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The Impact of Sand and Stone Mining on the Width of the Kampar River in Tambang District, Kampar

Dampak Penambangan Pasir dan Batu Terhadap Lebar Sungai Kampar di Kecamatan Tambang Kabupaten Kampar

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Abstract

The Kampar River has enormous benefits for people's lives, including the availability of non-renewable resources such as sand and stone, which are utilized without permission as raw materials for building. The high demand for river sand and stone and modern sand mining technology exacerbate environmental impacts, especially the width of the Kampar River. This study was conducted to determine the impact of changes in river width caused by illegal sand and stone mining activities in the Kampar River. This research uses a quantitative approach with direct observation methods, interviews, and literature studies. This research was conducted from May to August 2024 in Padang Luas Village, Terantang Village, Parit Baru Village, and Kualu Village, Tambang District, Kampar Regency. The results of this study indicate that illegal sand and stone mining activities in the Kampar River cause significant widening of the river, in addition to increasing turbidity and siltation of the river due to cliff collapse. The impact of changes in river width is worst in Parit Baru Village, which has the most mining locations compared to the other three villages. The highest turbidity value is found at station 3, and the shallowest river depth is at station 2. Illegal sand and stone mining has a real negative impact on the environment, especially on the physical condition of the Kampar River, which is marked by the siltation and widening of the river from year to year.

Keywords: Illegal sand mining, Kampar River, River widening.

Abstrak

Sungai Kampar memiliki manfaat yang sangat besar bagi kehidupan masyarakat, salah satunya adalah tersedianya sumberdaya tidak terbarukan seperti pasir dan batu yang dimanfaatkan tanpa izin sebagai bahan baku bangunan. Tingginya permintaan akan pasir dan batu sungai dan penggunaan teknologi penambangan pasir yang modern semakin memperparah dampak lingkungan khususnya lebar Sungai Kampar. Penelitian ini dilakukan untuk mengetahui dampak perubahan lebar sungai yang ditimbulkan oleh kegiatan penambangan pasir dan batu ilegal di Sungai Kampar. Penelitian ini menggunakan pendekatan kuantitatif dengan metode observasi langsung di lapangan, wawancara dan studi pustaka. Penelitian ini dilakukan pada bulan Mei hingga Agustus 2024 di Desa Padang Luas, Desa Terantang, Desa Parit Baru dan Desa Kualu, Kecamatan Tambang Kabupaten Kampar. Hasil penelitian ini menunjukkan bahwa kegiatan penambangan pasir dan batu ilegal di Sungai Kampar menyebabkan pelebaran sungai yang cukup signifikan, selain itu juga berdampak meingkatkan kekeruhan serta pendangkalan sungai akibat runtuhan tebing. Dampak perubahan lebar sungai terparah terjadi di

Desa Parit Baru yang memiliki lokasi penambangan terbanyak jika dibandingkan tiga desa lainnya, sementara itu nilai kekeruhan tertinggi terdapat di stasiun 3 sementara kedalaman sungai paling dangkal terdapat di stasiun 2.Penambangan Pasir dan Batu ilegal secara nyata memberikan dampak negatif bagi lingkungan khususnya terhadap kondisi fisik Sungai Kampar ditandai dengan terjadinya pendangkalan dan pelebaran sungai dari tahun ke tahun.

Kata kunci: Penambangan pasir ilegal, Sungai Kampar, Pelebaran sungai.

1. Introduction

Kampar River has long provided direct benefits to the community as a provider of clean water needs, fulfilment of protein sources, fish farming, agriculture, tourism, and transportation facilities. Meanwhile, sand and gravel at the bottom of the Kampar River are potential non-renewable resource commodities that the community has long utilized as building materials. However, excessive utilization began to occur along with the high demand for construction materials for development. Initially, the sand mining method was done manually, but now it has been changed to machine suction methods, resulting in more environmental impacts. This mining activity operates without an official permit from the relevant agency or what is known as illegal sand mining.

Sand mining is one of the C excavation mining categories the community can cultivate. Although the community can be permitted, activities in rivers based on Government Regulation No. 22/2010 concerning Mining Areas are still not allowed to conduct mining in river bodies. However, many of these mining practices are still operating in the field. This illegal sand mining is hazardous for the surrounding environment. The impacts that river sand mining activities can cause are damage to road infrastructure, flooding, landslides, reduced water discharge in springs, polluted river water, disruption of traffic activities, and increased air pollution (Ardianto, 2008). In the environment of the sand mining area, landslides will often occur and cause potential flooding and damage to the road, which is the transportation route for sand transporters (Hulukati & Isa, 2020).

Sand mining can reduce river water quality, and its direct impact affects the quality of river waters, ranging from water pH, increasing temperature, brightness, and low dissolved oxygen levels due to the remaining sand that is wasted back into the river (Hasibuan et al., 2019). In addition, sand mining activities can cause riverbed subsidence, which destabilizes river banks, resulting in river widening, and sand siphoning activities cause water to become turbid, blocking sunlight from entering and reducing respiration and photosynthesis of living things in the river (Rentier & Cammeraat, 2022). This condition can further impact the loss of various fish species, thus damaging the river ecosystem. This research was conducted to determine the environmental impacts of illegal sand mining in the Kampar River, especially its impact on changes in river width and water quality of the Kampar River, from the results obtained will be a theoretical basis for environmental management efforts in river sand mining areas, especially in the Kampar River.

2. Material and Method

2.1. Time and Place

This research was conducted from May to August 2024 in Padang Luas Village, Terantang Village, Parit Baru Village, and Kualu Village. The research was conducted at several points along the Kampar River that crosses the Tambang District.

2.2. Methods

This research uses a quantitative approach with direct observation and sampling methods in the field, laboratory analysis, interviews, and literature studies. Data collection through direct observation in the field was used to measure water turbidity, current speed, and depth. Changes in river width were measured using satellite image data for the last 10 years. Meanwhile, interviews were conducted to determine the community's opinions regarding the impacts caused by illegal sand mining activities in the Tambang Sub-district and related agencies such as the Kampar Regency Environment Office and the Village Government.

2.3. Procedures

The population in this study was the ecosystem of the Kampar River in the District of Tambang. The samples studied in this research were Kampar River water at three stations, where station 1 was between Padang Luas Village and Terantang Village, station 2 was between Terantang Village and Parit Baru Village, and station 3 was between Parit Baru Village and Kualu Village. Depth measurements were made using a rope with weights, turbidity was measured using a turbidimeter, and river width was measured using an analysis of the last 10 years of satellite imagery.

2.4. Data Analysis

The data collected in the field is then analyzed descriptively to produce a picture of the actual research results.

3. Results and Discussions

Tambang District is one of the Kampar Regency districts with many sand mining activities besides Petapahan and Siak Hulu Districts. Until 2025, there will be at least 22 active sand mining locations. However, only one business has an IUP (Mining Business License), and the rest are mining businesses that do not have a license and operate illegally. Tambang District is quite diverse in terms of its social and economic life. The economic growth in Tambang District has led to the rapid growth of sand mining activities. The most impactful aspect of sludge mining in the Kampar River is the hydrological condition of the river itself. As a result of mining in Kampar River, the hydrological conditions of Kampar River have changed, including the increase in river width, decrease in river water quality, changes in water flow patterns, erosion of riverbanks, and disturbance to fish habitat.

Based on Riau Governor Decree No. 23/2003, the water quality status of the Kampar River is class I, but based on evaluations conducted from 2017 to 2018 by the Riau Provincial Environment and Forestry Service at the Danau Bingkuang Village monitoring point in Tambang District, the status has changed to class II. The evaluation showed decreased river water quality and heavily polluted results (Hasibuan et al., 2019). Based on the results of field measurements, data on the water quality of the Kampar River, especially from the physical aspect, are described in Table 1.

Table 1. Kampar River water quality at illegal sand mining sites

No	Parameters	Unit	Quality Standard*	Analysis Result		
				Station 1	Station 2	Station 3
1	Depth	m	-	4.5	0.9	1.2
2	Turbidity	NTU	≤ 25 *	23.93 - 27.92	22.7 - 25.39	24.88 - 26.15
3	Current Speed	m/s	-	0.11	0.21	0.16

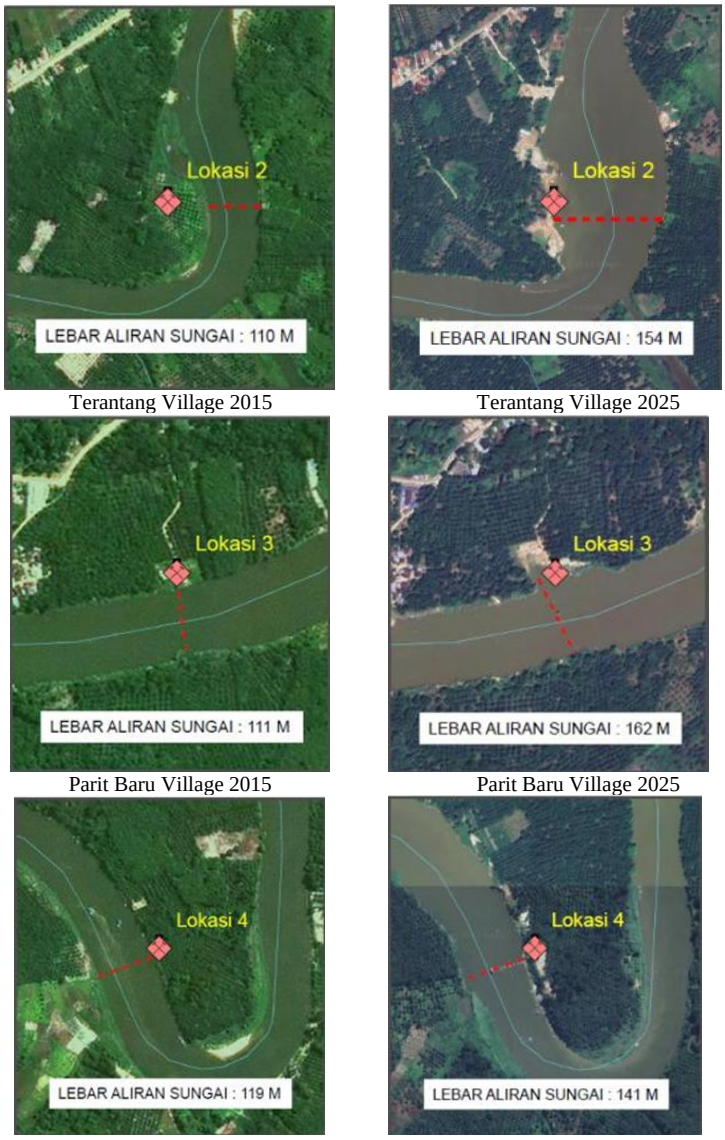
Note: *Class II River Water Quality Standard based on Government Regulation No. 22 of 2021 concerning the Implementation of Environmental Protection and Management

The river's depth at each station is quite varied; station 1 has a higher depth than stations 2 and 3, which have a depth of 4.5 m. Meanwhile, the shallowest part is at station 2, which is only 0.9m. Meanwhile, the shallowest part is at station 2, which is only 0.9 m. The water discharge from upstream strongly influences the river water depth and the weather when observations are made during the dry seas, and the high sediment deposits influence it due to the high sand mining activities in the river. The condition of the Kampar River depth at the research location is close to that of the Kampar River depth downstream from the results of research conducted by Purba et al. (2018), which ranges from 2 - 4 m with an average depth of 2.88m. This shows that the river has been silted at several points in the research location due to sediment deposition from mining activities. Excessive exploitation of rivers, such as taking sand and stones in rivers, can cause siltation and widening of river bodies (Saam & Siregar, 2018).

Differences in depth in river bodies can also cause changes in the motion of water flow because water discharge will move faster in shallower areas (Listriyana et al., 2024). The highest current velocity at station 2 is 0.21 m/s because the current velocity depends on the river's depth. Puteri et al. (2019) explained that the current speed will increase as the river's depth decreases. These conditions can further cause cliff erosion and accelerate erosion, especially on river banks without tree stands (Mawardin & Aryan, 2024). Continuous cliff erosion can cause the widening of the river body, which impacts the loss of riverbank plants or riparian vegetation, reduced land, which causes damage to infrastructure and community-owned buildings, and reduced community ownership land. From the analysis of satellite imagery, it can be seen that the width of the Kampar River in the four villages of the study site has changed significantly over the past 10 years, as shown in Figure 1.

Padang Luas Village 2015

Padang Luas Village 2025



Terantang Village 2015 Terantang Village 2025

Parit Baru Village 2015 Parit Baru Village 2025

Kualu Village 2015 Kualu Village 2025

Figure 1. Changes in the width of Kampar River in four research sites in the last 10 years

In Figure 1, it can be seen that in the last 10 years, the four research locations have experienced an increase in river width, and the worst occurred in Parit Baru Village, which in 10 years has widened by 51 meters, and in Terantang Village has widened in the last 10 years by 44 m. Juita et al. (2018) explain that river widening can be caused by cliff erosion or erosion due to sand mining, which, if it continues, will cause flooding and reduce the area of community-owned land along the river (Figure 2). Sand mining also impacts other changes in river morphology, such as changing river bends, flow direction, widening the river, and river depth (Arsyad et al., 2020).

Figure 2. Erosion of the Kampar riverbank cliffs at illegal sand mining sites

Illegal sand mining activities impact the depth and width of the river and the turbidity of the Kampar River water. Turbidity in this study was obtained within the quality standard range, and some exceeded the quality standard with a range of turbidity numbers between 23.93 and 27.92 NTU (Figure 3). Sand mining activities in the river cause an increase in the concentration of sand and soil particles in the water body, which can disrupt the aquatic ecosystem because it blocks the penetration of sunlight and has an impact on the photosynthesis process of phytoplankton and aquatic plants, and the balance of dissolved oxygen in water (Bawu et al., 2023). This turbidity value is still lower than the turbidity value at the sand mining site in the Batang Merangin River Jambi in a study conducted by Dayanti (2023), which ranges from 65.8 - 341 NTU. The low turbidity value at the research site can be caused by weather factors, namely measurements taken during the dry season so that the water discharge from upstream is not too high, which causes a lack of sediment or particles in the water. In addition, measurements were taken when the mining process was not taking place.

Figure 3. The murky waters of the Kampar River

This illegal river sand mining activity has significantly reduced the quality of the Kampar River waters, which will continue to impact humans who use the Kampar River daily. Based on the results of interviews with several people who live around the mining sites in the four villages, it is stated that illegal sand mining activities are quite disturbing because they damage the main access road to and from the village. Changes in the width of the river certainly have an impact on the condition of the land cover above it, which is generally in the form of gardens and houses owned by the community; the erosion of cliffs causes a decrease in community-owned land and raises concerns about the loss of this land over time. Another impact caused by this illegal sand mining activity is the emergence of conflict in the community due to protests and reporting of these activities. According to Irwandi & Chotim (2017), conflict and rejection arose in the community because the mining activities disrupted the community's activities as fishermen, causing a reduction in fish catches and damaging the surrounding environment.

4. Conclusions

Illegal river sand mining has a significant negative impact on the environment, especially on the physical condition of the Kampar River, where water turbidity began to occur due to sediment lifted from the riverbed, siltation, and deepening of the river at several points, which can trigger changes in river width from year to year. In addition to the physical impact on the river, illegal river sand mining activities also disrupt the daily lives of people living around the mining site due to damage to the main road and the reduction in the area of community-owned land on the riverbank. This research still needs to be developed because there are still many other aspects that need to be studied, both from other physical aspects, as well as biological and chemical aspects in the waters of the Kampar River. Nevertheless, this research can be used as a basis for conducting further research on efforts to deal with environmental impacts due to sand and stone mining activities, as well as other related research, such as economic valuation of environmental impacts arising from illegal river sand mining activities.

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