The Effect of Land Conversion Policy on Environment and Socio-economic Factors in the Keramasan Region of Palembang City

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Abstract. Data on changes and impacts of development activities on environmental/physical, social, and economic aspects can be used as academic texts in formulating a development policy for integrated swamp areas with watersheds. The study was conducted in the Keramasan area, Kertapati, Palembang City, which is an urban area affected by the conversion of swamp functions. The interview process and in-depth interviews of the informants. This type of research is descriptive qualitative with inductive reasoning. Data collection techniques through community observation, in-depth interviews, and documentation. Primary data in the research process is information obtained by researchers directly through the first source/informants/community. The negative and positive impacts of swamp function conversion on environmental, social, and economic components constitute the increase in income, lowering the quality of river water, and increase in the amount of runoff. The negative impacts, after all, need to be managed so that the development process can continue to run with an emphasis on environmental aspects. Changes in land use patterns, surface water quality, runoff, changes in community attitudes and perceptions, and public opinion conditions must be managed and considered because these factors have a real impact on changing both positively and negatively.

Keywords: land, environmental, economy

1. Introduction

Very high population growth affects the availability of sufficient land. Using swamp land for urban development requires a national policy as mandated by the 1945 Constitution Article 33 paragraph (3), namely "Earth, Water, and Natural Resources contained therein are controlled by the State and used as much as possible for the prosperity of the people. The province of South Sumatra is part of the Sumatran archipelago, which has the largest swamp land spread over several districts and cities. The swamp land area has important ecological, hydrological, and economic values. The impact of damage to swamp land or the reduction of swamp land can lead to decreased biological resources. Swamp land is one of the ecosystems that play an important role in preserving biodiversity because it has a rich habitat [1]. Regional Regulation Palembang City No.11 of 2012 regulates swamps into three types, namely

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conservation swamps, cultivation swamps, and reclamation swamps. The negative and positive impacts of swamp function conversion on environmental, social, and economic components need to be managed so that the development process can continue to run with an emphasis on environmental aspects

Swamp land is a wetland that functions as water storage, flood protection, groundwater recovery, water purification, nutrient source, local climate stability, and ecological balance [2]. (Vatsa et. al., 2019). The demand for land in urban areas is increasing with population growth and socio-economic activities. According to Foelske et al. [3], the limited availability of land in urban areas has resulted in the orientation of development changing to urban fringe areas. The development of swamp area development results in land subsidence. This condition is further exacerbated by climate change so that the rainy season lasts for a long time and causes flooding [4].

Land use and conversion of swamps into residential, industrial, and office areas have occurred in urban areas. Land use and conversion of swamps to new areas require a directed and regular policy to produce good environmental quality [5]. The balance of ecosystems and the availability of swamp land is disturbed due to the development process, so watershed management (DAS) is needed from upstream to downstream [6]. The development of swampy areas causes limited water resources, especially when climate change occurs during the dry season, so it can affect the agricultural and non-agricultural sectors [7]. The development of swampland produces several inherent impacts through opening access to remote areas and the growth of new activity locations related to regional development. However, the development process of the majority of swamp areas is generally still in the subsystem stage because it relates to the selection of an inappropriate development location, both in terms of the geographical area and the potential of its land resources. Swamp land management requires an integrated approach, improving policy, and legal and institutional frameworks are very influential in swampland management. Improper use of swamp land will cause environmental degradation due to limited spatial and land use arrangements.

Land use planning emphasizes space on land use in the context of rational planning supported by precise, accurate, and reliable information so that in applying methods, analysis/theory can be used optimally and effectively [8]. In planning, there is an emphasis on various aspects, namely planning that aims to create a more rational organization related to development demands by paying attention to the environment, social, and economy, coordinating the spatial impacts of other sectoral policies, achieving equitable development and regulating land use conservation by taking into account the ecosystem, and biological resources [9]. Land use change can result in deforestation, loss of biodiversity, increased greenhouse gas emissions, land conflicts, displacement of deforestation, and other social problems [10]–[13]. According to Sharifi [14], Land conversion in urban areas has caused a decrease in water catchment areas, so that during the rainy season, it causes erosion and flooding. According to Retallack [15], due to the reciprocal relationship between components of the watershed ecosystem, if there is a change in one of the environmental components, it will affect the other components. Changes in these components can, in turn, affect the overall ecological system in the area.

The area of Palembang City is mostly swamped land. Currently, swamps in Palembang City are 5,438 hectares, with a total composition of conservation swamps with a land area of 2,106 hectares, cultivation of 2,811 ha, and reclamation of 917 ha. This number will decrease with developments such as housing/settlement, offices, and industry. Swamp land has potential and plays a strategic role in supporting regional development through the application

of technology by taking into account the condition of the swamp agroecosystem and food security [16].

The Palembang City Government guarantees urban development by considering the environmental aspects of swamp areas through Regional Regulation Number 11 of 2012 concerning the Development of Swamp Control and Utilization. The swamp area of Palembang City, which has been designated as a conservation area, is 2,106.13 hectares, and a cultivation area of 2,811.21 hectares is to be used as agricultural land for settlements. The swamp area in Palembang is only 30% of the total area of Palembang City because of the rampant development of new and industrial areas. The development of the Keramasan area, Kertapati, became an office area included in the Strategic Program of the South Sumatra Provincial Government. Regional Regulation No. 11 of 2012 regulates swamps into three types, namely conservation swamps, cultivation swamps, and reclamation swamps. Conservation and cultivation swamps may not be changed to designation and cannot be built, while reclaimed swamps may be stockpiled, now the zoning of the swamp area is partial because the Palembang City government has never made a marker for this swamp [17].

The change in activity patterns in the Kertapati Region is due to the plan to develop an office area development area that requires spatial planning. The development, utilization, and conversion of swamp land can have dangerous impacts if not managed properly. Therefore analysis and discussion of changes in spatial patterns and watersheds (DAS) are needed. The social and environmental impacts caused by development in swamps can change the pattern of use, especially agricultural and non-agricultural lands, with land shrinking so that it will have an impact on people's livelihoods and changes in people's habits. The social impact of development policies will also affect social inequality through changes in the activities of farming communities into traders or tourism. Changes in livelihoods by pursuing new jobs lead to competition due to land conversion and changes in people's perceptions and attitudes.

The negative and positive impacts of swamp function conversion on environmental, social, and economic components must be managed so that the development process can continue with an emphasis on environmental aspects. Analysis Government policies regarding the development of urban areas that directly impact swamps and watersheds are needed to maintain the environmental sustainability. Data on changes and impacts of development activities on environmental/physical, social, and economic aspects can be used as academic texts in formulating a development policy for integrated swamp areas with watersheds. This paper is intended to study the effect of land conversion policy on environmental, social, and economic factors in the Keramasan area of Palembang.

2. Material and methods

The study was conducted in the Keramasan area, Kertapati, Palembang City, which is an urban area affected by the conversion of swamp functions (Figure 1). The interview process and in-depth interviews of the informants will be carried out in their respective agencies. This type of research is descriptive qualitative with inductive reasoning. An inductive approach is an approach that starts from a special event as a result of empirical observations and ends at a conclusion or new general knowledge. Data collection techniques through community observation, in-depth interviews, and documentation.

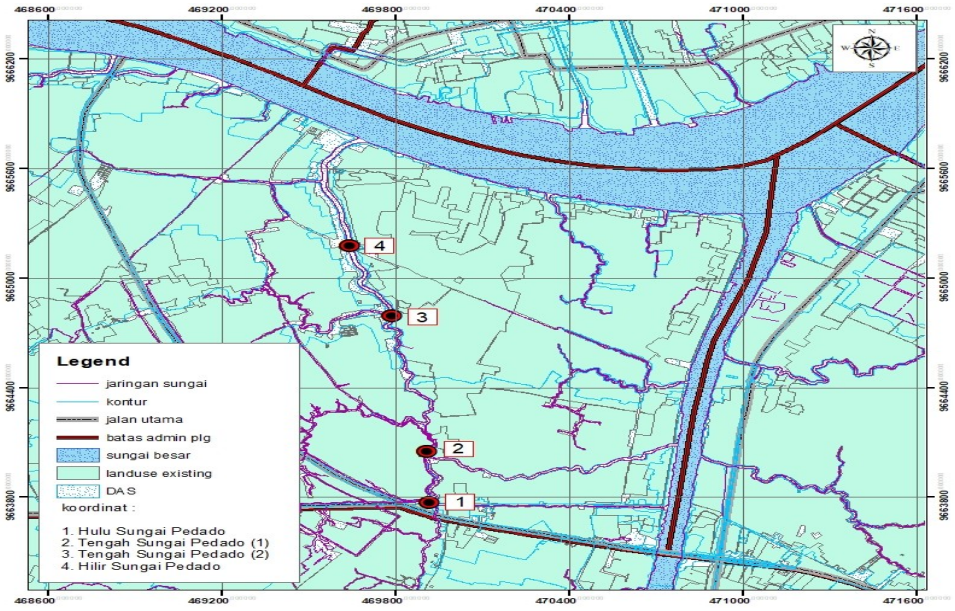

Figure 1. Research area; 1. Upstream of the Pedado river; 2. The middle of Pedado 1 river; 3. The middle of the Pedado 2 river and downstream pedado river

Primary data in the research process is information obtained by researchers directly through the first source/informants/community. The informants in this study were the PUPR Office of the South Sumatra Province, the PUPR Office of the City of Palembang, the South Sumatra Provincial DPRD, the South Sumatra Provincial Environment Service, the Palembang City Environment Service, the Palembang City DPRD, Environmental Experts and Observers and the people who were directly affected by the development of urban areas. The geospatial approach is also used to see the existing conditions of the affected development sites. Primary data is complemented by a study of secondary data to produce an in-depth analysis. Secondary data can be in the form of supporting data, which is used to strengthen, complement, or support primary data. The secondary data of this study were obtained through indirect sources, namely local regulations, public documents, online news, the internet, journals, and books related to the condition of swamps and watersheds in urban areas. Primary data liked surface water quality, runoff, income level, and perception. Secondary data liked climatology and people growth.

3. Results and Discussion

3.1 Environmental/Physical Factors

3.1.1 Climatology

Agriculture, industry, the health sector, politics, and the social-economic sector, among others, are all likely to be impacted significantly by climate change in the coming years [18]. Climate analysis is very important to discuss concerning rainfall conditions [19]. The definition of 1 (one) millimeter of rainfall is that in an area of 1 m on a flat place accommodated water as high as 1 mm or accommodated as much as 1 (one) liter of rainwater

that collects in a flat place, does not evaporate, does not seep, and does not flow. In the precipitation criteria, rainfall with an intensity of > 50 mm/day becomes a parameter for the occurrence of heavy rain. In contrast, the criteria for extreme rainfall have rainfall with an intensity of > 100 mm/day. So the intensity of rain greatly determines the humidity of soil conditions.

Based on data from the Meteorology, Climatology and Geophysics Agency (BMKG) Kenten Palembang, the average monthly rainfall in Palembang City in 2010-2019 tends to fluctuate. Palembang City in 2010-2019 had the highest average monthly rainfall in March, which was 389.5 mm/year, and the lowest monthly average rainfall in July, which was 68.5 mm/year. Palembang city in 2010-2019 is included in climate type B or wet climate type. This refers to the results of the calculation of the Q value, which is a comparison of the average dry month with the average wet month during 2010-2019. The Q value of 0.2 indicates that the rainfall that falls in the city of Palembang is high, with the number of wet months reaching 7-11 every year. According to Lawry et al. [19], rainfall data will have a direct effect on the potential for runoff in an area affected by construction and stockpiling.

3.1.2 Surface Water Quality

Surface water quality is known through field surveys by measuring directly (in situ) and analyzing samples of the Pedado River in an accredited laboratory. Measurement of surface water quality carried out around the location of the New Integrated Keramasan Area Development Plan for Palembang City to determine the content of several surface water quality parameters affected. Measurement of surface water quality as a measure of a decrease in surface water quality at the activity site, an analysis of the quality of surface water is carried out and compared with the quality standards that have been set to determine the impact that occurs. The sampling locations are shown in Table 1.

Table 1. Location of Surface Water Quality Sampling

No	Sampling location	Coordinate	
		Latitude	Longitude
1	Headwaters of Pedado	03°02'30.8"S	104°43'45.3"E
2	Middle of the Pedado river (1)	03°02'21.8"S	104°43'45.1"E
3	Middle of the Pedado river (2)	03°01'57.5"S	104°43'41.2"E
4	Downstream of the Pedado river	03°01'45.1"S	104°43'36.5"E

The results of the measurement of surface water quality around the location of the New Integrated Keramasan Development Activity Plan in Palembang City showed that the parameter test results for Total Suspended Solid (TSS), Copper (Cu), and Oil & Fat in the Upper Pedado River exceeded the quality standard; the parameters of Copper (Cu) and Oil & Fat in the Middle part of the Pedado River (1) exceed the quality standard; Total Suspended Solids (TSS) and Oils & Fats in the Middle part of the Pedado River (2); and Total Suspended Solid (TSS), Copper (Cu) and Oil & Fat in the Downstream of the Pedado River. Some of these parameters exceed the quality standards that refer to the Government Regulation of the Republic of Indonesia Number 82 of 2001 concerning Water Quality Management and Water Pollution Control, Class II.

Total Suspended Solid (TSS) indicates the presence of particles in the form of soil that accumulates in the waters [20]. The chemical analysis of water quality included all organic

and inorganic chemical parameters. The research results in the Upper and Middle parts of the river showed that they were polluted by one of the heavy metals, Cu (Copper). Copper (Cu) is very dangerous for humans because the mechanism for entering Cu into the human body can be through the respiratory system, digestion, or directly through the skin surface [21]. The toxicity of Cu can cause inflammation of the mouth, diarrhea, anemia, nausea, abdominal pain, and paralysis [22].

Water quality generally indicates the quality or condition of water associated with a particular activity or purpose [23]. The water quality will differ from one activity to another [24]. For example, the quality of water for irrigation purposes is different from the quality of water for drinking water purposes. The surface water quality can be determined through field surveys by measuring directly (in situ) [25]. Surface water quality analysis data derived from surface water quality testing results are calculated using the Pollution Index (IP) method. The results of the calculation are obtained in Table 2.

Table 2. Results of the Analysis of Surface Water Quality of the Pedado River.

Sampling location	Pollution Index	Category
Headwaters of Pedado	5,395	Medium
Middle of the Pedado river (1)	6,236	Medium
Middle of the Pedado river (2)	6,008	Medium
Downstream of the Pedado river	5,506	Medium

Development in the use of swamp land for the construction of residential, office, and industrial housing requires optimal planning by stakeholders and the availability of a retention pond as a green open space that functions as a counterweight to accommodate rainwater discharge and as water storage during drought. The characteristics of swamp land for development will have the potential for land subsidence (settlement) and a decrease in water quality as well as an increase in water runoff which results in the inundation of agricultural land and settlements [26]. It is estimated that the planned characteristics of the activities carried out at the research site will result in extreme conditions in increasing the volume, type, and pollutants in wastewater. Conditions like this can worsen the water quality of the Pedado River, which was originally bad.

3.1.3 Run Off

The impact of development on the environment will affect the decrease in air quality, groundwater quality, the shift of water runoff, and the disturbance of aquatic biota. The condition of swamp land cover due to hoarding in the construction of settlements, offices, and industries in swamps can cause a shift in runoff water which results in changes in the rate of rainwater infiltration and changes in water discharge [27]. The activity of preparing and structuring swamp land will impact the environmental component, namely a decrease in runoff [28]. This is due to the condition of the land cover at the activity site in the form of a swamp. At the land preparation stage and arrangement, 70% of the land will be filled and compacted with the material in the form of sand. This change in land cover is expected to cause a decrease in the rate of rainwater infiltration, which results in an increase in runoff discharge.

The current condition at the research site is that 42.90 hectares have been filled and built, and the rest are swamps and rivers. The potential for hoarding will trigger changes in surface water flow and have an impact on the condition of water capacity. In determining the

environmental scale, it is based on the criteria approach for determining the environmental component of the runoff water, which is converted into an environmental quality scale [29]. Based on the results of direct observations and observations, the plan for the Development of the New Integrated Keramasan Area, Palembang City, is still a swamp (vacant land) that has small irrigation to drain the water in the swamp land. This can cause a decrease in surface water quality due to the impact of increasing the volume of surface water runoff (runoff), which can cause a decrease in surface water quality, especially in river water that is close to the activity location, namely the Pedado river. This is because runoff enters the channel carrying soil material which can cause an increase in TSS levels in surface water and wastewater [30].

Based on the results of observations, the plan for the Construction of the New Integrated Keramasan Area Development in Palembang City is included in a solid building structure (after the existence of a building at the activity site) with a coefficient value (C) of 70 - 90 %. The rain intensity data were obtained from the average rainfall data in Palembang, while the highest rainfall intensity was 389.5 mm/month. The planned land area for the Development of the New Integrated Keramasan Area for Palembang City is 45.45 Ha, with a total floor area of 96,151 m2. Then the calculation results are obtained, namely:

Q = 0.278 x C x I x A
Q = 0.278 x 0.70 x 0.000541 m/hour x 96,151 m2
Q = 10.1226 m3/hour
Q = 0.002812 m3/second

3.2 Socio-Economic Cultural Factors

3.2.1 Changes in People's Perceptions and Attitudes

Swamp land conversion activities result in overall land cover, which can potentially affect the socio-economic components of the community, especially changes in community perceptions [31]. Observation and data collection was carried out on 50 respondents using a questionnaire to collect data. The condition of changes in people's perceptions and attitudes is carried out through an approach to survey results regarding respondents' responses to development activities. Based on survey data, 40% of respondents answered agree with the activity plan, 32% answered they did not know, 24% answered normal, and 4% answered disagree. Based on the large percentage of respondents who stated that they did not agree and did not know about the activity plan, which was 36%, it can be concluded that 36% of the population was worried about things that arise as a result of the activity plan.

Several things can lead to negative perceptions and attitudes from the public, namely the occurrence of a decrease in air quality due to an increase in vehicle volume in the process of developing mobilization & demobilization of heavy equipment and materials due to traffic of vehicles carrying materials and equipment, traffic generation and the potential for flooding as a result of hoarding [32].

3.2.2 Business Opportunities and Economic Improvement

The condition of business opportunities is based on observations and interviews regarding the number and types of business units opened by the community in the study area [33]. Based on the survey results at the location of the planned activity, there are several community businesses in the form of places to eat, printing services, workshops, credit sales

services, and also places to buy and sell basic necessities. The economic condition is carried out through the approach of survey results regarding the monthly income level of the community after the stockpiling process takes place. Based on survey data, as many as 60% of respondents have an income of around Rp. 1,100,000 - Rp. 2,500,000, as many as 20% of respondents have an income of around Rp. 2,600,000 - Rp. 3,500,000, as many as 16% of respondents have income > 3,500,000 and as many as 4% of respondents have income < Rp. 1,000,000. A comparison of community income levels before and after the hoarding process can be seen in Table 3.

Table 3. Comparison of community income levels before and after the hoarding process

Community Income Level Before the Hoarding Process		Community Income Level after the Hoarding Process	
Income	Percentage	Income	Percentage
< IDR 1,000,000	4	< IDR 1,000,000	0
IDR 1.100.000 - 2.500.000	60	IDR 1,100,000 - 2,500,000	64
IDR 2,600,000 – 3,500,000	20	IDR 2,600,000 - 3.500.000	20
> 3,500,000	16	> 3,500,000	16

Forecasting environmental quality conditions for the socio-economic and cultural components of business opportunities in future environmental conditions with the project is carried out through a non-formal approach to professional judgment. Business opportunities in the activities are predicted to increase business opportunities for the community, especially in the vicinity of the planned activity locations [34]. However, the real impact of the increase in people's income cannot be taken directly due to development activities which are still a problem.

4. Conclusion

The Palembang City Government guarantees urban development by considering the environmental aspects of the swamp area. The development of the Keramasan area, Kertapati, became an office area included in the Strategic Program of the South Sumatra Provincial Government. The negative and positive impacts of swamp function conversion on environmental, social, and economic components must be managed so that the development process can continue with an emphasis on environmental aspects. Changes in land use patterns, surface water quality, runoff, changes in community attitudes and perceptions, and conditions of public opinion are variables that must be managed and considered because these factors have a real impact on changing both positively and negatively.

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