Journal of Development and Integrated Engineering
Journal homepage: https://ejournal.upi.edu/index.php/jodie

Analysis of the Influence of Subang Exit Toll on Changes in Commercial Land Use and Traffic Volume in Otto Iskandardinata Road Corridor, Subang District

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ABSTRACT

The development of highway infrastructure and Exit Tolls is very important for regional development. The existence of toll road infrastructure and Exit tolls provides easy access by land route so it is expected to have an impact on accelerating regional economic growth. Since the construction of the Exit Toll access in Subang City, the area around the Exit Toll has become an important area for regional development, especially community economic activities such as trade, industry, and public services. Over time, the area around the Subang Toll Exit has developed into a center of commercial activity marked by changes in land use along the corridor of Jalan Otto Iskandardinata. This study aims to analyze the impact of land use change and its relationship to traffic volume that has occurred along the Jalan Otto Iskandardinata corridor since the opening of the Subang Toll Exit access. Land use change analysis is carried out by comparing satellite imagery data obtained from Google Earth and through field surveys. The correlation with traffic volume was obtained through linear regression analysis with land use change as the dependent variable and vehicle activity in the road corridor as the independent variable. The results show that land use changes that occur along the corridor of Jalan Otto Iskandardinata Subang are dominated by commercial land uses. The change in land use also has an impact on changing the visual image of the road corridor.

ARTICLE INFO

Article History:
Submitted/Received 6 Oct 2022
First Revised 15 Nov 2022
Accepted 22 December 2022
First Available online 22 December 2022
Publication Date 22 December 2022

Keyword:
Exit Toll,
Land use,
Commercial,
Road corridor,
Traffic.

1. INTRODUCTION

Toll road infrastructure has a very important role in the development of regional economic activities (Anas et al., 2017; Rahayu and Kipuw, 2020; Sumaryoto, 2010). If the economic aspect of a region relies on access to transportation by land, infrastructure in the form of roads, especially toll roads, will encourage economic efficiency in the area. (Suprayitno, 2012). Within the toll infrastructure network, there are several types of travel destinations, such as business, tourism, trade, to personal needs. This has an impact on the development of regional activities, especially the area around the location of the toll gate or Exit Toll. The development of activities that occur such as the development of commercial, economic, industrial, housing, service activities, and others. In general, the development of commercial activities occurs in business centers with heavy traffic, while for industry, settlements and services such as shops, gas stations, restaurants and others occur on the outskirts of the city along the main roads leading to the city, while changes in utilization land on the main roads leading to the city which were originally fields or housing turned into trade centers, shops, offices (Mukhlis, 2017).

Subang District is one of the toll gate locations or Exit Tolls in Subang Regency. Now with the opening of toll road access and road infrastructure improvements, it has made it easier for the community to access the central point of Subang City, especially for visitors from out of town. This has the effect of changing land use which is dominated by commercial functions along the corridor of Jalan Otto Iskandardinata which is the access to the Subang District Exit Toll Road. Commercial activities along the Jalan Otto Iskandardinata corridor have slowly developed since the Subang Toll Gate began operating in 2015. Now there are various types of commercial activities such as restaurants, gift shops, mini markets, ornamental plant sellers, fruit traders, to foot traders. five. Of course, the Subang Toll Exit is one of the main accesses for out-of-town visitors to the district center, the Jalan Otto Iskandardinata corridor is now passed not only by vehicles from within the city but also by vehicles originating from outside the city. This condition is different from before the Subang Toll Exit was built, the Jalan Otto Iskandardinata corridor only served as access between sub-districts.

In encouraging economic development, the availability of infrastructure is needed, especially the availability of road infrastructure as one of the needs of urban residents who can support the accessibility and mobility of residents in various urban activities (Harum and Sutriani, 2017; Pyrialakou et al., 2016). In addition to having an impact on changes in land use, the construction of the Exit Toll also has an impact on increasing the volume of vehicles on the Jalan Otto Iskandardinata corridor. The high level of land use is directly proportional to the movement of the traffic flow it produces (Kanyepe et al., 2021; Surya et al., 2020). However, the findings from the field show that the Jalan Otto Iskandardinata corridor does not yet have a good-quality infrastructure. One example is that pedestrian ways are not available in these road corridors, which are the rights of pedestrians. Pedestrian ways are one of the infrastructure-supporting elements capable of supporting the development of commercial land uses that are currently occurring in the corridor. The loss of availability of pedestrian ways in road corridors with high traffic activity can endanger pedestrians. This study aims to analyze changes in land use and its relationship to traffic in the Jalan Otto Iskandardinata corridor since the construction of the Exit Toll infrastructure in Subang District{Formatting Citation}.

1. Research Methods

This research is a quantitative descriptive research by describing, researching, and explaining the phenomena studied as they are for further conclusions to be drawn. The research was conducted by explaining the results of the analysis of land use changes that occurred along the corridor of Jalan Otto Iskandardinata Subang. The population in this study is land use on the left and right along the road corridor, while the sample in the study island on the left and right along the road corridor has changed land use since the opening of the Subang Toll Exit access. Analysis of changes in land use that occurred in the research corridor was carried out by comparing satellite imagery before the opening of the Exit Toll and after the opening of the Exit Toll. Satellite image data is secondary data obtained through the Google Earth application using the Historical Imagery feature. The Google Earth application obtained satellite imagery in 2013, namely

DOI: https://doi.org/10.17509/ jodie.v2i2.67791
p- ISSN 2798-2246 e- ISSN 2798-2165

before the opening of the Exit Toll in 2015, and in 2022, which is 7 years after the opening of the Exit Toll. To find out more specific changes in visual image and changes in land use in the road corridor, a search was carried out through the "See More Dates" feature on the Google Street View website. The data obtained is in the form of a Google Maps street view display along the road corridor in 2015 and 2022.

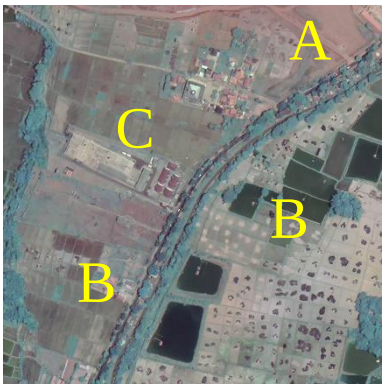
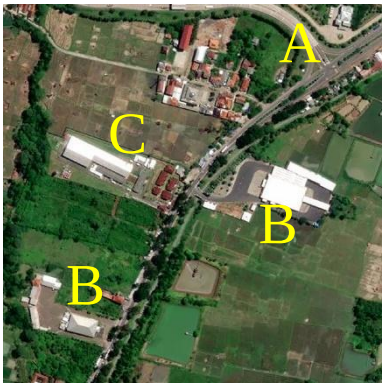
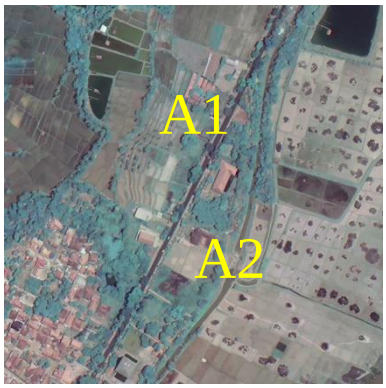
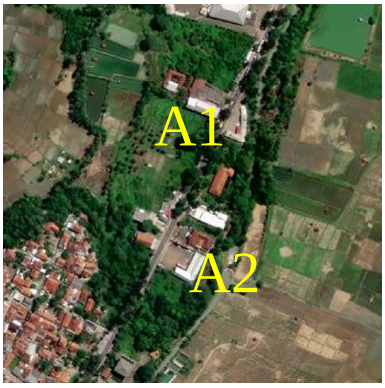
To determine the impact of changes in land use on traffic volume along the corridor of Otto Iskandardinta Street, a regression analysis was carried out with traffic volume in the road corridor as the dependent variable and activity on commercial land use as the independent variable (Jati, 2012; Yunanto and Susetyo, 2019). The results are expected to be able to find out how big the correlation is between changes in commercial land use and the increase in traffic volume that has occurred along the Jalan Otto Iskandardinata corridor since the Subang Exit Toll infrastructure was built(Akbardin et al., 2020).

2. RESULTS AND DISCUSSION

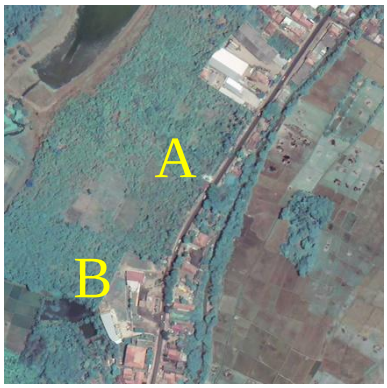
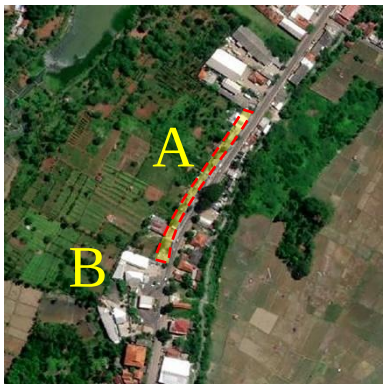
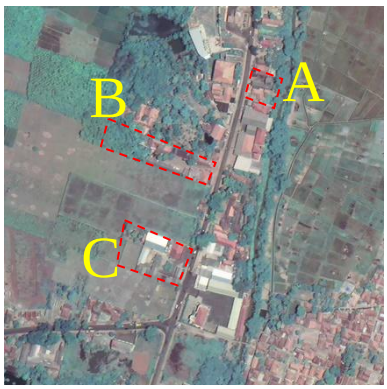
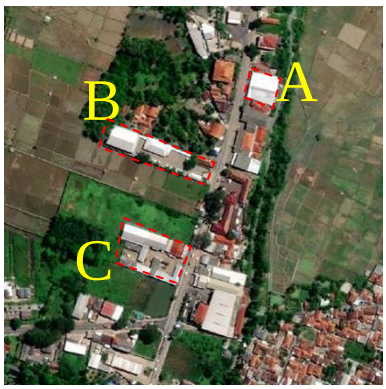
2.1. Analysis Of Land Use Change

Changes in land use in road corridors in the form of utilization of building space and utilization of space into built-up space dominated by buildings with commercial functions. Analysis of commercial land use change was carried out by comparing Google Earth satellite imagery in 2013 before the Exit Toll was opened and in 2022 after the Exit Toll was opened as shown in Table 1. The research corridor map is divided into several segments to facilitate the process of land use change analysis.

Table 1. Analysis of Land Use Change in the Jalan Otto Iskandardinata Corridor.

The 2013 Year Map	Analysis	Map of the Year 2022
 **Segment 1**	A. Subang Toll Exit access point. B. There was a change from paddy fields to built-up land in the form of a Restaurant (B1) and Rest Area (B2). C. Development of vacant land into built-up land in the form of a souvenir center.	 Segment 1
 **Segment 2**	A. Changes in land use from vacant land to built-up land in the form of restaurants (A1, A2).	 Segment 2

DOI: https://doi.org/10.17509/ jodie.v2i2.67791
p- ISSN 2798-2246 e- ISSN 2798-2165

 **Segment 3**	A. There was a change in land use which was originally vacant land and settlements, to become a restaurant, mini market (Alfamart), and a building materials store.	 Segment 3
 **Segment 4**	A. There was a widening of the shoulder of the road, which in turn appeared sellers of typical Subang souvenirs (street vendors) on the shoulder of the road in area A. B. Utilization of vacant land to become a Karaoke and Restaurant located at point B.	 Segment 4
 **Segment 5**	A. Change of house land use to a ceramics shop. B. Change of vacant land into Distributor Office. C. Change of Warehouse land use to Distributor Office.	 Segment 5

It can be seen from the analysis results in Table 1 that the majority of changes in land use occur from paddy fields, vacant land, and built-up land to buildings with other functions. Changes in land use are dominated by buildings with commercial functions. Types of commercial activity that have emerged since the opening of the Exit Toll as recorded from the results of field surveys include restaurants, gift shops, street vendors, building shops, mini markets, ornamental flower traders, and fruit traders. Changes in land use in this corridor generally take up 20-30 meters of land from the road shoulder. The use of land for restaurants and souvenir shops in this corridor has the characteristics of a large parking area in front and the building is about 15-20 meters backward.

DOI: https://doi.org/10.17509/ jodie.v2i2.67791
p- ISSN 2798-2246 e- ISSN 2798-2165

Figure 1. Map of Change in Commercial Land Use in 2022.
Source: Author Analysis (2022)

DOI: https://doi.org/10.17509/ jodie.v2i2.67791
p- ISSN 2798-2246 e- ISSN 2798-2165

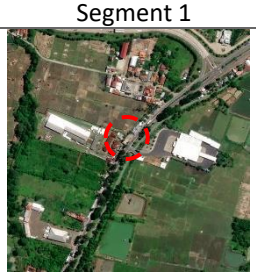
Table 2. Description of Types of Commercial Land Use.

Information Number	Land use type Commercial
1	*Rest Areas*
2	Snack and Souvenir Center
3	Restaurant A
4	B restaurant
5	Cellphone Accessories, Credit, and so on
6	C restaurant
7	*Mini Market*A
8	Street vendors
9	Ornamental Flower Trader
10	Building Tools and Materials
11	*Mini Market*B

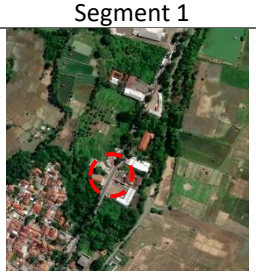
Changes in land use that have occurred have also had an impact on changes in the visual image of the Jalan Otto Iskandardinata corridor. The road corridor, which was originally dominated by views of rice fields on its left and right sides, has now turned into a row of buildings dominated by commercial land use. However, changes in land use on the left and right along the road corridor did not significantly affect the rice fields as a whole in the area. This is caused by changes in land use that only occur on the left and right sides of the road corridor, which on average take up about 20-25 meters of land from the road shoulder.

The following table shows changes in land use and corridor images at several points along the Jalan Otto Iskandardinata corridor taken from Google Street images in 2015 before the opening of the exit toll and in 2022 after the opening of the Exit Toll.

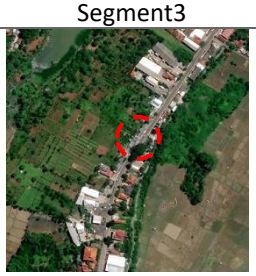
Table 3. Comparison of the Atmosphere of the Road Corridor Before and After the Opening of the Toll Exit.

2015 Road Corridor	2022 Road Corridor	Key Map
		
source: https://www.google.com/streetview/		Segment 1
		
source: https://www.google.com/streetview/		Segment 1

DOI: https://doi.org/10.17509/ jodie.v2i2.67791
p- ISSN 2798-2246 e- ISSN 2798-2165

  source: https://www.google.com/streetview/		 Segment 1
  source: https://www.google.com/streetview/		 Segment2
  source: https://www.google.com/streetview/		 Segment3
  source: https://www.google.com/streetview/		 Segment3
  source: https://www.google.com/streetview/		 Segment3
  source: https://www.google.com/streetview/		 Segment3

DOI: https://doi.org/10.17509/ jodie.v2i2.67791
p- ISSN 2798-2246 e- ISSN 2798-2165

  source: https://www.google.com/streetview/		 Segment3
  source: https://www.google.com/streetview/		 Segment3
  source: https://www.google.com/streetview/		 Segment4
  source: https://www.google.com/streetview/		 Segment4
  source: https://www.google.com/streetview/		 Segment5

The table above shows a view of the road corridor filled with places such as restaurants, retail, and street vendors after the opening of the Subang Toll Exit in 2022. The appearance of these places covers the view of paddy fields and gardens which were previously a view of the road corridor on the left and right sides.

Effect of Commercial Land Use Change on Traffic Volume

Analysis of the effect of commercial land use on traffic volume was carried out using linear regression analysis with vehicle volume as the dependent variable and activity on commercial buildings as the independent variable. To find out how much influence commercial activity has on vehicle volume along the Jalan Otto Iskandardinata corridor, the coefficient of determination value from the results of multiple linear regression analysis is used (Suseno et al., 2017).

DOI: https://doi.org/10.17509/ jodie.v2i2.67791
p- ISSN 2798-2246 e- ISSN 2798-2165

From the results of the regression analysis, it can be seen that the coefficient of determination is 0.568. These results can be interpreted that commercial activities in the Jalan Otto Iskandardinata corridor (Subang Toll Exit – Dharmodihardjo Intersection) have an effect of 56.8% on the increase in vehicle volume activity in the corridor. As much as 43.2% of vehicle volume in the corridor can be influenced by other factors such as traffic in and out of the Subang Toll Road, trips between sub-districts, or factories located outside the research corridor.

3. CONCLUSION

The results of research using satellite imagery in 2013 and 2022 show that there has been a change in land use along the Jalan Otto Iskandardinata corridor since the opening of the Subang Toll Exit. Land use change points on the left and right along the corridor are dominated by buildings with commercial functions. The characteristics of land use change occur in various processes, such as vacant land turning into built-up land, and built-up land changing its function into commercial buildings ranging from stalls, and restaurants to mini markets.

The impact of land use change also has an impact on changing the visual image of the corridor and increasing the volume of vehicles on the Jalan Otto Iskandardinata corridor. Changes in the visual image are shown in Table 3 by comparing Google Street images in 2015 and 2022. This comparison shows that there are differences in views on the left and right along the road corridor which was originally decorated with rice fields to a row of buildings with commercial functions. Commercial activities in the Jalan Otto Iskandardinata corridor also have an impact on increasing the volume of vehicles in the corridor. Based on the results of the regression analysis, commercial activities in the corridor have an effect of 56.8% on the increase in vehicle volume.(Meneguzzer et al., 2017; Putri and Irawan, 2015; Sasmita et al., 2022).

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DOI: https://doi.org/10.17509/ jodie.v2i2.67791
p- ISSN 2798-2246 e- ISSN 2798-2165