JOURNAL OF APPLIED GEOSPATIAL INFORMATION

Vol 9 No 1 2025

http://jurnal.polibatam.ac.id/index.php/JAGI
ISSN Online: 2579-3608

Analysis of Land Value Zone Due to Land Use Change for Kendal Special Economic Zone (Case Study: Kaliwungu Sub-District, Kendal Regency)

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Received: August, 28 2024
Accepted: April 19, 2025
Published: June 26, 2025

Abstract

Land use change in Kaliwungu Sub-district due to the development of Kendal Special Economic Zone is significant. The method used in this processing is overlay method. The analysis method used to determine the influence of Kendal Special Economic Zone on Land Value Zone is linear regression analysis. There was a significant land use change in 2015-2019 amounting to 937.29 hectares while in 2019-2023 amounting to 495.92 hectares used as Kendal Special Economic Zone. The change of land value zone in Kaliwungu Sub-district is quite significant in 2015-2019 with the biggest increase of IDR 2,896,000 while in 2019-2023 there is the biggest increase of IDR 9,674,000. Based on the results of the linear regression test, there is an influence of the independent variable distance with the dependent variable, namely NIR 2023, which is indicated by the R Square value of 0.075 or 7.5% of the influence. According to the correlation test between the independent variable of the distance of Kendal Special Economic Zone to the centroid zone to NIR 2023, there is no correlation between the two because the correlation value is 0.00, while the independent variable of the distance of the national road to the centroid zone to NIR 2023 has a correlation with a negative correlation value (-0.271), which means that the farther the zone is from the national road, the lower the land price will be.

Keywords: Land Use, Land Value Zone, Kendal Special Economic Zone, Linear Regression Analysis, Kaliwungu Sub-district

1. Introduction

1.1 Background of Research

Kendal Regency is one of 35 regencies/municipalities in the province of Central Java. Kendal Regency is strategically located directly adjacent to the provincial capital, Semarang City. This strategic location is the reason for the development of an independent city based on international standard industry. In an effort to increase economic growth in this district, it is necessary to convert land use as an industrial area. By increasing the economic growth of the region through the development of an industrial estate, it also means a form of government efforts to improve the economy and welfare of its people. Therefore, the Central Java regional government in 2016 continued to pursue the development of Kendal Industrial Estate (KIE). Kendal Industrial Estate (KIE) is the largest township development in Central Java with a total development area of 2,200 hectares. KIE was officially inaugurated on November 14, 2016 by Indonesian President Joko Widodo. KIE is designated as one of the national strategic projects for accelerating macro and micro infrastructure development. Therefore, in December 2019, KIE was officially designated as a Special Economic Zone (SEZ) as regulated in PP No. 85/2019. The development of this SEZ will certainly have a significant impact on both the economy, social and land use. Kaliwungu Sub-district is one of the sub-districts affected by the SEZ development. Land use changes that occur in Kaliwungu Sub-district in particular will affect the increase in the price level of land value. Therefore, there is a need for periodic monitoring of land use changes that can potentially increase land value in order to match the current

conditions in Kaliwungu Sub-district, especially those based on spatial data.

This study aims to analyze land use change and land valuation in Kaliwungu Sub-district in 2015 before the inauguration of KIE, in 2019 when KIE was inaugurated as a SEZ and in 2023 when Indonesia began to recover from the Covid-19 disaster.

1.2 Problem Formulation

The problem formulations of this research are:
1. How is the land use change in Kaliwungu Sub-district in 2015, 2019 and 2023?
2. How is the change of Land Value Zone in Kaliwungu Sub-district in 2015, 2019 and 2023?
3. How is the relationship analysis between Land Value Zone change and land use change to Kendal Special Economic Zone in Kaliwungu Sub-district?

1.3 Objectives of Research

The objectives of this research are:
1. To find out the land use change in Kaliwungu Sub-district within 2015, 2019 and 2023.
2. To find out the changes of Land Value Zone in Kaliwungu Sub-district in 2015, 2019 and 2023.
3. To find out the relationship between the change of Land Value Zone to the change of land use into Kendal Special Economic Zone in Kaliwungu Sub-district.

2. Research Methodology

2.1 Tools

1. Hardware
    a. Laptop
    b. Smartphone
    c. Printer
2. Software
    a. Ms. Word 2016
    b. Ms. Excel 2016
    c. ArcMap 10.7.1
    d. IBM SPSS 26
    e. Google Earth

2.2 Data

1. Spatial Data
    a. Administrative Map of Kaliwungu Sub-district, Kendal Regency obtained from the Public Works and Spatial Planning Office of Kendal Regency
    b. Land Use Map of Kaliwungu Sub-district, Kendal Regency in 2015 and 2019 from the Public Works and Spatial Planning Office of Kendal Regency
    c. High Resolution Satellite Imagery (SPOT-6) of Kaliwungu Sub-district, Kendal District in 2023
    d. Land Value Zone Map of Kaliwungu Sub-district, Kendal District in 2015, 2019 and 2022 obtained from the Regional Office of ATR/BPN of Central Java Province
    e. Road Network Map of Kaliwungu Sub-district, Kendal District obtained from the Public Works and Spatial Planning Office of Kendal District
2. Non-Spatial Data
    a. Data on transaction prices and land offers in Kaliwungu Sub-district, Kendal Regency in 2023 obtained from field surveys.

2.3 Location of The Research

The location of this research object is located in Kaliwungu Sub-district, Kendal District, Central Java. Kaliwungu Sub-district is one of the sub-districts in Kendal Regency, Central Java Province which borders the area to the north with the Java Sea, to the south with South Kaliwungu Sub-district, to the west with Brangsong Sub-district and to the east with Semarang City. The area of Kaliwungu is 47.48 km^2 where the largest village is Mororejo Village with an area of 14.35 km^2 or about 30.07% of the area of Kaliwungu. Then the smallest village is Karangtengah Village which has an area of 1.2 km^2 or 2.52% of the area of Kaliwungu.

2.4 Stages of Research

1. Preparation
   This preparation stage consists of identifying problems, studying literature from various research and journal articles regarding research and conducting preliminary surveys.
2. Data Collection
   Data collection is done by collecting data consisting of spatial data and non-spatial data. Spatial data is obtained from agencies and non-spatial data is obtained from field surveys.
3. Creating Land Use Map
   The land use map was created using ArcMap 10.7.1 by digitizing high-resolution satellite images of Kaliwungu Subdistrict in 2023, while the years 2015 and 2019 were obtained from the Kendal District Public Works and Spatial Planning Office.
4. Creating Land Value Zone Map
   The creation of a land value zone map consists of several step:
    a. Initial zone creation based on the 2022 land value zone map. The initial zones totaled 121 zones.
    b. A field survey of land price data was conducted to determine the value of land transactions/bids that occur in the market of the study area. The sample points in this study are 478 points.
    c. Correction of land price data is carried out to obtain corrected land value. There are 4 corrections in the calculation of land value, namely correction of transaction data, correction of transaction time, adjustment of rights status and calculation of building RCN.
    d. The NIR calculation is obtained from the calculation of the average land value of sample points that are in one zone and can represent the land value in the zone with a standard deviation of <30%.
    e. The creation of the land value zone map is done by overlaying the 2015, 2019 and 2023 land value zone maps.
5. Linear Regression Analysis
    a. Calculation of the distance from the sample land plot to the variables that have been determined using network analysis tools in the ArcGIS application.

b. Statistical calculations were carried out using IBM SPSS 26 software. The tests carried out were classical assumption tests, linear regression tests and correlation tests.

3. Result and Analysis

3.1 Analysis of Land Use

1. Analysis of Land Use in 2015

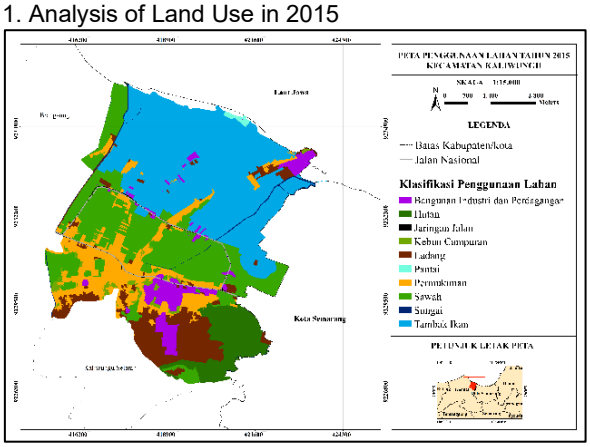

Figure 1 Land Use Map 2015

The land use of Kaliwungu Sub-district in 2015 has the highest area of fish ponds with an area of 1785.6542 hectares or about 38.21% of the total land use. This is because Kaliwungu Sub-district is located near the north coast so there are a lot of fish ponds. Meanwhile, the lowest area is the beach with an area of 13.218346 Hectares or about 0.28%, although Kaliwungu Sub-district is directly adjacent to the sea, but there are only a few beaches.

2. Analysis of Land Use in 2019

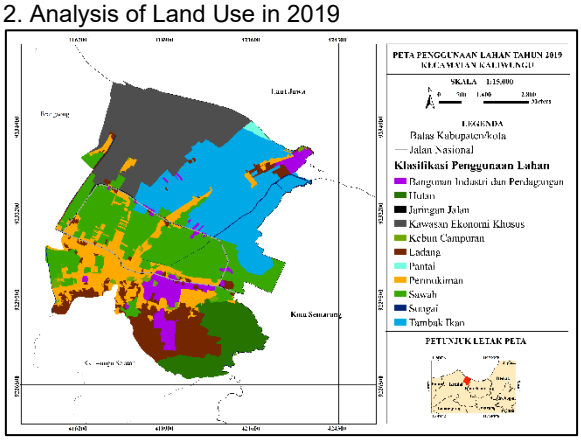

Figure 2 Land Use Map 2019

Land use in 2019 Kaliwungu sub-district has the same highest area of fishponds but the area is reduced to 1049.528 Hectares or about 22.15% of the total land use. This is due to the change in land use to Kendal Special Economic Zone.

3. Analysis of Land Use in 2023

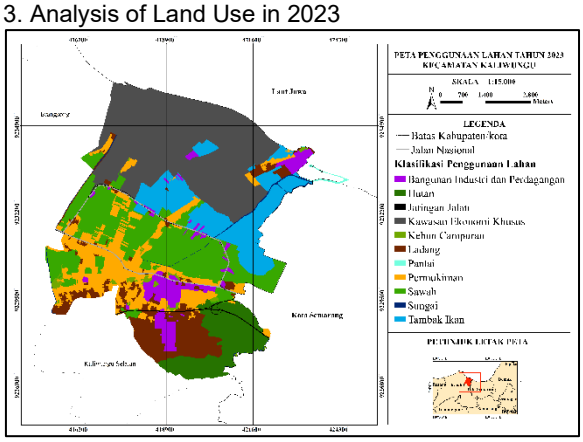

Figure 3 Land Use Map 2023

Land use in 2023 Kaliwungu Sub-district has the highest area of Kendal Special Economic Zone with an area of 1433.223 Hectares or about 30.18% of the total land use. This is due to the additional development for Kendal Special Economic Zone.

4. Analysis of Land Use Change in 2015-2019

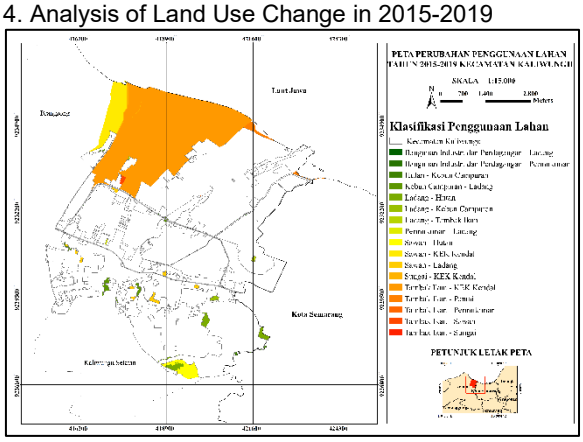

Figure 4 Land Use Change Map 2015-2019

The extent of land use change in Kaliwungu sub-district in 2015-2019 can be seen in the table below.

Table 1 Land Use Change in 2015-2019

No	Jenis Penggunaan Lahan	Tahun 2015		Tahun 2019		Perubahan	
		Luas (Ha)	Persentase	Luas (Ha)	Persentase	Luas (Ha)	Persentase
1	Bangunan Industri dan Perdagangan	236.30309	5.06%	230.5824	4.87%	-5.720706	-0.19%
2	Hutan	322.886	6.91%	374.731	7.91%	51.844966	1.00%
3	Jaringan Jalan	21.664801	0.46%	21.66353	0.46%	-0.001269	0.00%
4	Kawasan Ekonomi Khusus Kendal	0	0%	937.2974	19.78%	937.29736	19.78%
5	Kebun Campuran	59.500997	1.27%	42.33464	0.89%	-17.16636	-0.38%
6	Ladang	461.9389	9.89%	456.6691	9.64%	-5.2698	-0.25%
7	Pantai	13.218348	0.28%	18.12734	0.38%	4.908988	0.10%
8	Permukiman	596.50659	12.76%	594.1376	12.54%	-2.369022	-0.22%
9	Sawah	1141.8028	24.43%	985.6135	20.80%	-156.1893	-3.63%
10	Sungai	33.91955	0.73%	27.5773	0.58%	-6.34225	-0.15%
11	Tambak Ikan	1785.6542	38.21%	1049.528	22.15%	-736.1266	-16.06%
	Total	**4673.3953**	**100.00%**	**4738.261**	**100.00%**	**64.865936**	-

The largest increase in land use occurred in the Kendal Special Economic Zone land use classification with a change area of 937.29736 Hectares or around 19.78%. This is due to the development of the Kendal Special Economic Zone which began in 2016 and is still under construction. The largest decrease in land use occurred in the Fishpond classification with a decrease of 738.1266 Hectares or around 16.06%. This is due to changes

in land use for the development of the Kendal Special Economic Zone.

5. Analysis of Land Use Change in 2019-2023

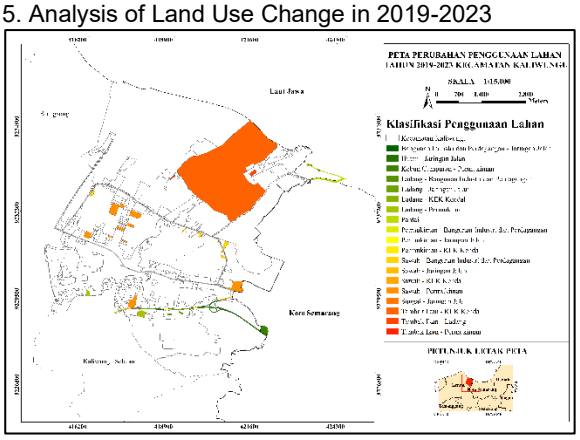

Figure 5 Land Use Change Map 2019-2023

The extent of land use change in Kaliwungu sub-district in 2019-2023 can be seen in the table below.

Table 2 Land Use Change in 2019-2023

No	Jenis Penggunaan Lahan	Tahun 2019		Tahun 2023		Perubahan	
		Luas (Ha)	Persentase	Luas (Ha)	Persentase	Luas (Ha)	Persentase
1	Bangunan Industri dan Perdagangan	230.582388	4.87%	239.84849	5.01%	9.266102	0.14%
2	Hutan	374.730971	7.91%	365.87024	7.70%	-8.860733	-0.21%
3	Jaringan Jalan	21.6635316	0.46%	39.19957	0.83%	17.536038	0.37%
4	Kawasan Ekonomi Khusus Kendal	937.297356	19.78%	1433.2233	30.18%	495.925904	10.40%
5	Kebun Campuran	42.3346357	0.89%	42.334625	0.89%	-0.000011	0.00%
6	Ladang	456.669103	9.64%	445.02724	9.37%	-11.641865	-0.27%
7	Pantai	18.1273359	0.38%	11.145403	0.23%	-6.981932	-0.15%
8	Permukiman	594.137569	12.54%	640.51303	13.49%	46.375459	0.95%
9	Sawah	985.6135	20.80%	932.4687	19.64%	-53.144800	-1.16%
10	Sungai	27.5773	0.58%	27.55911	0.58%	-0.018190	0.00%
11	Tambak Ikan	1049.52755	22.15%	571.68923	12.04%	-477.838326	-10.11%
	Total	**4738.26119**	**100.00%**	**4748.8789**	**100%**	**10.6177387**	-

The largest increase in land use occurred in the Kendal Special Economic Zone land use classification with a change area of 495.925904 Hectares or around 10.40%. This is due to the expansion of Kendal Special Economic Zone development which began in early 2023. The largest decrease in land use occurred in the Fishpond classification with a decrease area of 477.838326 Hectares or around 10.11%. This is due to changes in land use for the expansion of the Kendal Special Economic Zone development.

3.2 Analysis of Land Value Zone

1. Analysis of Land Value Zone in 2015

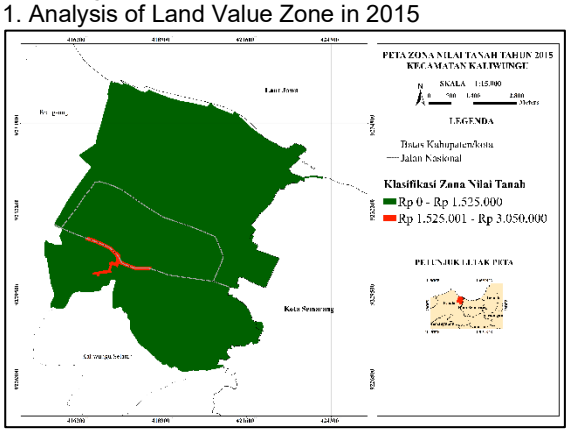

Figure 6 Land Value Zone Map 2015

The zone with the highest NIR is located in zone 22 with a NIR of IDR 2,873,000/m^2. This zone is located along Jalan Raya Timur Kaliwungu that connects Semarang City with the center of Kaliwungu Sub-district. Along the road there are public facilities such as Kaliwungu square, Kaliwungu market, mosque, hotel, boarding school and several other facilities. The zone with the lowest NIR is located in zone 16 with an NIR of IDR 19,000/m^2. Zone 16 is in the form of fishponds and swamps in the northernmost part of Wonorejo Village, close to the north coast, so there are very few offers or transactions for buying and selling land in this zone.

2. Analysis of Land Value Zone in 2019

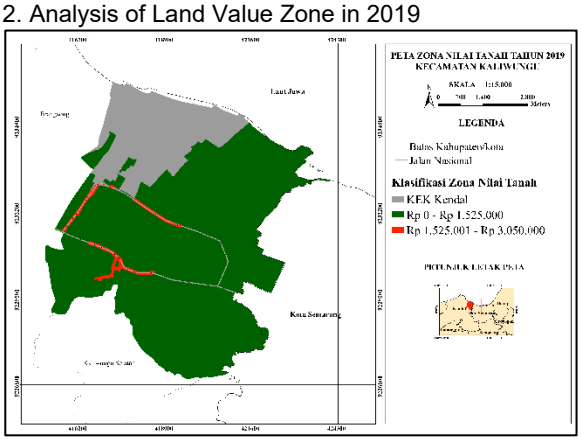

Figure 7 Land Value Zone Map 2019

The zone with the highest NIR is located in zone 15 with a NIR of IDR 2,896,000/m^2. This zone is located along Jalan Raya Timur Kaliwungu that connects Semarang City with the center of Kaliwungu Sub-district. Along the road there are public facilities such as Kaliwungu square, Kaliwungu market, mosque, hotel, boarding school and several other facilities. The zone with the lowest NIR is located in zone 38 with an NIR of IDR 112,000/m^2. Zone 38 is in the form of fish ponds and swamps in the northernmost part of Mororejo Village, close to the north coast, so there are very few offers or transactions to buy and sell land in the zone.

3. Analysis of Land Value Zone in 2023

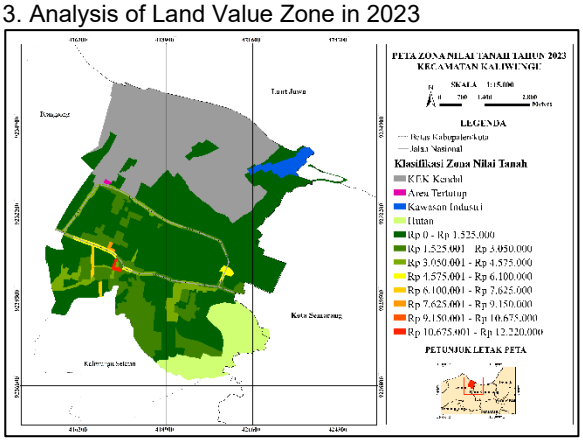

Figure 8 Land Value Zone Map 2023

The zone with the highest NIR is located in zone 91 with a NIR of IDR 12,222,000/m^2. This zone is located at the intersection that connects Kaliwungu East Highway from the east, to Kendal city center from the west, to kaliwungu square from the north and to the south sub-district of kaliwungu from the south. Along the road are public facilities such as Kaliwungu square, kaliwungu market, gladag market,

mosques, hotels, boarding schools and several other facilities. The zone with the lowest NIR is located in zone 59 with an NIR of IDR 248,000/m^2. Zone 59 is located in the villages of Nolokerto and Sumberejo which are actually not too far from the national road, but zone 59 is in the form of fishponds and rice fields and the road to the zone is also inadequate, only a footpath. Zone 59 also has very few land deals and transactions, making it the zone with the lowest NIR.

4. Analysis of Land Value Zone Change in 2015-2019

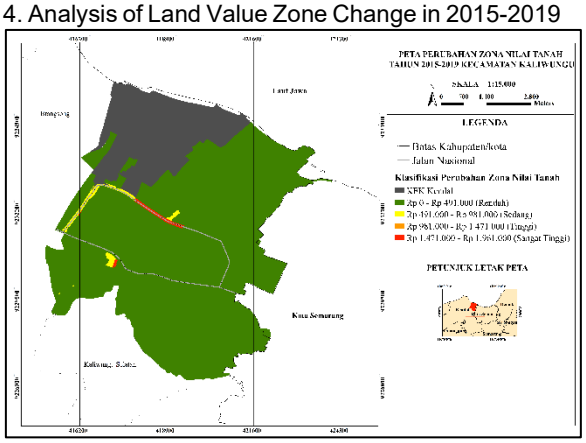

Figure 9 Land Value Zone Change Map 2015-2019

The biggest NIR change in the span of 2015 to 2019 is zone 46 in 2015 while in 2019 it is zone 15 with a change of IDR 2,896,000. This zone is located in Krajan Kulon Village which is a strategic location because it is close to public facilities and the center of Kaliwungu sub-district such as the square, market, school, hospital, national road, quite close to SEZ and several other public facilities. The smallest NIR change of IDR 1,000 is in zone 49 in 2015 and zone 38 in 2019 with a percentage change of 0.90%. This zone is located in Mororejo Village and for land use, settlements are located at the northernmost tip of Mororejo Village bordering the sea and next to the industrial area. The zone is far away from public facilities, national roads, and Kendal SEZ.

5. Analysis of Land Value Zone Change in 2019-2023

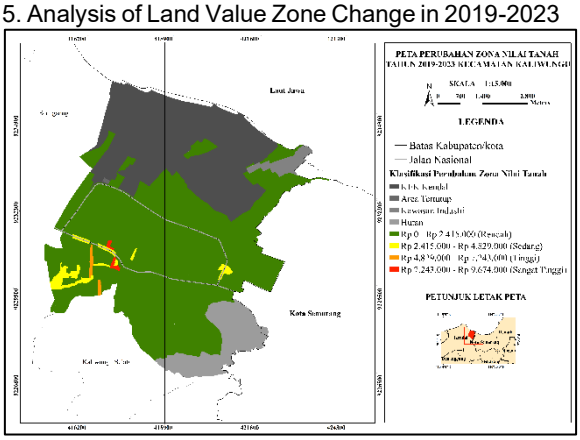

Figure 10 Land Value Zone Change Map 2019-2023

The largest NIR change in the time span of 2019 to 2023 is zone 32 in 2019 while in 2023 it is zone 91 with a change of IDR 9,674,000. This zone is located in Krajan Kulon Village which is a strategic location because it is close to public facilities and the center of Kaliwungu sub-district such as the square, market, school, hospital, national road and quite close to Kendal SEZ and several other public facilities. The smallest NIR change of IDR 17,000 is in zone 67 in 2019 and zone 57 in 2023 with the lowest percentage change increase of 2.06%. This zone is located in Mororejo Village and the land use is settlements located near the national road bordered by fishponds and swamps/wetlands. Although close to the national road, this zone is located in dense settlements directly adjacent to fishponds / swamps that are less well maintained, so that flooding can occur during heavy rains. This zone is also less productive as a place to run a business, hence the low rate of increase in NIR.

3.3 Analysis of the Effect of Kendal Special Economic Zone on Land Value Zone

1. Analysis of Variable Distance Calculation

The total centroid zone is 124 points. The average distance of the zones to Kendal SEZ is 4,205 meters. The farthest distance is zone 105 with a distance of 8,956 meters from Kendal SEZ, this zone has an NIR of IDR 603,000. The closest distance is zone 6 with a distance of 695 meters from Kendal SEZ and has an NIR of IDR 3,542,000. The average distance of zones in Kaliwungu to the national road is 593 meters. The farthest distance is zone 33 with a distance of 3,865 meters from the national road and has an NIR of IDR 1,163,000. While the closest distance is zones 75, 93, and 56 with a distance of 0 meters because the centroid zone is right in the middle of the national road, the zone has a high NIR of above three million rupiah.

2. Analysis of Normality test

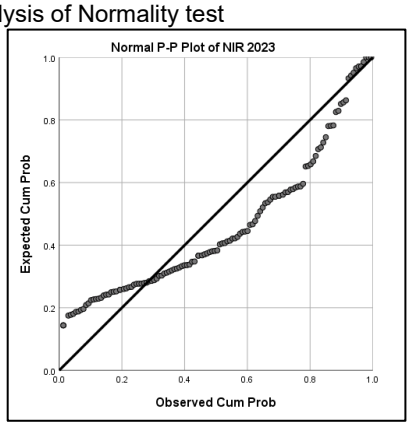

Figure 11 P-Plot of Normality Test

In the P-Plot graph above, it can be seen that there are some plots that follow the linear line and some that move away from the linear line, the data spreads around the diagonal line and follows the direction of the histograph line towards the normal distribution pattern so it can be concluded that the residuals are normally distributed.

3. Analysis of Linear Regression Test

Table 3 Linear Regression Test Result

Model Summary[b]									
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.273[a]	.075	.059	1862344.029106	.075	4.875	2	121	.009
a. Predictors: (Constant), Jarak Jalan Nasional, Jarak KEK Kendal									
b. Dependent Variable: NIR 2023									

From the table, it can be seen that the R square value is 0.075, which means that there is an influence of

the independent variables, namely the centroid zone distance to the national road and the centroid zone distance to Kendal SEZ by 7.5%.

4. Analysis of Correlation Test

Table 4 Pearson Correlation Test Result

Correlations				
		Jarak KEK Kendal	Jarak Jalan Nasional	NIR 2023
Jarak KEK Kendal	Pearson Correlation	1	0.124	0.000
	Sig. (2-tailed)		0.169	0.998
	N	124	124	124
Jarak Jalan Nasional	Pearson Correlation	0.124	1	-0.271**
	Sig. (2-tailed)	0.169		0.002
	N	124	124	124
NIR 2023	Pearson Correlation	0.000	-0.271**	1
	Sig. (2-tailed)	0.998	0.002	
	N	124	124	124
**. Correlation is significant at the 0.01 level (2-tailed).				

It can be seen from the table that the Pearson correlation value of the independent variable centroid zone distance to KEK Kendal on the dependent variable NIR 2023 has no correlation because the value is 0.00 so there is no significant relationship. This is because Kendal SEZ is currently still under construction, there are many vacant lots that have not been built and many ponds that have not changed land use for industrial plants, so this has less influence on land value. While the independent variable centroid zone distance to the National Road to the dependent variable NIR 2023 has a negative correlation (-0.271) which means that the further the distance of the zone from the National Road, the lower the price will be.

4. Conclusion

Based on the results of research, processing and analysis, the following conclusions are obtained:

1. Land use change in Kaliwungu Sub-district in 2015 - 2019 was significant due to the first phase of Kendal Special Economic Zone development with an area of 937.2974 hectares. While in 2019-2023 the biggest land use change is due to the second phase of Kendal Special Economic Zone development with an area of 495.925904 hectares. The impact of these land use changes is the reduction of fish ponds.
2. Land value zones in Kaliwungu Sub-district in 2015 - 2019 experienced an increase with an average increase of 83%. The zone with the largest increase was zone 46 in 2015 and became zone 15 in 2019 with an increase of IDR 2,896,000. Then in 2019 - 2023 in Kaliwungu Sub-district there was a very significant change in the land value zone because it increased by an average of 290%. The zone with the largest increase was in zone 32 in 2019 and became zone 91 in 2023 with an increase of IDR 9,674,000.
3. Based on the results of the linear regression test that has been carried out, it can be concluded that there are independent variables of the distance of the centroid zone point to the Kendal SEZ and the distance of the centroid zone point to the national road that have an influence on the dependent variable, namely the NIR or land value zone in 2023, which is indicated by the R Square value of 0.075 or 7.5%. The independent variable centroid zone distance to Kendal SEZ does not have a significant relationship with the dependent variable, namely NIR 2023 because the correlation value is 0.00, while the independent variable centroid zone distance to the national road has a significant relationship with the dependent variable, namely NIR 2023, which is indicated by a negative correlation value (-0.271), which means that the further the distance of the zone from the national road, the lower the land price will be.

5. Suggestion

Suggestions that the author can give to readers for further research are as follows:

1. It is better to prepare all the data needed in the research, starting from primary and secondary data so as not to hinder the research.
2. The digitization process on satellite imagery for land use should be done carefully and thoroughly so as not to encounter many errors.
3. Sampling data in the field should take samples of vacant land or agricultural land to avoid errors in making corrections to land prices.
4. Adding other variables to more clearly know what affects the Land Value in each zone.

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