehend the underlying meanings associated with social and humanitarian issues (Nugrahani & Hum, 22014). In accordance with this understanding, this research employs qualitative methods to examine news from the mass media pertaining to environmental pollution resulting from the discharge of liquid waste from PKS into local society' plantation in Teluk Paman Timur village, Kampar Kiri District, Kampar Regency, Riau, Indonesia. The objective is to gain insight into a social problem that originated from the news.

The methodology employed in this study entails the observation of content from the mass media that highlights environmental pollution in the Kampar district, caused by palm oil mill waste that has not been managed in an appropriate manner. Moreover, content analysis was selected as the primary methodology in this study. Content analysis is a technique employed to derive conclusions by identifying the characteristics of messages in an objective and systematic manner. (Holsti & Fluornoy, 1989). As a research technique, content analysis employs a distinct approach to the analysis of data. This approach differs from direct observation of human behavior or interviewing individuals. Instead, the researcher analyzes the communications or data produced and poses questions about the communication (Kerlinger, 1973).

The stages of the research carried out are as shown in figure 2 below:



**Figure 2. Authors` s Illustration**

The data source for this research is written language data in the form of discourse in mass media. The mass media source selected for this study is Tribunnews. The mass media was selected for analysis because it represents a nationally prominent and well-regarded source. The present study is limited to the news text of environmental pollution due to waste from palm oil mills in Teluk village, Kampar district, published on November 8, 2023. The data collection period was constrained by considerations based on phenomena that commonly occur among the community.

**3. RESULT AND DISCUSSION**

In 2023, the area of oil palm plantations in Kampar district reached 279,720 hectares, representing the largest area of oil palm plantations in Riau province. Table 1 presents a comparison of the land area dedicated to plantation commodities in Riau Province.

**Table 1. Plantation crop area in 2022 (Hectares)**

Regency/City	Plantation Crop Area in 2022 (Hectares)				
	Oil Palm	Coconut	Rubber	Coffee	Cocoa
Riau	1732748.00	419381.00	337638.00	4214.00	3624.00
Kuantan Singingi	221520.00	1169.00	29617.00	10.00	291.00
Indragiri Hulu	69292.00	1241.00	37847.00	128.00	589.00
Indragiri Hilir	109839.00	341625.00	5364.00	1261.00	1872.00
Pelalawan	188194.00	26014.00	31503.00	80.00	12.00
Siak	208075.00	1543.00	24878.00	21.00	74.00
Kampar	279720.00	1674.00	53215.00	-	285.00
Rokan Hulu	270886.00	987.00	73509.00	150.00	195.00
Bengkalis	133798.00	6103.00	30778.00	106.00	-
Rokan Hilir	195204.00	4623.00	24443.00	19.00	269.00
Kepulauan Meranti	-	32915.00	20956.00	2441.00	-
Pekanbaru	17418.00	15.00	3081.00	-	12.00
Dumai	38804.00	1472.00	2448.00	-	26.00

Source: (BPS, 2023)

The expansion of oil palm plantations in Kampar district has been accompanied by the establishment of numerous oil palm processing facilities, which has led to the generation of oil palm processing waste from oil palm mills. Table 2 presents a comprehensive overview of the number of palm oil companies and mills operating in Riau province and their respective processing plants.

**Table 2. Number of companies and palm oil mills located in Riau province in 2022**

Regency/City	Private Company	State-Owned Company	Palm Oil Mill
Kuantan singingi	15	-	20
Indragiri Hulu	35	2	21
indragiri Hilir	18	-	20
Pelalawan	32	-	29
Siak	19	2	23
Kampar	38	9	42
Rokan Hulu	29	5	45
Bengkalis	12	-	15
Rokan Hilir	14	2	31
Pekanbaru	5	-	2

Source: (BPS, 2023)

The data presented above indicates that the Kampar district has the largest number of palm oil companies, both private and state-owned, and is the second largest in the number of palm oil mills. This suggests that there are significant opportunities for environmental pollution from palm oil mill production activities. In accordance with the rate of expansion of oil palm plantations and the number of palm oil mills, the waste management practices employed in these facilities generate solid, liquid, and gas production residues (Rahmadi, et al., 2022).

The processing of one ton of oil palm Fresh Fruit Bunches (FFB) generates a variety of waste materials, including 23% empty palm bunches, 6.4% palm shells, 4% palm sludge, 13% fibers, and 50% liquid waste (Satria, et al., 2021). Consequently, a palm oil mill with a capacity of 50 tons per hour is anticipated to generate up to 23,250 tons per day of solid waste. The direct discharge of liquid waste into rivers has the potential to cause a number of environmental problems, including a decrease in water quality, turbidity, unpleasant odors, and damage to fish habitat. The liquid effluent from palm oil mills contains a variety of substances, including floating solids, dissolved solids, and oil-in-water emulsions.

These require treatment before discharge into the environment. The effluent can be classified as either low or high. Low effluent requires only natural cooling before discharge, while high effluent necessitates special treatment. In addition, the combustion of empty bunches and palm fiber also contributes to emissions that can damage air quality and impact human health by affecting the respiratory system. The biological stabilization pond or lagoon method is employed to treat liquid waste generated from the processing of oil palm fresh fruit bunches at palm oil mills. This process involves the use of multiple ponds, with dimensions varying from one to several hectares and depths between 3 to 5 meters. In general, effluent with a high oil content is directed into anaerobic ponds, where it undergoes fermentation and produces methane gas while reducing the concentration of organic substances in the effluent.

Subsequently, the effluent from the anaerobic pond is conveyed into the oxidation pond for aerobic treatment. While, the effluent containing suspended solids is directed into the sludge pond for a settling process, after which it is ultimately discharged into the river or utilized as fertilizer in oil palm plantations (Malinda, et al., 2024). The utilization of effluent as fertilizer through land application represents an economically and cost-effective method for fertilizing oil palm crops (Rosyadi, et al., 2023). Nevertheless, it is essential to emphasize that environmental health considerations remain a paramount concern, with the stipulation that effluent quality standards must be met prior to its discharge into ditches within the plantation.

In a report published by Media Tribunnews in 2023, it was revealed that a Palm Oil Mill in Teluk Paman Timur Village, Kampar Kiri Subdistrict, Kampar Regency had caused environmental contamination by allowing its liquid waste to enter local society' plantations. Consequently, a 1.8-hectare rubber plantation and a 5-hectare oil palm plantation were inundated by factory waste, while the soil containing the waste also invaded the residents' gardens. This has resulted in a reduction in crop yield and difficulties for the community in harvesting fruit, which in turn has an impact on their economy. Figure 2 illustrates a significant amount of factual water waste from palm oil mills that have a negative impact on local communities.



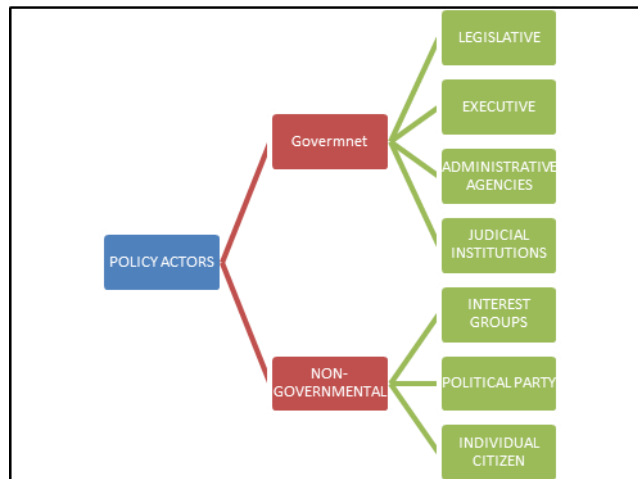
**Figure 3. Instances of Wastewater Inundating Community Gardens Have Been Observed in Teluk Paman Timur Village, Kampar Kiri Sub-district.**  
Source: (Tribunnews, 2023)

The resolution of this issue involved the imposition of legal sanctions on the mills responsible for environmental pollution, as well as legal actions and appeals to communities to jointly monitor potential pollution in their neighborhoods. Those mills that have been identified as being responsible for environmental pollution are required to compensate the affected communities and to normalize the polluted environment. The government's policy on palm oil waste management, as outlined in Law No. 39 of 2014 concerning plantations, is designed to achieve several objectives. Primarily, it aims to increase state revenues and create employment opportunities.

Additionally, it seeks to meet the demands of industrial raw materials (Yawahar, et al., 2022). In the context of the establishment of PKS in the palm oil sector, it is necessary to consider the impact of the scheme on society, including in the management of liquid waste according to predetermined quality standards. The



involvement of various public policy actors, including governmental and non-governmental entities, is crucial for the maintenance of environmental balance and public health. Figure 3 depicts the public actors who can assume an active role in addressing wastewater pollution from oil palm mills in the study area.



**Figure 3. Actors of Public Policy**  
 Source: Author's Illustration

It is evident that public policy actors play a pivotal role in regulating the environmental impact of palm oil mill effluent treatment (Adianto & Prayuda, 2021). The government is responsible for establishing environmental policies that promote efficient waste management for sustainable development, as well as supporting initiatives such as the Indonesian Sustainable Palm Oil Plantation Certification System (ISPO) and the Roundtable on Sustainable Palm Oil (RSPO). In contrast, public policy actors from outside the government will engage in discourse on related matters and offer an evaluation of the policy in question (Komala, 2023). Through effective monitoring, the impact on public health and the environment due to the presence of oil palm mills can be mitigated.

#### 4. CONCLUSION

An increase in the production of crude palm oil (CPO) from palm oil mills (PKS) will result in a concomitant increase in the volume of waste generated, both directly and indirectly. This will have implications for the environment, both in terms of quantity and quality. If palm oil mill effluent (POME) is discharged directly into a river, the majority of the waste will settle, decompose slowly, consume dissolved oxygen, cause water turbidity, emit a very sharp odor, and can disturb the aquatic environment, including fish breeding areas.

The effluent contains suspended solids, dissolved solids, and oil-in-water emulsions. Consequently, PKS must implement a liquid waste treatment process to ensure compliance with quality standards prior to discharge into the environment. This will reduce the impact of pollution. If environmental pollution occurs, legal sanctions must be given to the PKS responsible, while providing legal action and an appeal to the community to jointly monitor potential pollution in their environment. PKS that cause pollution must provide compensation to the affected communities and normalize the polluted environment.

Further, the involvement of a multitude of public policy actors, encompassing both governmental and non-governmental entities, is crucial for the maintenance of environmental balance and community welfare. These actors include legislative, executive, administrative agencies, judicial institutions, interest groups, political parties, and citizens or individuals in the affected areas.

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