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ANALYSIS OF THE INFLUENCE OF LEBAK BULUS TERMINAL EXPANSION TOWARD LAND USE IN THE ENVIRONMENT

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Abstract

In the process of urban development, the terminal is one of the factors forming the structure of urban space that is important for changes in activity and land use around it. Infrastructure expansion influences the activities inside, the wider the infrastructure, the greater the impact on the surrounding environment. In 2012 the DKI Jakarta Government planned the construction of Jakarta Mass Rappid Transit (MRT) mass transportation and the Lebak Bulus Terminal selected as one of the Jakarta MRT Station Depots. In the construction of the Jakarta MRT Station, the Lebak Bulus Terminal will be expanded to 12 Ha for the needs of facilities and infrastructure to support the Jakarta MRT Station. This study aims to see the effect of the expansion of the Lebak Bulus Terminal on the use of land in the surrounding environment. The method used in this research is Quantitative Descriptive Analysis using Geographical Information Systems, assisted by Arcgis 10.1. The results of this study are that the expansion of the Lebak Bulus Terminal for the Jakarta MRT Station requires additional area from the previous terminal area of 2.20 Ha to 12 Ha, and requires the relocation of 103 buildings around the terminal to meet the needs of the terminal land for the construction of the Jakarta MRT Station. The expansion of the Lebak Bulus Terminal influences land use changes, especially in residential land use which decreased by 10% from 2010 to 2015 land use, trade and service land use increased by 2% from 2010 to 2015, and green space decreased by 4 % from 2010 to 2015.

Keywords: *Influence, Land Use, and Terminal Expansion.*

Preliminary

The urban environment, the transportation system, and land use are components that influence each other. Changing one of these components will result in changes in the other part. This understanding will facilitate urban planning in planning future forms of transportation locations and land use needs (Catanese and James, 1992). The terminal is a supporting component in the procurement of urban transportation that will affect the effectiveness and efficiency of the transportation system on the urban space structure.

The terminal is a component in the road transportation network that functions as the main service as a place for passengers to go up and down and / or loading and unloading of goods, for traffic control and public transportation, as well

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as intra and intermodal transportation. Based on the terminal's functions, the construction of the terminal needs to consider location, spatial planning, capacity, traffic density and integration with other transportation modes.

The function of the terminal and terminal supporting facilities not only serve the passengers but also for the government and bus operators. For passengers comfort while waiting, the convenience to move from one mode or vehicle to another mode, where information facilities and private vehicle parking. For the government in traffic planning and management to manage traffic and transportation systems to avoid congestion, as a controller of public vehicles and as an attraction to the development of the city, and for entrepreneurs or operators is to regulate buses, provision of facilities and information for bus crews as base facilities the bus (Saudi, 2014)

The expansion of the Lebak Bulus Bus Terminal requires additional land nearby for the construction of the MRT Station. The Football Stadium and Lebak Bulus Swimming Pool were relocated to add terminal area. In the development of the Lebak Bulus Terminal expansion, there has been a change in land use at the bus terminal location. There was a change in open space to built up land for the Jakarta MRT station.

Therefore, this study was conducted with the aim of analyzing the effect of the expansion of the Lebak Bulus Bus Terminal on land use around the Terminal. With the hope that it can be used as input for the government and managers of development and land use around the bus terminal in the future from the impact caused by the expansion of the terminal on land use.

Methodology

The methodology of this research approach is carried out through a survey approach with qualitative descriptive methods as follows:

a. Descriptive method is used to systematically describe the facts or characteristics of a particular population or certain field, in this case the field actually and accurately. The researcher acts as an observer, he only makes a category of perpetrators, observes the symptoms and records them in the observation book
b. In general, qualitative data is in the form of statements of words or images. Qualitative data analysis involves identifying what are the concerns (concerns) and what are the issues (issues). This identification is carried out with the following processes: (1) categorization, (2) priority, and (3) equipment determination.

GIS analysis with this analysis technique is used to see changes in land use from the results of digitization of land use maps in 2010 with 2015 land use maps overlaid to find out land use changes from 2001 to 2015

Results and Discussion

Analysis of the Effect of Lebak Bulus Terminal Expansion on Land Use

1. Identification of Lebak Bulus Terminal Conditions and Expansion Plans.

The Lebak Bulus Bus Terminal is located on the edge of South Jakarta City and is directly adjacent to the City of South Tangerang. On February 21, 2009 the Lebak Bulus Terminal was integrated with TransJakarta corridor 8 which connects Lebak Bulus - Harmoni.

In 2012 the DKI Jakarta government planned the construction of the Jakarta MRT mass transportation. The Lebak Bulus Terminal was chosen to be one of the Jakarta MRT Station Depos. The selection of the Lebak Bulus Terminal as the Jakarta MRT Station requires the expansion of the terminal to build the Jakarta MRT Station. The plan is to expand the Lebak Bulus Terminal by 12 hectares. To meet the needs of terminal expansion land, the government and the private sector relocated buildings around the terminal for an expansion of 12 hectares to build the Jakarta MRT station, there are 103 buildings that must be moved for expansion.

Table 1
Recap of Land Areas Affected by Lebak Bulus Terminal Expansion

No	Alokasi	Jumlah Bidang Terkena	Yang Sudah Dibebaskan	Yang Belum Dibebaskan
1.	Depo (103) Bidang			
	- Girik/SHM	80	76	4
	- Tanah Negara	22		21
	- Surat Belum Jelas	1		1
	Jumlah	**103**	**77**	**26**

Sumber: Kelurahan Lebak Bulus Tahun 2016

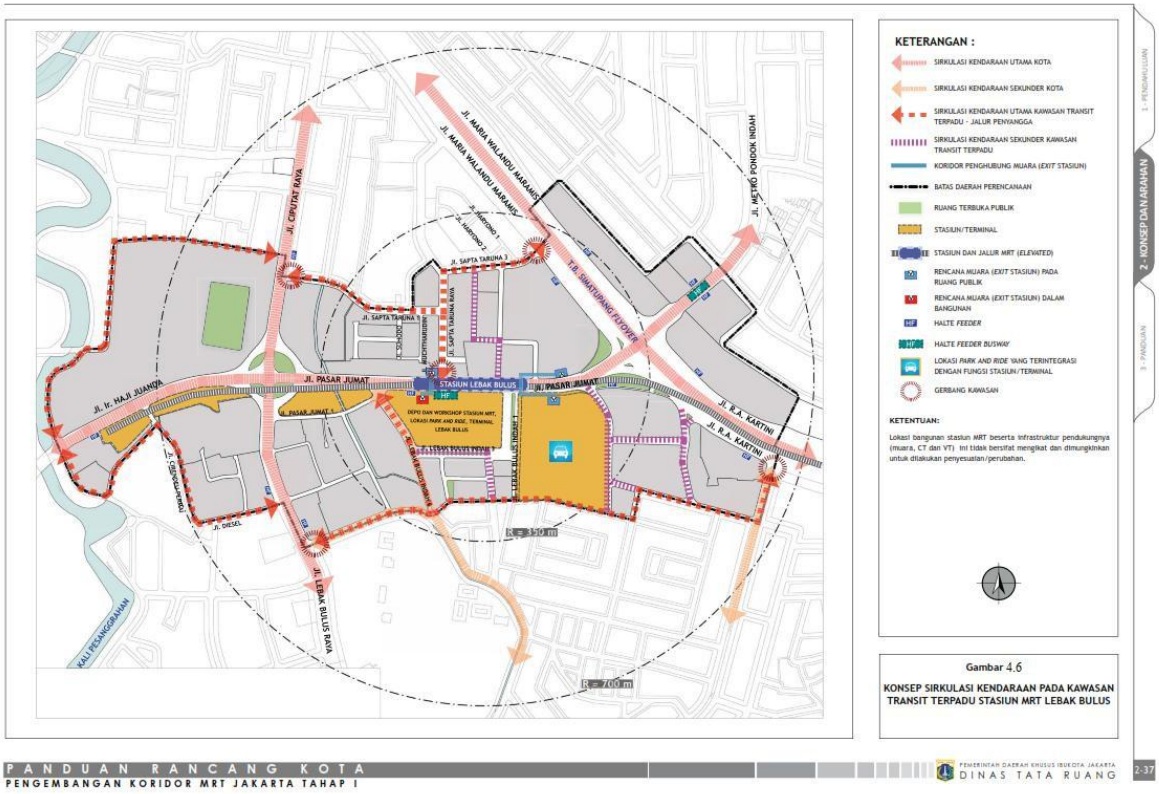
In early 2015 the process of expanding the Lebak Bulus Terminal took place while the activity within the terminal was moved temporarily and the terminal only served Transjakarta, Damri and small transportation because the terminal was still in the expansion stage.

MRT (Mass Rapid Transit) is an urban transportation system that has 3 main criteria, namely mass (large carrying capacity), rapid (fast travel time and high frequency) and transit (stops at many stations in the main urban points). The Jakarta MRT is planned to stretch 11 km from Senayan - Lebak Bulus (elevated). The Lebak Bulus Terminal is planned to become the Lebak Bulus MRT Depot. The construction of the Jakarta MRT system is divided into 2 (two) corridors, namely:

1. Construction of the South - North corridor from Lebak Bulus - Kampung Bandan is carried out in two stages, namely:

   A. Phase I which will be built first connects Lebak Bulus to the 15.7 km HI Roundabout with 13 stations, 7 elevated stations and 6 underground stations) which are planned to start operating in 2018.
   B. Phase II will continue the South - North line from the HI Roundabout to the 8.1 Km village of Bandan which will begin construction before phase I operates and is targeted to operate in 2020.

The planned construction of the Lebak Bulus MRT Station, equipped with supporting facilities inside and outside the MRT Station. The concept of supporting facilities inside the MRT Station is toilets, ticketing, counters and as other supporting facilities Lebak Bulus MRT station is equipped with Retail, Mall, Exhibition Hall, and Shopping Center Buildings inside the station. Outside the station it is planned to be equipped with Public Spaces in the form of green lines and Passive and active green space with Universal Design principles that are safe, comfortable, and prioritizing user safety, then shade vegetation, promenades, waterfront areas, bicycle lanes, bicycle storage areas and street vendors points so the environment is more conducive and cleaner than street vendors that interfere with the activities of pedestrians and motorists going to the station.



Picture 1
The concept of the Jakarta MRT Station is the Lebak Bulus Terminal

2. Effect of Lebak Bulus Terminal Expansion on Changes in Land Use in the Surrounding Environment

Land Use Around the Lebak Bulus Terminal in 2010

The definition of land is the surface of the earth where various activities take place, land use is a continuous process of land use for development in an optimal and efficient manner (Sugandhy, 1989), land use analysis before the expansion of the Lebak Bulus Terminal is intended to determine the characteristics of land use in the Terminal area Lebak Bulus. Land use characteristics that will be discussed include the type, extent and distribution of the area around the terminal. The land use characteristics in the environment around the Lebak Bulus Terminal will explain the types of land use in the vicinity which includes housing, social facilities, blue open spaces, green open spaces, and trade and services.

Based on the results of the analysis of land use through the application of land use GIS seen through the 2010 image map and through surveys and interviews to find out more specific land uses for more details can be seen on the 2010 land use map. in the study area based on the type of land use, the largest type of land use in 2010 was Housing around 30.32 Ha of the total land use of the study area, for more details, it can be seen in the 2010 land use table as follows:

Table 2
Land Use Around the Lebak Bulus Terminal in 2010

No	Land use type	Area (Ha)
1	Social Facilities	10,20
2	Housing	30,23
3	RTB	1,20
4	RTH	6,34
5	Commercial	13,43
6	Terminal	2,20
	amount	**64,00**

Source: Result of digitizing Citra map, 2010

Land use area based on digitization results in 2010, residential land use area is 30.23 Ha or 48% of total land use, social facilities 10.20 Ha or 16% of total land use, green open space land use by 10% in the year 2010 or 6.34 Ha, trade and services by 21% or 10.20 Ha, blue open space by 1.20 Ha or 6.34% of the land area in the form of swimming pools and fishing in Pondok Pinang kelurahan with an area of 1 Ha and Lebak Bulus Terminal covering an area of 2.20 Ha or 3% of the total land use in the surrounding environment. To see the distribution can be seen on the map of land use in the surrounding environment as follows:

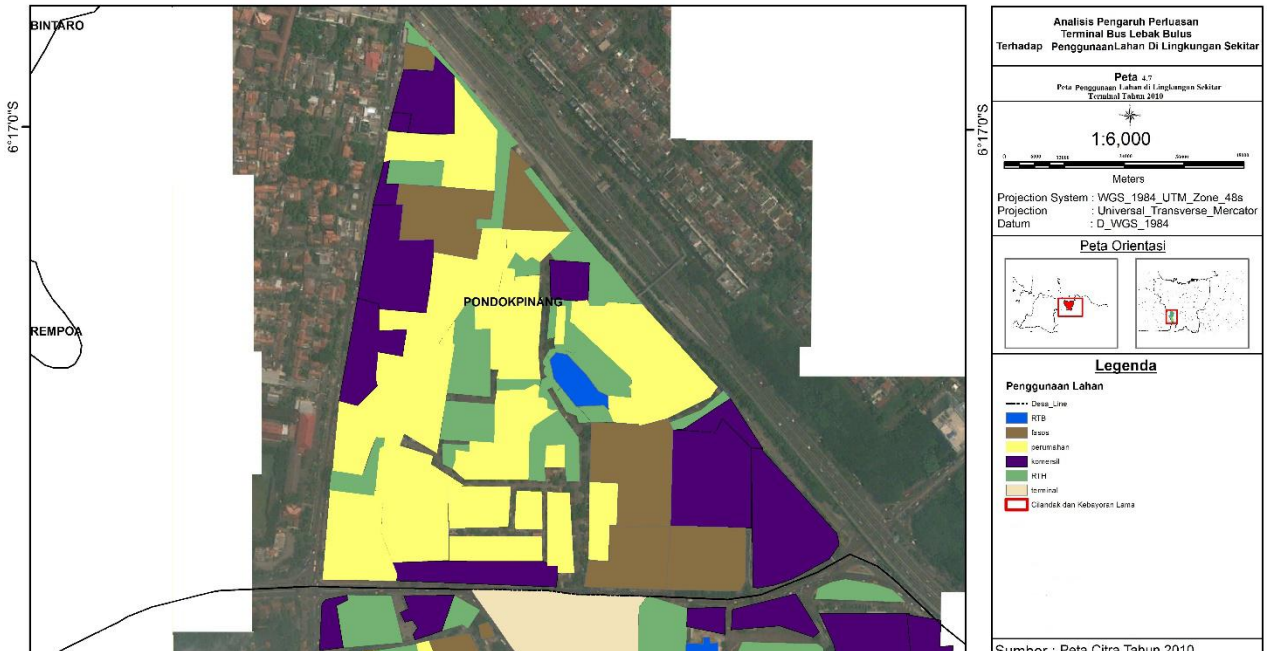


Figure 2
Map of Land Use in 2010

Land Use in the Environment Around the Lebak Bulus Terminal in 2015

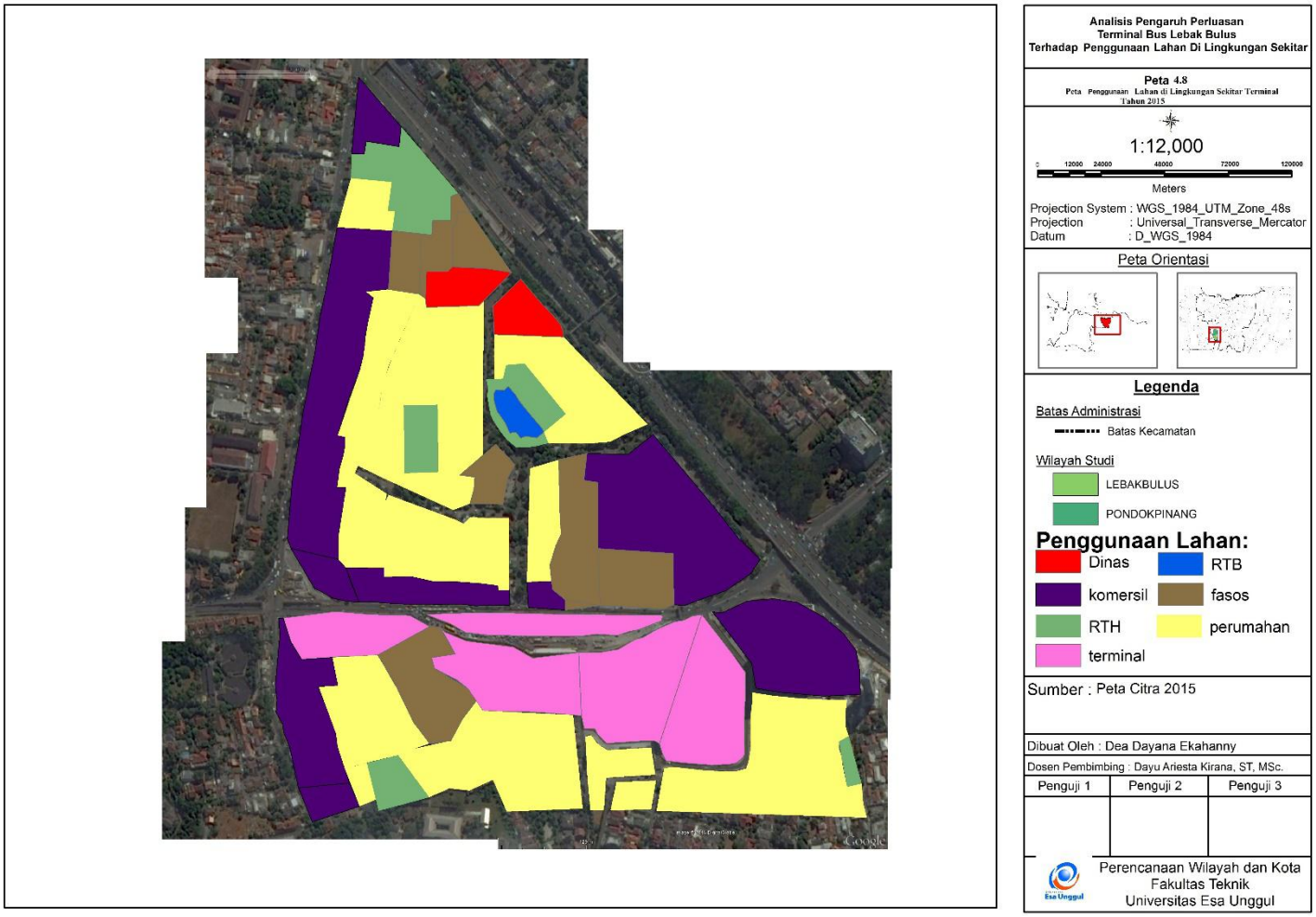
The land use and space utilization characteristics around the Lebak Bulus Terminal will explain the types of land use, the extent of each type of land use, and activities that are developing at this time after experiencing the expansion of the Lebak Bulus Terminal to the Lebak Bulus Jakarta MRT Station in early 2015 which has undergone expansion which requires the taking of land around it for the construction of the Jakarta Lebak Bulus MRT Station before the Lebak Bulus Terminal experiences an expansion of land use dominance is housing. The Lebak Bulus Terminal, which was initially covering an area of 2 hectares for the development of the Jakarta Lebak Bulus MRT Station, has expanded to become 12 hectares for the MRT station and Jakarta MRT Station supporting facilities.

In analyzing land use after the expansion of the Lebak Bulus Terminal and seeing changes in land use using GIS analysis through image maps and field surveys to determine existing land use that occurred in 2015, for more details, it can be seen on the land use map in 2015, after digitizing image map and determine the type of land use distribution around the terminal so that it is known the total land use area around the terminal in 2015, in 2015 housing still dominates the highest land use of 27.65 Ha or 48% of the land area but this is reduced from the year In 2010, the total residential land use was 30.23 Ha and the terminal area increased to 12 Ha. For more details, you can see in the table of types of land use and extent, and the percentage of land use as follows:

Table 3
Land Use in the Surrounding Environment of the Terminal in 2015

No	Land use type	Area (Ha)
1	Social Facilities	8,20
2	Housing	24,65
3	RTB	1,00
4	RTH	3,69
5	Commercial	16,63
6	Terminal	12,00
	amount	**64,00**

Sumber: Hasil digitasi Citra 2010



Perubahan Penggunaan Lahan di Lingkungan Sekitar Terminal Tahun 2010 dan 2015

Changes in land use are a transition from certain land uses to other uses that have different functions from before. In changing land use there are several modifying factors including:

1. Topography
   Topographical conditions in the study area were 26.2 meters above sea level and were intended for cultivation areas.
2. Population
   Lebak Bulus Village and Pondok Pinang Village are increasing every year and based on the results of population projections in 2018 reaching 205,710 inhabitants.
3. Accessibility
   The Lebak Bulus Terminal is bordered by two primary arterial roads namely the lebak balus highway and the RA Kartini road. The completeness of facilities and infrastructure in the terminal, especially the route served by the Lebak Bulus Terminal

The method of analysis uses map overlay techniques. This analysis aims to see changes in land use activities that occur around the Lebak Bulus Terminal. From the comparison of land use around the Lebak Bulus Terminal in 2010 and 2015. For more details, it can be seen in the table of changes in land use around the terminal in 2010 - 2015 as follows:

Table 4
Changes to Land Use Around Terminals in 2010 and 2015

No	Land Use in 2010	Area (Ha)	Land Use in 2015	Luas (Ha)	Ket
1.	Social Facilities	10,20	Social Facilities	8,20	Permanent
			Terminal	2,00	Change
2.	Housing	30,23	Housing	24,65	Permanent
			Terminal	3,50	Change
			Commercial	1,20	Change
3.	RTB	1,20	RTB	1,00	Permanent
			Terminal	0,20	Change
4.	RTH	6,34	RTH	3,69	Permanent
			Terminal	2,65	Change
5.	Commercial	13,43	Commercial	16,63	Permanent
6.	Terminal		Terminal	12,00	Permanent
	Total	**64,00**		**64,00**	

Source: 2015 Analysis Results

Note: A negative value indicates a decrease in land use in 2015 while a positive value in the land use change table has increased from 2010 to 2015.

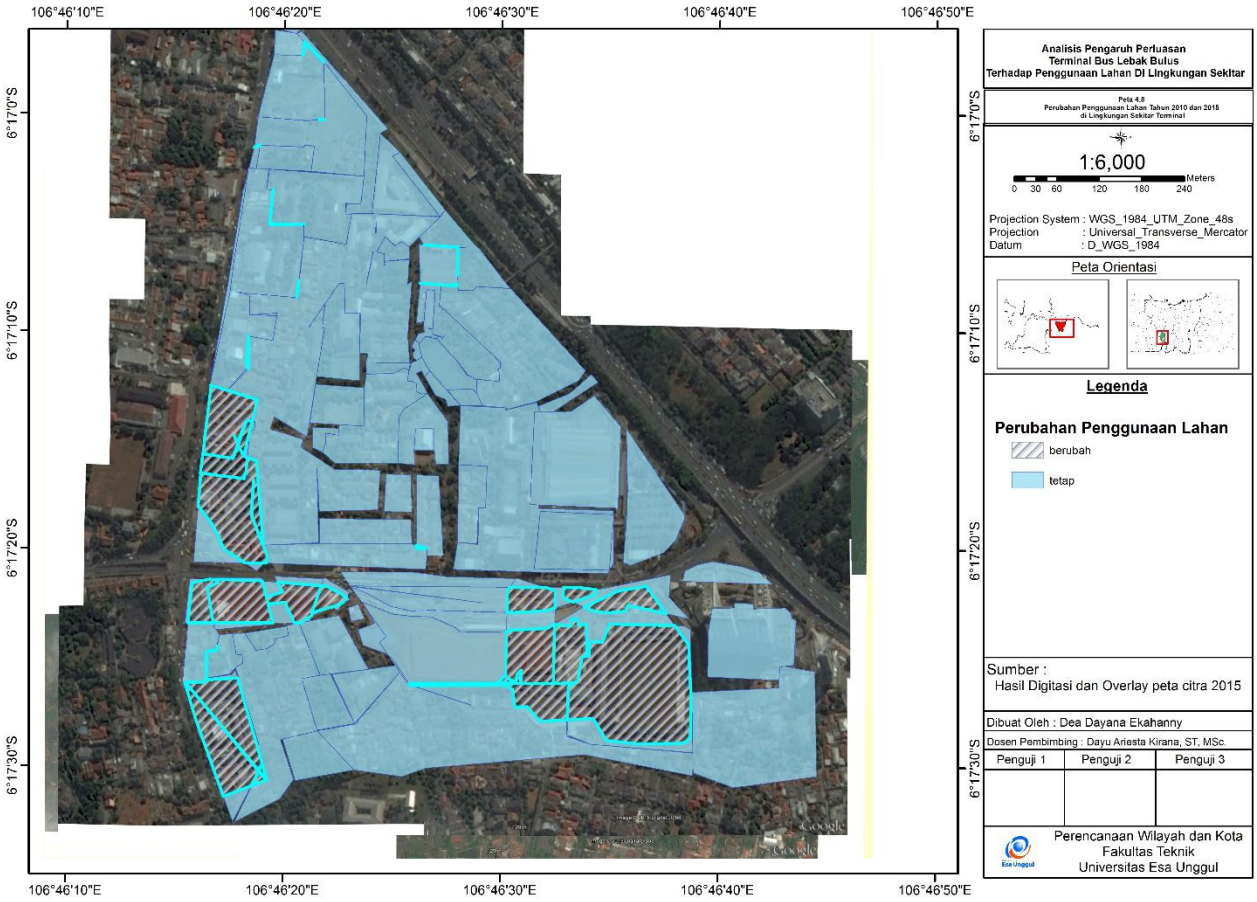


Figure 4
Change in Land Use in the Environment Around the Lebak Bulus Terminal

A. Terminal

The area of Lebak Bulus Terminal in 2001 was 2.20 Ha based on the digitization of land use through the imagery map in 2010 and expanded in January 2015 to 12 Ha for the construction of the Jakarta MRT Depot south corridor (Lebak Bulus - Bendungan Hilir) and also the MRT Station supporting facilities Jakarta.

B. Housing

The area of housing facilities in 2010 was 30.23 Ha or 48% of the total land use in 2010 and there was a decrease in 2015 in residential land use by 10%, currently the area of residential land use is 24.65 Ha or 38% of total land use area in 2015. Based on population data of Lebak Bulus Village and Pondok Pinang Village, the population has increased from 2011 to 2014 and it is projected that until 2018 the population will continue to increase.

In 2010 the total population in both outages was 96,975 people and in 2014 it was 100,739 people, based on the results of population projections in 2018 the population in both villages was 210,833 people. The decline in residential land use is due to changes in residential land use for terminal expansion and trade and services around the terminal.

C. Social Facilities

In 2010 the area of social facilities was expanded by the calculation of the terminal area of 10.20 hectares or 16% of the total land use and a decline in 2015 was 3%. In 2015 the area of social facility land use was 8.20 hectares or 13% of the current total land use. Social facilities such as schools, places of worship and social services and so on.

D. Blue Open Space (RTB)
Blue open space intended in this study is a swimming pool and lake located in the Lebak Bulus and Pondok Pinang Kelurahan. In 2010 the land use area for blue open space was 1.20 Ha or 2% of the total land use and decreased in 2015 by 1%, in 2015 the land use area for blue open space was 1 Ha or 1% of total use 2015. The decline in blue open space is due to the expansion of the Lebak Bulus Terminal which is moving the swimming pool in the lebak turtle stadium in the relocation for the expansion of the terminal to become the Jakarta MRT station.

E. Green Open Space (RTH)
In 2010 the area of land use for green open space was 6.34 Ha or 10% of the total land use around the Lebak Bulus Terminal. In 2015 the area of green open land use was 3.69 Ha or 6% of the total land use in 2015, the use of green open space was reduced by 4% from 2010. At present the green open space in the environment around the terminal has not fulfilled the provisions of 10 % of green open space area based on Law No 26 of 2007 concerning Spatial Planning. The reduced use of green space is a result of changing the use of green space to housing and also the continuation of the Lebak Bulus Terminal.

F. Trade and Services
The area of land use for commercial or trade and service areas in 2010 in the surroundings of the Lebak Bulus Terminal was 13, 43 Ha or 21% of the total land use in 2010. In 2015 the area of land use for commercial or trade and service areas was 14.63 Ha or 23% of total land use in 2015. Commercial land use or trade and services rose 2% from 2010, can be seen from the development of trade and services along the arterial road, namely the lebak bulus raya and RA Kartini connecting South Jakarta to the City South Tangerang. Increased accessibility causes the surrounding land to have a higher value and leads to trade and services.
Based on the analysis of land use overlay maps in 2010 and land use maps in 2015 the biggest change in terminal land use is 16%, then land use for commercial or trade and service areas is 8% of total land use. For other land uses, the biggest decrease was in residential land use decreases by 10% from 2010.

Analysis of the Effect of Terminal Expansion as a Factor of Change in Land Use

Understanding land use in general, namely the transformation or change in the allocation of land resources from one allotment to another allotment (Adriansyah, 2005). There are four main processes that cause changes in land use namely (Bourne, 1982):

1. Expansion of the city
2. Central rejuvenation
3. Expansion of infrastructure networks
4. Growth and loss of certain activities

According to (Chapin, 1996) land use change is an interaction caused by three components of land use, namely the development system, the activity system and the environmental system. There is a strong interaction between the transportation system and the land use system. Geographical distribution between land use (activity system) with the magnitude of movement (movement system) or whether or not smooth movement in the transportation network will have a feedback effect (Nasution, 2003) and according to Whayne Hammond (in Daldjoeni, 1998), the development of areas especially suburbs caused by three things and one of them is the increase in transportation services, such as the Lebak Bulus Terminal which has expanded to become the Jakarta MRT Station which will be integrated by inner and outer city and outside the province and TransJakarta bus corridor 8 and Damri buses that go directly to the International Airport Soekarno Hatta.

Based on data on land use changes around the Lebak Bulus Terminal in 2010 and 2015 when the terminal expansion process took place, through the overlay analysis method of land use maps in 2010 and 2015, land use changes in both years can be seen, the terminal area in 2010 was 2.20 Ha and has expanded to the Jakarta MRT Station by 12 Ha and an increase in land use for trade and services by 2% from 2010 13.43 Ha and in 2015 amounted to 16.63 Ha. For more details, it can be seen on the map of land use change from 2010 to 2015 on the use of trade and service land as follows:

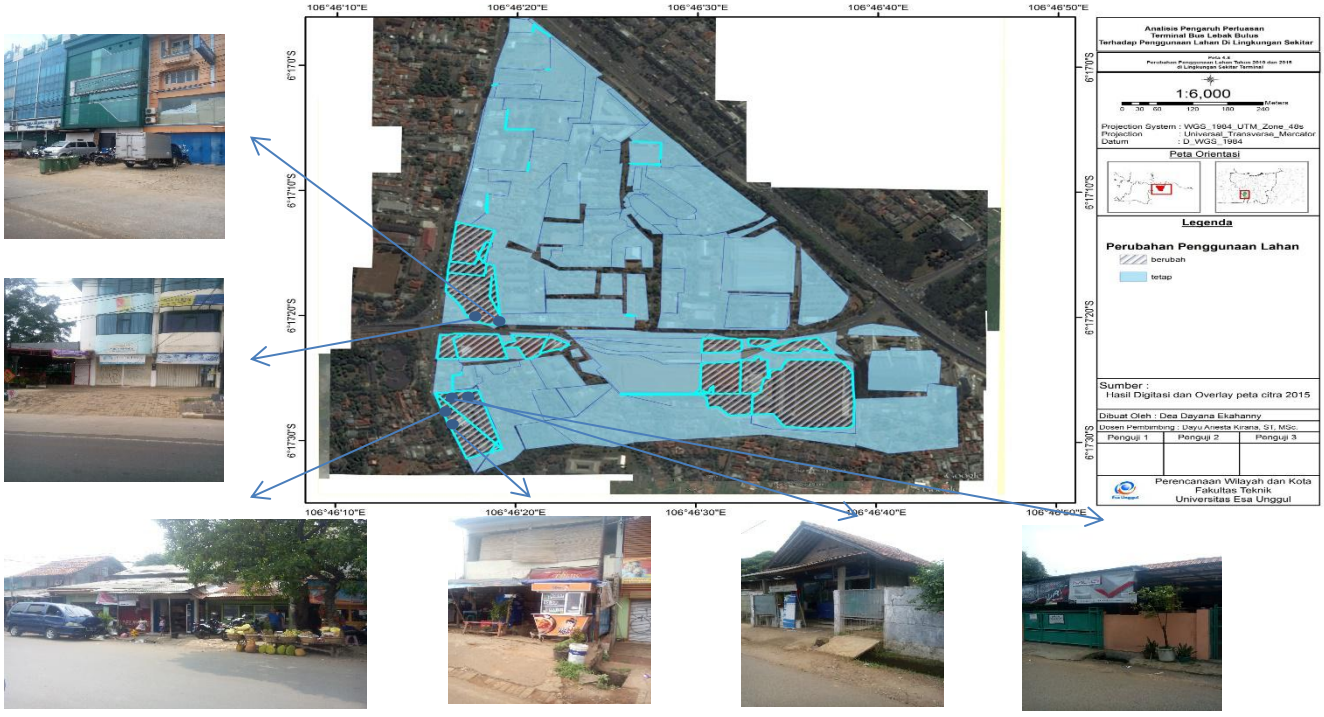


Figure 5

Change in the Use of Housing Land to Trade and Services

Land Use in 2010, 2015 Against RDTR

This analysis was carried out to see the extent of the suitability of land use changes that occurred in the environment around the Lebak Bulus Terminal with the Spatial Detail Plan in the environment around the terminal in accordance with the RDTR stipulations that have been determined based on Regional Regulation No. 1 regarding the 2014 DKI Jakarta Spatial Planning Plan for Kebayoran Lama and Cilandak Districts. By looking at changes in land use in 2010, 2015 and spatial use based on the RDTR to see changes in land use around the terminal has been the extent of land use changes and land suitability in RDTR land use. Changes in land use around the Lebak Bulus Terminal in 2010, 2015 with utilization

RDTR space can be seen as controlling spatial use as an effort to realize spatial order in accordance with RDTR directives.

Under the RDTR the land use around the Lebak Bulus Terminal is divided into trade and services, housing, social facilities, blue open space, green open space and government. Based on the area of the RDTR area around the terminal, for Social Facilities land use is 12.27 Ha, residential land use is 25.07 Ha, blue open space is 1.00 Ha, green open space is 4.26 Ha and trade and services is 20.09 Ha. For more details, it can be seen on the RDTR map in the environment around the Lebak Bulus Terminal and the land use tebel based on RDTR as follows:

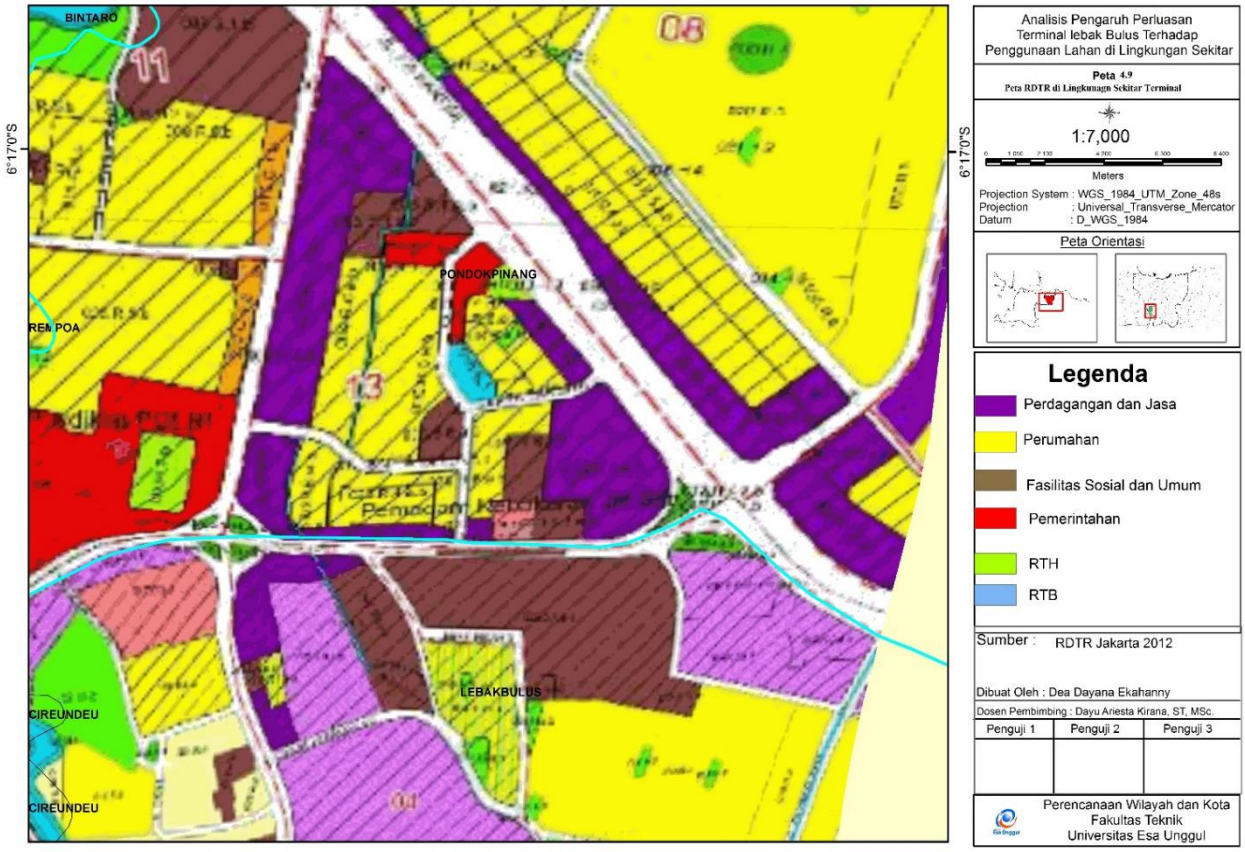
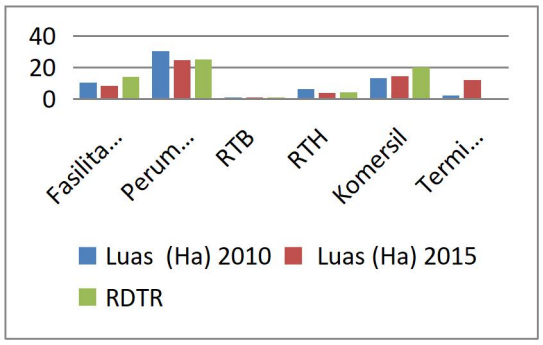


Figure 6
RDTR Map of the Neighborhood Around the Terminal



Source: 2016 Analysis Results

Figure 7

Changes in Land Use in 2010 and 2015 to RDTRFasilitas Sosial

Based on the RDTR, land use for social facilities is 32% or an area of 14.27 Ha. In 2010 the area of social facilities was 12.40 Ha. If added to the Lebak Bulus Terminal and in 2015 social facilities covering an area of 20.20

Ha, increased in 2010 to 2015 in line with the expansion of the Lebak Bulus Terminal from 2010, which covered an area of 2.20 Ha to 12.00 Ha for the construction of the Jakarta MRT, this is not in accordance with the planned social facilities in the RDTR which should be 14.27 Ha. There was an expansion of land use of 5.93 hectares of the area determined by the RDTR.

A. Housing

In 2010 to 2015 residential land use decreased by 10%, in 2010 the area of residential land use was 30.23 Ha and in 2015 it was 24.65 Ha or 48% of the total land use in 2015. Based on the RDTR provisions the area of residential land use is 25.07 Ha or 38% of the RDTR land use requirement. Based on the RDTR land use provisions, the existing conditions almost meet the figures set by the RDTR for land use in the environment around the Lebak Bulus Terminal. according to the direction of land use around the primary arterial road on Jalan Lebak Bulus Raya for trade and services. Housing around the primary arterial road changes its land use to trade and services.

B. RTB

Based on data on land use area of blue open space in 2010 the total land use area for blue open space was 1.20 Ha and decreased by 1% in 2015 to 1 Ha due to the expansion of the Lebak Bulus Terminal which relocated swimming pools to expand the terminal for which the station is planned to be built Jakarta MRT, wide blue open space of 1 Ha is in accordance with land use plans based on RDTR of 1 Ha or 1% of land use in the environment around the terminal.

C. RTH

Changes in land use of green open space in the environment around the terminal from 2010 to 2015 decreased by 4% of the total land use in the surrounding environment. In 2010 green open space amounted to 6.34 Ha or 10% of land use in 2010 but decreased in 2015 by 4% to 3.69 Ha, this is not in accordance with the Jakarta RDTR and also Law No. 26 of 2007 concerning the arrangement space for green open space of at least 10% of land use. The decrease in land use can be seen from the change in the use of green space for expansion of the terminal and into housing to meet housing needs.

D. Trade and Services

Changes in trade and service land use or commercial land use from 2010 to 2015 increased by 6% or 1.87 Ha. In 2010 13.43 Ha and in 2015 14.63 Ha from the development of trade and services along the primary arterial road and road plans for primary arteries in the RDTR. Based on the RDTR, the area of land use for trade and services is 31% or 20.03 Ha, for the area of trade and services that along with the development of roads and infrastructure will develop and continue to increase in accordance with the area and percentage of land use under the RDTR.

Conclusions and recommendations

Conclusion

Research on the effect of the expansion of the Lebak Bulus Terminal on land use in the surrounding environment produces several conclusions, namely:

a. In the expansion of the Lebak Bulus Terminal into the Jakarta MRT Station, in 2010 the terminal area was 2.20 Ha and in 2015 the terminal was expanded by 12 Ha for the construction of the Jakarta MRT.
b. There are 103 buildings that must be relocated, 77 buildings have been relocated or given replacement buildings and 26 are still in the process of being released for the construction of the Lebak Bulus Jakarta MRT Depot.
c. The expansion of the Lebak Bulus Terminal has an influence on the surrounding land use, especially in the use of commercial and service land which increased by 2% in 2015 when the terminal was still in the process of constructing the Jakarta MRT Station. A significant decrease occurred in residential land use which fell by 10%, largely due to relocation for terminal expansion.
d. Based on the RDTR residential land use approaching the land use provisions in the RDTR with a 0.42% clearance, and blue open space is in accordance with the RDTR, reduced green space and not in accordance with RDTR provisions and trade and services which are still not far from the RDTR provisions.

Suggestion

Suggestions from the results of research on the effect of the Lebak Bulus Terminal expansion on land use in the surrounding environment, based on the conclusions above are as follows:

1. To meet the needs for housing facilities based on population projections the population continues to grow until 2018, the need for vertical housing buildings to meet future housing needs is due to an increasing population and the need for increased housing facilities and land that cannot increase Vertical housing is one solution to address the needs of housing facilities.
2. Meet green open space 30% of land use in accordance with Law No. 26 of 2007 concerning spatial planning such as parks and green lines along arterial roads.
3. There needs to be a revision of the RDTR because land use that is not in accordance with the direction and provisions of the area of land use based on the RDTR such as green space, social facilities and the construction of the Lebak Bulus Terminal expansion into the MRT Station are not included in the RDTR plan.

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