

Analizing Land Use Change and Direction for Controlling Space Utilization at Industrial Area of Kasemen District, Serang City

Neni Sofiyanti^{1*}, Santun R.P. Sitorus², Asep Denih³

Universitas Pakuan, Indonesia

Email: nenisofiyanti@gmail.com

*Correspondence

ABSTRACT

Keywords: land use change; space utilization; industrial area management	The determination of industrial estates in Kasemen District has a significant influence on the area around the industrial area, especially on agricultural land, public green open spaces (RTH), and river borders around the industrial area. The methodology used in this study is the industrial location theory analysis method, the spatial analysis method of overlaying land use maps with spatial pattern maps of RTRW Serang City using QGis media, the method of analyzing the impact of determining industrial locations using leopod matrix, and the AHP SWOT method to analyze the direction of control. The location of the determination of industrial estates has been in accordance with the industrial location theory, changes in land use before and after the establishment of the RTRW regional regulation show a reduction in agricultural and fishery land, but the built-up land and mangrove forest land have increased and new land use has emerged including industrial land, service trade land. The identification of land use change occurred from 2009, 2016 to 2023. The results of the study show that the largest change in agricultural land use occurred in 2009 - 2016 of 833 hectares, while in 2016 - 2023 it was 90 hectares of land area in Kasemen District. This shows that after the establishment of the Serang City RTRW Regional Regulation, land changes in agricultural areas can be reduced to 0.01%.
---	--



Introduction

Serang City as one of the new autonomous cities and echoed as the capital of Banten Province has a history in changing government status. According to Lamidi (2017) stated that the City of Serang has undergone several changes, it is stated that "... In 2000, through Law No. 23 of 2000 concerning the Establishment of Banten Province, Serang was designated as the capital of Banten Province. In 2007, through Law No. 32 of 2007 concerning the City of Serang. Serang is designated as an autonomous city with administrative areas including Serang District, Kasemen District, Walantaka District,

Curug District, Cipocok Jaya District, and Taktakan District. The change in status to become an autonomous city has been followed by the establishment of the Tata Plan"

The designation of the city of Serang as a candidate for the capital of Banten Province has made several activities no longer able to run in Serang City, one of which is brackish water pond fisheries in Kasemen District. In RTRW Regional Regulation No. 6 of 2011 and its amendment RTRW Regional Regulation No. 8 of 2020, it was stipulated that the change of brackish water pond fishery land was changed to the designation of industrial estates. Land use is an effort to utilize land from time to time to obtain results (Soetarno, 2003), Kasemen District is one of the sub-districts designated as one of the industrial areas in Banten Province besides Cilegon City and Serang Regency.

The development of areas in coastal areas, just like development in other areas, aims to improve the welfare of the population. (Panggalih, 2020). Regional development is an effort in the development of an area or an area and resources (natural, artificial, human and technological) optimally, efficiently and effectively (Homer et al., 2016). The determination of industrial estates almost occurs in several coastal areas that are directly adjacent to other industrial estates that have developed, one of the industrial estates in Banten Province that is directly adjacent to Kasemen District is the Wilmar Integrated Industrial Estate in Kramatwatu District, Serang Regency.

The determination of industrial estates in the Serang City RTRW Regional Regulation is an implementation of Government Regulation No. 14 of 2015 about the National Industrial Development Master Plan (RIPIN) for 2015 – 2035. In addition, the change in the activities of the community of Sawah Luhur Village, especially Kasmen District in general, from farmers to private employees and self-employed. This can be seen from the number of education at the Senior High School (SMA) and Undergraduate levels increasing every year. At the location of the Kasemen District industrial area, in addition to general industry, there will also be an industry and a National Ordnance Laboratory under the auspices of the Ministry of Defense and Security. This information was expressed by representatives of the Ministry of Defense and Security at a joint meeting to determine the RDTR for Cities/Regencies throughout Indonesia in Jakarta in 2023, then this was stated at Regulation of the Mayor of Serang No. 77 of 2023 about the Detailed Spatial Plan (RDTR).

The industrial activities that will currently run are agricultural industry activities, this is in accordance with the location of the industrial area which is directly adjacent to the Sustainable Food Agricultural Land (LP2B) of Serang City. Determination of Sustainable Food Agricultural Areas (KP2B) which is an implementation of Law No. 41 of 2009 concerning LP2B, according to Government Law of the Republic of Indonesia Number 41 of 2009 about Sustainable Food Agricultural Land Protection explained that "Sustainable Food Agricultural Land is a field of agricultural land that is determined to be protected and developed consistently in order to produce staple foods for national food independence, resilience, and sovereignty." The existence of LP2B in Kasemen District has an impact on restricting access to agricultural land, in the Serang City RTRW Regulation No. 8 of 2020 LP2B land must not be converted except for government-owned

Analizing Land Use Change and Direction for Controlling Space Utilization at Industrial Area of Kasemen District, Serang City

public facilities. For this reason, the role of the government is needed in controlling the use of space in Kasemen District, Serang City. The objectives of this study are (1) Analyzing the suitability of the location of the determination of industrial estates in Kasemen District with the provisions of the Industrial Location Theory, (2) Analyzing Land Use before and after the determination of industrial estates in the Serang City RTRW Regional Regulation, (3) Analyzing the suitability of land use changes with the applicable RTRW and Serang City RDTR Regulations, and (4) Preparing directions for controlling the use of space in industrial estates based on the applicable Regional Regulations.

Method

This research was carried out from October 2023 to July 2024 in the Development Area (WP) of Kasemen District, which consists of 10 (ten) villages, namely Kasemen Village, Warung Jaud, Priyayi Mosque, Bendung, Terumbu, Sawah Luhur, Kilasah, Margaluyu, Kasunyatan and Banten. with an administrative area of 6885 ha with territorial boundaries To the North is the Java Sea, Serang City South of Serang District is Serang City, East is Kramatwatu District, Serang Regency, West is Pontang District, Serang Regency, Map of the Outer Boundary of Kasemen District Development Area (WP) The location of the study is presented in Figure 1.

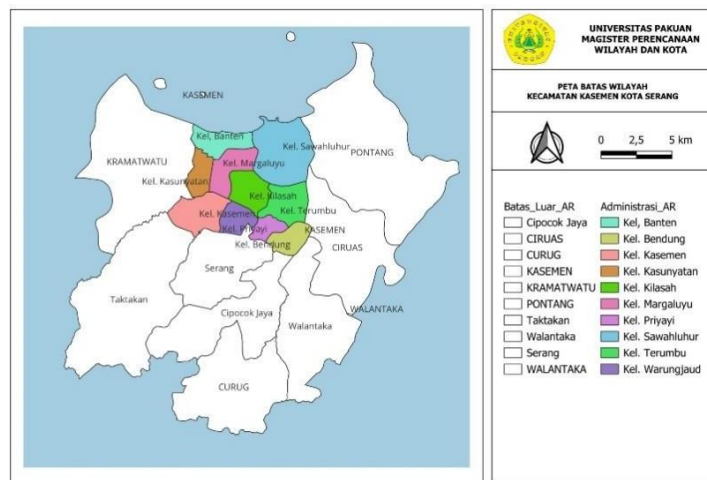


Figure 1. Research Location

Materials and Tools

The materials used in this study include (1) raster data, which is satellite image data that has temporal data recording with a recording time range of 5 (five years), such as Landsat 8, land cover maps in 2009, 2016 and 2023; disaster maps; Spatial Pattern Map, Land Use Map, Land Use Conformity Map to RTRW, Population Data, Professional Data, Land Use Data for the period 2009, 2016 and 2023;. The tools used are *Quantum GIS* supported by *UAV Mapping*; and Camera.

Data Collection Methods

This study uses various data collection methods to achieve the research objectives. For the analysis of land use of industrial locations, data was collected through primary and secondary surveys. For the analysis of changes in land cover/land use patterns, it was collected through secondary surveys (*Google Earth Engine, Earth Explorer*) and primary surveys.

Data Analysis Techniques

The analysis methods described in this study are adjusted to the research objectives to be achieved, including: the suitability of the industrial location land use plan to the theory of industrial location, the extent of land use, the suitability of land cover to the applicable RTRW Regional Regulation, the direction of land use control in Kasemen District.

Table 1
Matrix of research objectives, data types, analysis techniques and outputs

It	Research Objectives	Data Type	Data Source	Data Collection Techniques	Data Analysis Techniques	Result
1	Analysis of the suitability of the determination of industrial location areas in Kasemen District in the Serang City RTRW Regional Regulation on the theory of industrial location	Industrial activity plan data Industrial Raw Materials Data based on industrial activity plans Location data Agglomeration of industrial activity plans Marketing location data	BPS Serang City BPS Serang City and Serang Regional Government Perwal RDTR Serang City No. 77 of 2023 BPS Serang City, BPS Banten Province	Secondary Survey Secondary Survey Secondary Survey Secondary Survey	Descriptive Analysis and Industrial Location Theory, GIS Analysis using QGIS media	Planner of the right activities at the location of the industry so that the achievement in production efficiency, good market access, and optimization of operational costs, with the running of industrial

Analizing Land Use Change and Direction for Controlling Space Utilization at Industrial Area of Kasemen District, Serang City

						activities, the original income of the Serang City area will increase
2	Analysis of land use in Kasemen District before and after the establishment of the Serang City RTRW Regional Regulation	Land use data before and after the determination of the Serang City RTRW regional regulation	Serang City DPUPR	Secondary Survey	Descriptive Analysis, Scoring Analysis	Land use data before and after the establishment of the Serang City RTRW Regional Regulation
3	Analysis of Land Use Suitability Around the Industrial Location of Kasemen District Based on the Regional Regulation of RTRW Serang City	Land Use Map of Serang City RTRW Map	Serang City DPUPR	Secondary Survey	Descriptive Analysis and GIS Analysis with QGIS Media Matrix Leopold	Map Overlay Results of Land Use Conformity and Non-Conformity
4	Analysis of land use control directives around the location of the Kasemen District industrial estate	Land Use Control Policy Plan	Serang City DPUPR	Secondary Survey	Qualitative Analysis	Land use control directive policy based on the Serang City RTRW Regional

determinat ion based on the applicable RTRW Regional Regulation	I Regulati on which applies for now and in the future
---	---

Results and Discussion

Analysis of the suitability of the determination of industrial location areas in Kasemen District in the Serang City RTRW Regional Regulation on the theory of indust location

The selection of industrial locations must refer to several factors that will affect the implementation of activities, some of these factors include market location, sources of raw materials, labor, electricity, water, transportation, community attitudes, and local government regulations. Improper determination of business location will result in high operational costs so that there is an inability to compete and will cause losses (Maulana, 2018).

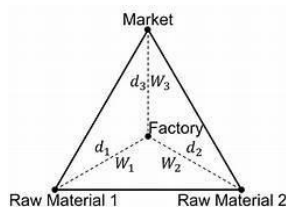
Based on the theory of the location of industrial estates proposed by Weber in Ivanda (2023) in Daldjoenu (1997:62-64). Location with a fee *least cost location* is the principle of *smallest expense area* Where the principle applies if the topographic area is uniform, the same source of raw materials, the same labor wages, and the same marketing. These three factors are measured by a comparison of transportation costs, transportation costs depend on the weight and distance that must be traveled to transport the goods (Boys, 2023). According to Eddy Herjanto (2007: 127) several factors that must be considered in determining the location of an industry include the location of the market, the location of raw materials, the availability of labor, the availability of electricity, the availability of water, health services, government regulations, community attitudes, the cost of land and buildings, the area of parking lots, sewers, the possibility of expansion and the width of the road.

The theory of the location of the minimum cost was put forward by Alfred Weber, a German economist, in his book entitled *Uber Den Standort Der Industries* in 1909. Then translated by C.J. Fredrich in a book entitled *Alferd Weber's Theory Of Location Of Industries in 1929*. Weber based the theory that in the selection of industrial locations depends on the total cost of transportation and labor when the sum of the two is minimal with the maximum level of profit. The theory put forward by Weber in John Glasson's book is that the Research Unit is an isolated area, with a homogeneous climate, consumers are concentrated in several centers, and market conditions are a perfect competition. Natural resources are *ubiquitous*. Water, sand and rock resources are available in adequate quantities and are easy to find. Scattered Natural Resources (*Sporadis*), aterial such as

Analizing Land Use Change and Direction for Controlling Space Utilization at Industrial Area of Kasemen District, Serang City

mineral fuels and mines are available sporadically and only reach a few places. The labor force is *unubiquitous* but grouped in several locations with limited mobility.

According to Alfred Weber's location theory, transportation costs are a major factor in determining the location of an industry. Weber states that transportation costs increase proportionally with distance, so the optimal location point is the place where the total cost of transportation (both to transport raw materials to the factory and finished products to the market) is minimal. Thus, in order to determine the optimal plant location, it is necessary to consider the input weight: The total weight of all raw materials that must be transported to the production site. Output weight: The weight of the final product to be transported to the market. The goal is to find the point where the transportation costs for transporting raw materials to factories and finished products to the market are at their lowest level. Other factors such as labor wages and agglomeration can modify the location, but transportation costs remain a key consideration in Weber's analysis.



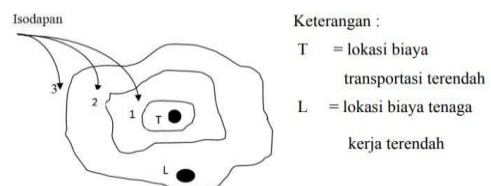
- a. *Market* : the place where buying and selling occur
- b. *Factory* : The optimal Industrial Location is determined based on the closest distance to raw materials and the market.
- c. *Raw Material 1 & 2* : location of production

Figure 2 *Locational Triangle From Weber*

Source: (Muzayanah, 2015)

- a. d_1, d_2, d_3 : Distance of input and output locations
- b. W_1, W_2, W_3 : Input and output weight
- c. $d_1 W_1$: the most expensive transportation cost, the fastest

Figure 2.2 Figure 2.2 Weber's Isodapan Curve



On the concept in location optimization, where two sources of raw materials (M1 and M2) and the market are located in different places. The optimum point, or point T, is the place that minimizes the total cost of transportation from both sources of raw materials to the market. In this context, the T point is usually found using methods such as **the Centroid Method** or **Location and Placement Analysis** which aims to determine the optimal location that minimizes the total cost of transportation.

Raw Material Factor

The raw material factor is the main thing that becomes a benchmark in industrial activities, the location and cost of obtaining raw materials are one of the main considerations for choosing an industrial location in the theory of industrial location put forward by experts.

a. Raw Material Location

One of the main raw materials that will be used in producing the agricultural industry is a fairly large area of rice fields. Kasemen District is one of the sub-districts that has the largest agricultural land in Serang City, the existence of Sustainable Food Agricultural Land (LP2B) with an area of 2932 hectares in the Kasemen District area is considered feasible as a location for the main raw materials in agricultural industry activities.

b. Raw material procurement costs

The selection of industrial location distance affects the acquisition and production costs, the selection of industrial locations in Kasemen District is considered to have low acquisition costs. This can be seen from the location of the industrial determination next to the location of raw materials, for this reason, with a very minimal raw material acquisition price, it is considered to reduce production costs so that *production costs* can be diverted to other factors that are considered to require considerable costs. Table 2 presents an estimate of the cost of obtaining raw materials per km.

Cost per km : $H = f(B, J, K, M)$

Table 2
Pricing Based on Mode of Transportation

Types of means of transport	H	B	J	K	N
Truck	H1	Small	Near / Far	Keep	Variant
Train	H2	Big	Far / Near	Keep	Variant

Truck type

- Truck Tronton 235PS – 260 ps (6 X 4)
- Truck Capacity = M3 (25), Ton (25)
- Fuel Ratio / 1 liter Solar =
- Truck Age 0-2 Years = 2,5 km
- Above 3 Years = 2.2 km

Several factors affect the fuel ratio in the calculation of transportation costs (1) Driver behavior, (2) The condition of the path traveled (damaged, flat, flat, ramp or descent, etc.), (3) The load or load cargo being transported, (4) Tire pressure (the higher the wind pressure on the tires, the more economical it is in fuel consumption), (5) The operation of the vehicle used, *stop and go*, or *continue*.

Analizing Land Use Change and Direction for Controlling Space Utilization at Industrial Area of Kasemen District, Serang City

1. Labor Factor

Human Resources (HR) is the main thing in determining a competent workforce, the quality of education and expertise in work are the benchmarks in determining the quality of the workforce. Human resources needed as a benchmark for the workforce in the industry are urgently needed. Serang City as one of the cities designated as an education center city where there are several leading universities established in Serang City, has the potential to produce human resources needed in industrial activities in Kasemen District. Several public and private universities that are not far from the location of the Serang Industrial Estate (KIS) include Sultan Ageng Tritayasa University (UNTIRTA), Sultan Maulana Hasanudin State Islamic University (UIN SMH Banten), Pamulang University, Indonesian Education University (UPI), Sutomo University.

2. Agglomeration Factor

The development of the industrial sector is part of long-term economic development because of the huge contribution of the industrial sector. Agglomeration is sometimes needed in industrial activities, Kuncoro (2002) that agglomeration is the spatial concentration of economic activity due to the savings due to the proximity of the location associated with the spatial cluster of companies, workers and consumers. In the concept of industry, there are several groups of functional relationships.

The production relationship and service of industrial activities, in the production relationship of the Wilmar Integrated Industrial Estate (KIWT) in Kramatwatu District, Serang Regency which is engaged in industrial activities in the field of agriculture and plantations, have similarities in terms of production. KIWT, which is 16.5 km away, is expected to be a support for industrial activities on KIS land so that good agglomeration will be created in production activities.



Figure 3 Location of Serang City Industrial Estate (KIS), Wilmar Integrated Industrial Estate (KITW) and Bojonegara Port, Serang Regency

3. Market Relations

In marketing, KIWT that has agricultural production activities is expected to have a positive reciprocal relationship, so that cooperation is created in terms of product marketing both domestically and abroad. In terms of transportation, the location of the KIS determination is supported by 2 (two) ports, the port of Karangantu Kasemen District which is included in the class D port and the Bojonegara International container port which is 30.6 km from the location of the industrial determination. These two ports are expected to become a means of transportation in marketing both domestically and internationally.

From the factors that have been explained earlier, it can be seen that the location of the determination of the Serang Industrial Estate (KIS) is considered quite feasible as an industrial location in Serang City based on the theory of industrial location supported by several supporting factors, the location of the determination of the industry in Kasemen District is considered appropriate.

Analysis of land use in Kasemen District before and after the establishment of the Serang City RTRW Regional Regulation

Kasemen District is one of the agricultural and fishery land areas in Serang City with an area of 3855 Ha or 30.76% of agricultural land in 2009 spread across Margaluyu Village, Kilasah Village, Sawah Luhur Village, Terumbu Village and Bendung Village. Meanwhile, the fishery land covers an area of 795 hectares or 6.34% of the Kasemen District area in the Sawah Luhur and Banten Village areas. The following is data on land use in Kasemen District in 2009, 2016 and 2023.

Table 3
Land Use Data of Kasemen District, Serang City
Year 2009, 2016 and 2023

It	Land Type	Area (ha)		
		Year 2009	Year 2016	Year 2023
1	Rice Field Farmland	3855	3022	2932
2	Cultural Heritage Area	215	215	215
3	Fishery Cultivation Land	795	855	0
4	Land for Yard and Yard Buildings, Streets	1400	1703	2646
5	Trade and Service Zone	0	0	120
6	Industrial Land	0	470	349
7	Mangrove Area	31	31	35
8	RTH and Non-RTH Open Space	274	274	274
9	Borders and Rivers	316	316	316
Sum		6885	6885	6885

Source : Serang City Regional Government (2009,2016,2023)

Based on table 3 above, the largest land use in Kasemen District is agricultural land. In 2009 the use of agricultural land in Kasemen District was 3855 ha, the area of

Analizing Land Use Change and Direction for Controlling Space Utilization at Industrial Area of Kasemen District, Serang City

buildings, yards and yards was 1371 ha, in 2016 there was a significant decrease, the area of agricultural land changed to 3022 ha, and the land of buildings, yards and yards increased by 1676 ha. This shows a reduction in the amount of agricultural land and an increase in the land of buildings, yards and yards covering an area of 833 ha. In 2023 there will be a change again so that the area of agricultural land will be 2932 ha, this year the change in land use is not too large, only reducing the area by 90 ha.

Based on the 2011 and 2020 Serang City RTRW Regional Regulations, Kasemen District is included in the sub-district which is designated as one of the Government Areas (WP) where there is an Industrial Estate area. This is a mandate from Government Regulation 2015 No. 14 of 2015 about the National Industrial Development Master Plan (RIPIN) for 2015 – 2035. Land use in Kasemen Village before the formation of Serang City 56% was agricultural land, but since the formation of Serang City in 2008 and changed its status to Kasemen District, land use has begun to change.

Table 4
Area of Land Use Change in Kasemen District
Year 2009 - 2016

It	Land Type	Area (ha)		Changing Land Area	In %
		Year	Year		
		2009	2016		
1	Rice Field Farmland	3855	3022	-833	-22%
2	Cultural Heritage Area	215	215	0	0%
3	Fishery Cultivation Land	795	855	60	8%
4	Land Yard Building, Yard and Road	1400	1703	303	22%
5	Trade and Service Zone	0	0	0	0%
6	Industrial Land	0	470	470	100%
7	Mangrove Area	31	31	0	0%
8	RTH and Non-RTH Open Space	274	274	0	0%
9	Borders and Rivers	316	316	0	0%
	Sum	6885	6885	6885	

Land use in 2009 where Serang City was just formed and the status of Kasemen District was changed and in 2016 after the issuance of the Serang City RTRW Regulation No. 6 of 2011 there was a significant change in land use. The largest land change occurred in agricultural land which decreased by -833 hectares or 22% of the original land area. In 2020, the RTRW Regional Regulation was issued amendment No. 8 of 2020, in the regional regulation there is the use of Trade and Service Area land in the regional spatial plan. The data in Table 5 shows the emergence of the area of trade and service land use in the Serang City Spatial Pattern plan in Kasemen District as well as the increase in several built-up lands and mangrove forests.

**Table 5 Area of Land Use Change in Sub-district
Year 2016 – 2023**

It	Land Type	Area (ha)		Changi ng Land Area	In %
		Year			
		2016	2023		
1	Rice Field Farmland	3022	2932	-90	-3%
2	Cultural Heritage Area	215	215	0	0%
3	Fishery Cultivation Land	855	0	-855	-100%
4	Land Yard Building, Yard and Road	1703	2646	943	89%
5	Trade and Service Zone	0	120	120	100%
6	Industrial Land	470	349	-121	100%
7	Mangrove Area	31	35	4	13%
8	RTH and Non-RTH Open Space	274	274	0	0%
9	Borders and Rivers	316	316	0	0%
	Sum	6885	6885	6885	

In Table 5, the built-up land increases along with the decrease in agricultural land. Meanwhile, fishery land was lost with a 100% reduction which had an impact on the addition of 943 hectares of built land, 120 hectares of trade and service land and 4 hectares of mangrove land. The depiction of land use changes in Kasemen District is based on the stipulation of Regional Regulation No. 6 of 2011 and Regional Regulation No. 8 of 2020. The reduction and addition of several lands in Kasemen District is contained in the 2020 Serang City Spatial Pattern Map.

**Table 6
Area of Land Use Change in Sub-district
Year 2009 - 2023**

It	Land Type	Area (ha)		Changing Land Area	In %
		Year			
		2009	2023		
1	Rice Field Farmland	3855	2932	-923	-24%
2	Cultural Heritage Area	215	215	0	0%
3	Fishery Cultivation Land	795	0	-795	-100%
4	Land Yard Building, Yard and Road	1400	2646	1246	89%
5	Trade and Service Zone	0	120	120	100%
6	Industrial Land	0	349	349	100%
7	Mangrove Area	31	35	4	13%
8	RTH and Non-RTH Open Space	274	274	0	0%
9	Borders and Rivers	316	316	0	0%
	Sum	6885	6885	6885	

Analizing Land Use Change and Direction for Controlling Space Utilization at Industrial Area of Kasemen District, Serang City

In Table 6, it can be seen that there has been a change in use from 2009 after the new Serang City was established and after the issuance of the Serang City RTRW Regional Regulation and its amendments in 2020. and agricultural land has been reduced to an area of -923 hectares or 24% of the initial area before the establishment of Serang City. This reduction was followed by an increase in built-up land, trade and service areas, and industrial land. Based on data from tables 4, 5 and 6, changes in the Status and determination of the Serang City RTRW Regional Regulation have an influence on changes in land use from 2009 – 2023.

Analysis of Land Use Suitability Around the Industrial Location of Kasemen District Based on the Regional Regulation of RTRW Serang City

Land use changes in Serang City are often not fully in accordance with the Regional Spatial Plan Regional Regulation (Perda RTRW). Land use violations are one of the causative factors in land use irregularities. Some of the causative factors of the violation include the lack of information on the Serang City Regional Spatial Plan. In figure 8, the following is a map of the spatial pattern of Serang City based on the applicable Serang City RTRW Regional Regulation.\

This can be seen in the rampant change in agricultural land use in Kasemen District. Land use changes in Serang Raya from 2000-2018 show a discrepancy between existing land conditions and the expected spatial plan. There is a significant increase in built-up areas along with the decline in paddy which led to a 8.92% in 2018 increase to 9.31% (2022). Figure 4 land in 2009, 2016 and 2023.

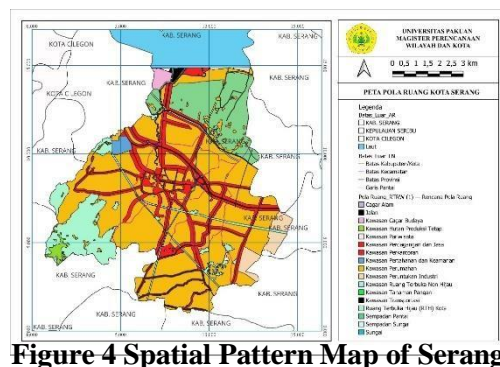


Figure 4 Spatial Pattern Map of Serang

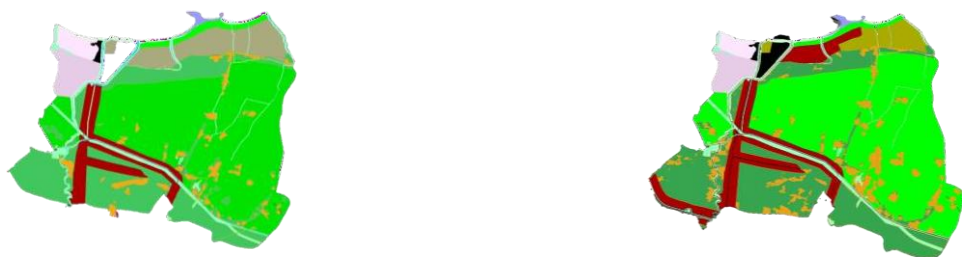


Figure 5

Source : History
2009,2016 and 2023

google earth pro

In Figure 4, it can be seen that there has been a change in use in the three years before the enactment of the Serang City RTRW Regional Regulation in 2009, after the enactment of the Serang City RTRW Regional Regulation No. 6 of 2011, and after the enactment of the Serang City RTRW Amendment Regulation No. 8 of 2020. In 2009 it can be seen in Figure 9 that almost 60% of land use in Kasemen District is rice field agricultural land marked in green, in 2016 it can be seen that there is a change in land use in accordance with the determination of the Serang City RTRW Regional Regulation No. 6 of 2011 on fishery land in Sawah Luhur Village which has changed to Serang Industrial Determination Land, And it can be seen that the development of built land is marked by orange color on agricultural land.

In 2023, there will be significant land use on several agricultural lands with the issuance of the RTRW Spatial Pattern Map in the Serang City RTRW Regional Regulation No. 8 of 2020 so that a considerable change in land use can be seen, this can be seen in the Serang City Spatial Pattern Map, many agricultural lands have changed their function to built land which can be seen in Table 6 where there is a reduction in agricultural land and an increase in residential land/built land, land for trade and services, land for industrial purposes and addition to mangrove forests.

Agricultural land in Kasemen District is Sustainable Food Agricultural Land (LP2B). The existence of LP2B in Kasemen District is a mandate from Law article 41 of 2009 concerning the Protection of Sustainable Food Agricultural Land. LP2B is land that is only intended for agriculture, LP2B can only be converted to public interest in accordance with the provisions of laws and regulations (Serang City Regional Regulation, 2020). Changes in land use in areas that are not for their designation are one of the inconsistencies in land use, some of the factors that cause inconsistencies in land use in Kasemen District include:

1. Limitations in Supervision and Enforcement of Spatial Planning Law can trigger land use violations
2. Population growth and rapid urbanization cause pressure on existing land, which encourages land use violations.
3. Lack of public awareness and knowledge in understanding land use regulations.
4. Land price speculation encourages land use changes that are not in accordance with its original designation.

Based on the results of Google Earth Pro history data and a survey of field excision conditions, there was a change in land use in the LP2B area and part of the Public RTH as well as the river boundary which is superimposed in Figure 6.

Analizing Land Use Change and Direction for Controlling Space Utilization at Industrial Area of Kasemen District, Serang City

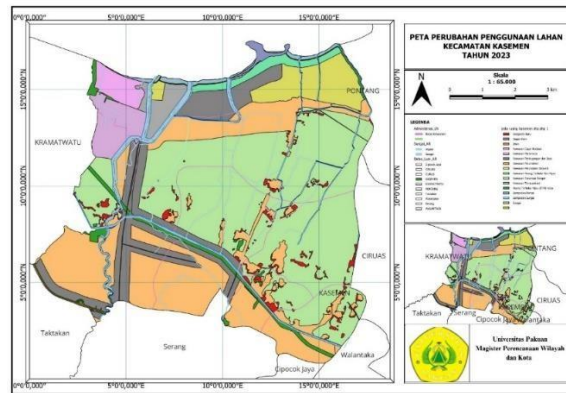


Figure 6 Map of Changes Kasemen District Land Use in 2023

Inconsistencies in land use have various significant impacts on the environment and socio-economic conditions of the community around the location, here are some of the impacts that will be caused by changes in land use LP2B, Public RTH and River Boundaries in the following Table 7:

Table 7 Analysis of Land Use Violations

Project Activities (100) Environmental Components (88)	Infrastructure Upgrades	Land Conversion	Pollution	Environmental Control
LP2B	<p>Positive Impact</p> <ol style="list-style-type: none"> 1. Reducing transaction costs for agricultural activities 2. Increasing the efficiency of agricultural production 3. Encouraging the quality of sustainable agricultural development <p>Negative Impact:</p> <ol style="list-style-type: none"> 1. Influencing the sustainability of Agriculture 2. Deterioration of the quality of 	<p>Positive Impact:</p> <ol style="list-style-type: none"> 1. Improving the accessibility and comfort of people's lives 2. create new jobs and increase regional income <p>Negative Impact:</p> <ol style="list-style-type: none"> 1. Reduce the land available for food production, which can have an impact on food security and increase food prices 2. Causes environmental degradation 	<p>Positive Impact:</p> <ol style="list-style-type: none"> 1. Increasing public awareness 2. Increasing the active role of environmental agencies and governments 3. Development of green technology 4. Improved environmental recovery methods <p>Negative Impact:</p> <ol style="list-style-type: none"> 1. Causes disease 2. Decreased quality of life 	<p>Positive Impact :</p> <ol style="list-style-type: none"> 1. Improving Human Health 2. Ecosystem balance 3. Knowledge and technology transfer 4. Formation of a better quality of life 5. Creation of environmental management <p>Negative Impact :</p> <ol style="list-style-type: none"> 1. Requires considerable costs

	<p>the agricultural environment</p> <p>3. Transfer of Financial resources</p>	<p>3. Increasing regional unemployment</p> <p>4. Causes social and economic problems</p>	<p>3. Ecosystem damage</p> <p>4. Species Extinction</p> <p>5. Losses in the economic sector</p> <p>6. Environmental aesthetic decline</p> <p>7. The occurrence of social conflicts in the community</p>	<p>2. Improper environmental management will result in new problems</p>
RTH Public	<p>Positive Impact :</p> <p>1. Improving the accessibility of public green spaces and the welfare and health of urban residents</p> <p>2. reduce air pollutant levels and improve overall environmental quality</p> <p>3. Generate areas for socialization, relaxation, and rejuvenation in a fun environment, and</p> <p>4. improve thermal comfort and biodiversity</p> <p>Negative Impact:</p> <p>1. Limited availability of Public RTH</p> <p>2. Reduction of carbon emission</p>	<p>Positive Impact :</p> <p>1. Conversion to settlement development can increase local revenue through taxes and create new jobs</p> <p>2. Improving Accessibility and Mobility of Citizens</p> <p>3. Help address the problem of population density by providing more space for housing and businesses.</p> <p>4. Improving the aesthetics of the city with planned and modern development</p> <p>Negative Impacts of Public RTH</p> <p>Land Conversion:</p>		

Analyzing Land Use Change and Direction for Controlling Space Utilization at Industrial Area of Kasemen District, Serang City

	<p>sequestration areas</p> <p>3. Reduce ecosystem benefits obtained by the community</p>	<ol style="list-style-type: none"> 1. Reduced RTH can reduce water catchment areas, which can lead to flooding and degrade groundwater quality 2. Decline in air quality due to reduced vegetation that functions as an absorber of air pollutants 3. The loss of public space can reduce the quality of life of residents who depend on RTH for recreation and social activities. 4. Increasing urban temperature (urban heat island effect) due to the reduction of green areas that function as natural cooling 		
River Boundary	<p>Positive Impact :</p> <ol style="list-style-type: none"> 1. Improving accessibility and connectivity between regions separated by rivers 	<p>Negative Impact:</p> <ol style="list-style-type: none"> 1. Conversion of river boundaries can damage the natural habitat of flora and fauna, threatening biodiversity 		

	<p>2. can attract investment and business development in the river border area</p> <p>3. The construction of flood control infrastructure, such as levees and canals, can help reduce flood risk in river border areas</p> <p>4. The development of infrastructure such as dams and reservoirs can aid in the management of water resources for irrigation, clean water supply, and hydropower</p> <p>Negative Impact:</p> <p>1. Environmental Degradation</p> <p>2. Sediment Erosion</p> <p>3. Land and Community Social Conflicts</p> <p>4. Damage to cultural heritage</p>	<p>2. Increased soil erosion and river sedimentation can damage water quality and river habitat</p> <p>3. Reduction of river boundary areas that serve as buffer zones can increase the risk of floods and landslides</p>		
--	---	---	--	--

Based on Table 7, there has been a change in land use that is not in accordance with its designation on the Serang City RTRW Spatial Pattern Map in Kasemen District. These

Analizing Land Use Change and Direction for Controlling Space Utilization at Industrial Area of Kasemen District, Serang City

violations have positive and negative impacts on the environment and the community around the area where the land use change is located. The impact of land use inconsistencies can be seen in the following table 8:

**Table 8 Impact
Land Use Change**

It	Allocation of Types of Activities in Spatial Patterns	Land Use Change in 2023
1	LP2B	Settlements
2	River Boundary	Settlements
3	RTH Public	Small Trade

The results of the 2023 Google Earth Pro history overlay show that there are violations in the LP2B, Public RTH and River Boundary areas marked in red. The red color indicates that there is a new built land that stands in an area that is not for its designation so that there is a discrepancy in the use of space in Kasemen District.

Analysis of land use control directives around the location of the Kasemen District industrial estate determination based on the applicable RTRW Regional Regulation

The control of space utilization in industrial estates is regulated through Regional Regulations (Perda) which aims to ensure the use of industrial land in accordance with the spatial plan that has been determined. The following are some general aspects regulated in the Regional Regulation related to the use of space. Based on the data in

Table 7, several violations of space utilization that occurred in Kasemen District in the LP2B area, Public RTH and River Boundary are violations that occurred both before and after the issuance of the Serang City RTRW Regional Regulation. In this case, the Serang City government as a policy holder in the use of space in Kasemen District implements regulations in controlling the use of space outlined in the Serang City RTRW Regional Regulation. In the problem in Table 7, land control that is appropriate for space use violations that occur in Kasemen District, one of which is due to the lack of information about space use regulations that have been in effect in Serang City. Proper handling of the settlement of space use violations can avoid clashes between the government and the

It	General Aspects	Operating Instructions	Penalty
1	Licensing	Location area restrictions are not allowed for expansion	Warning Letter Delivery, Sealing, Dismantling
2	Supervision and Control		
3	Environmental Management	Directions for environmental management in waste disposal and drainage flows	
4	Law Enforcement	Sanctioning	

community.

**Table 9
Analysis of Land Use Control**

Conclusion

The determination of the Industrial area in Kasemen District has been in accordance with the theory of industrial location. Some of the things that are considered include Location and Distance Location Determination of industry with raw material sources has easy distance and travel time, Human Resources (HR) for the workforce comes from the best education and is located close to the location of the determination of industrial estates, The possibility of agglomeration with PT. Pindad is located not far from the location of the industrial designation, a market share that is easy to reach with various easy access to transportation facilities.

Land use in Kasemen District from 2009 – 2023 before and after the establishment of the Serang City RTRW Regional Regulation and its changes have undergone significant changes in land use. This can be seen in the reduction of agricultural and fishery land that has been converted into industrial, trade and service land, built-up land and mangrove forests. The lack of information about the regulations of the Serang City RTRW Regional Regulation has led to inconsistencies in land use.

Directions to control areas of violations in land use that are not in accordance with the RTRW Regional Regulation must be carried out in accordance with applicable regulations in a persuasive way so as not to cause turmoil in the community.

Bibliography

- Herjanto, Eddy. (2007). *Manajemen Operasi Edisi Ketiga*. Jakarta: Jakarta:Grasindo.
- Homer, Eliezer Neison, Wicaksono, Agus Dwi, & Usman, Fadly. (2016). Penentuan Jenis Klaster Industri Di Kawasan Industri Arar Kabupaten Sorong Berdasarkan Metode Delphi Dan Analytical Hierarchi Process (AHP). *Indonesian Green Technology*, 5(1), 1–8.
- Ivanda, Nadhifa Bernica. (2023). *Aplikasi Teori Lokasi Weber Dalam Pembangunan Kawasan Industri Jababeka*. Jakarta: Jakarta State University.
- Lamidi, Lamidi. (2017). Perubahan Penggunaan Lahan Di Kota Serang, Provinsi Banten. *Tataloka*, 20(1), 65–74.
- Libriyanto, Oki. (2022). Dynamics and Predictions of Land-Use Changes in Serang Raya and Their Conformity to the Spatial Plan of Banten Province. *Jurnal Geografi*, 14, No 1, 34–35.
- Maulana, Y. S. (2018). Analisis Faktor-Faktor Yang Mempengaruhi Pemilihan Lokasi Pabrik Pt Sung Chang Indonesia Cabang Kota Banjar. *Jurnal Ilmiah ADBIS (Administrasi Bisnis)*, 2(2), 211–221.
- Muzayanah. (2015). Terapan Teori Lokasi industri (Contoh Kasus pengembangan Kawasan Industri Kragilan Kabupaten Serang). *Jurnal Geografi*, 13(1412–6982), 116–119.
- Panggali, Bagas Luhur. (2020). *Pengembangan Potensi Wilayah Pesisir di Indonesia*. 1–8.
- Pemerintah Republik Indonesia. (2009). *Undang - Undang Republik Indonesia Nomor 41 Tahun 2009 tentang Perlindungan Lahan Pertanian Pangan Berkelanjutan. Lembaran Negara Republik Indonesia Tahun 2009 Nomor 149*.
- Peraturan Daerah Kota Serang. (2020). *Perda RTRW Kota Serang No 8 Tahun 2020 Tentang Rencana Tata Ruang Wilayah Kota Serang Tahun 2020 - 2040,28 Desember 2020, Lembaran Daerah Kota Serang Tahun 2020 Nomor 8*. Kota Serang: Kota Serang,Pemerintah Daerah Kota Serang.
- Peraturan Pemerintah RI. (2015). *Peraturan Pemeritnah No 14 Tahun 2015 Tentang rencana Induk Pembangunan Nasional Tahun 2015 - 2035. 6 Maret 2015. Lembaran Negara Republik Indonesia Tahun 2015 Nomor 46*.
- Peraturan Wali Kota Serang. (2023). *Peraturan Wali Kota Serang No 77 Tahun 2023 Tentang Rencana Detail Tata Ruang Wilayah Perencanaan Curug,Walantaka*,

Neni Sofiyanti, Santun R.P. Sitorus, Asep Denih

Taktakan dan Kasemen Kota Serang Tahun 2023 - 2043. Kota Serang: Kota Serang, Pemerintah Daerah Kota Serang.

Putra, Ilham M. (2023). Pengembangan Wilayah. In *ebook* (p. 14). Medan: Medan:Prokreatif Media.

Soetarno, W. (2003). *Pengaruh Perubahan Fungsi Jalan Terhadap Perkembangan Guna Lahan Pada Koridor Jalan Pamularsih Semarang*. Universitas Diponegoro, Semarang.

Tarigan, Henry Guntur. (2009). *Pengkajian Pragmatik*. Bandung: Angkasa.