Analysis of Sustainable Urban Landscape in Karawang HSR Station Area

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Abstract. This research presents a qualitative study that examined the sustainable urban landscape based on the land value aspect by mapping the potentials of an area in the land value by synthesizing the results of a theory on specific factors that affect land values in examining the spatial direction of land value determination by mapping the potentials of an area of land value. This study looks from a different perspective. In previous studies, it was seen how land use could change prices, but in this study, it is more seen how land value maps can also map the spatial changes of a city. Future researchers are encouraged to confirm the results of this finding in quantitative research that links the determinants of land value which can be later used to calculate the value of vacant lands.

Keywords: land value, spatial mapping, sustainable urban landscape

1. Introduction

The growing urbanization is causing a steady loss of agriculture. [1]. The transformation of agricultural land into residential [2], commercial [3], and industrial [3] areas is one example of land conversion [4]. This situation is caused by social development and population growth [5], both of which are not by regional supporting facilities and infrastructure [6]. As a result, infrastructure must be built by redesigning the surrounding environment and implementing mobility-based planning through accessibility and space creation. [7]. The goal is to connect the cities in a shorter travel time. The ‘Kereta Cepat Jakarta Bandung’ (KCJB) or High-Speed Rail (HSR) Jakarta-Bandung is part of the Indonesian government's grand plan to develop mass transportation, inter-regional connectivity, and the development of integrated areas. KCJB will connect Jakarta and Bandung with a shorter travel time [8] from Bekasi and Karawang stations, West Java. This plan can potentially increase the value of the land around the development area and will result in changes to the urban landscape. It is necessary to map the area and land values from the last few times to see the relationship between changes in landscape and land values.

This research examines the variable affecting land value around the Karawang HSR. If previous research was conducted in cities, or suburban areas [6], [7] where infrastructure development was intended to support the region's development, discussed the land value in urban areas with well-established infrastructure [9]–[11] and examined the factors that affected land value by measuring the correlation between certain variables [12]–[14]. In this present research, factors affecting land value are determined by connecting various theories with factors that affect land values in the area being studied.
This qualitative study will discuss an important issue on how the potentials of the area affect the land values around the Karawang HSR Area. This problem will be closely related to the land value determinants that follow the infrastructure development.

2. Material and Method

This qualitative study will investigate the causes and relationships between infrastructure development and land value. A qualitative study was performed to understand land value development in association with regional development. This study will also be performed to map the area's potentials that can affect land values. Later, factors that may affect the land value will be examined.

| Variety of Architectural Data | Literature Study | Spatial Analysis Through Satellite Image |
|------------------------------|------------------|------------------------------------------|
| Collected/generated          | Collecting data containing understanding, data, regulations, and previous research | Data in the form of data collections at Karawang and Bekasi Regencies that are containing photos of satellite images, RTRW 2011-2031, BPS, and regional developments, as well as increasing land values that appear based on ATR/BPN data |
| Data Type                    | Secondary data   | Secondary data                           |
| System                       | Digital          | Digital                                  |
| Objective                    | Making sense of context – archival document | Making sense of context – archival document |
| Perspective & Depth          | Group of society perspective, multiple variables | Group of society perspective, multiple variables |

3. Literature Review

This literature research will discuss environmental changes and their impact on land values. This research will provide a qualitative basis in the form of knowledge about appropriate strategies that can be used to solve similar problems. This research will provide a qualitative basis in the form of knowledge of proper strategies that can be used to solve similar problems.

Areas with dense industries will grow faster than non-industrial areas with a greater amount of capital. Industrial areas have higher land values [4], [9]. In addition, infrastructure development inside and outside the area will support economic activities in an area. Several aspects cause changes in a city, including environmental, social, political, and economic aspects [10]. Consequences also follow, especially (1) economic changes in the form of economic attractiveness of a region, (2) environmental phenomena such as visual intern from an environment, and (3) social phenomena in which humans behave. These phenomena include community concentration and population movement, which drive socio-economic transformation [11], and environmental changes [12]. Through various patterns, namely the pattern of trajectories or processes of dependent change, turning points are results of innovation or crisis, while the pattern forms a repetition of spatial changes, intertwined temporality, and transformation of regional forms [13]. The land is defined as a physical location and a collection of values and meanings that make it a more valuable commodity due to territorial planning [14]. Alternatively, it can be said that the notion of land value is a type of measurement that does not take into account the value of the building [15].

Environmental quality and its effect on land value appear in the land control and configuration. The decisions made close to the land regarding agglomeration effects and spatial externalities impact land usage. Regional incomes and productivity can be affected by agglomeration [16]. Regional investment influences the surrounding area through spatial interaction [11], [12]. Infrastructure will positively impact the region's and nearby
areas’ spatial and production features. The association is directly linked to a site’s strategic position, impacting a region’s success, particularly in choosing the location [17], [18].

### Table 2. Factors Affecting Land Value.

| Factor          | Theory                                                                 | Recent Research                                                                 |
|-----------------|------------------------------------------------------------------------|-------------------------------------------------------------------------------|
| Economic Factor | • In classical economics in the nineteenth century, land played a crucial part in economic analysis. Alonso (1964), Muths (1969), and Mills (1969) indicate that agricultural land productivity, geographical theory, locational features of the land in terms of its use and value, as well as tax, population, and spatial aspects. | Income, tax, Purchasing power, and transaction costs. [7], [21]–[24] |
| Social Factor   | • The city is a representation of human life. The following elements must be considered while determining strategic locations: Accessibility, traffic, visibility, regional complementing facilities, government laws, the environment, competition, and regional expansion are all factors that must be considered. [19] | Population density, education level, demographic. Characteristics of the population. [25]–[29] |
| Government-Related Factor | • Spatial planning, zoning | The planned land use for redevelopment [30]–[32]. |
| Physical Factor | • Accessibility, Transportation Distance to public park, hospital, mall Open space area / Forest. [33]–[35] | Accessibility, Transportation Distance to public park, hospital, mall Open space area / Forest. [33]–[35] |

In this research, map data retrieved from Google Earth and RTRW 2011-2031 for Karawang and Bekasi Regencies were used to map the areas with certain development criteria and detect the types of development that can significantly affect the environment and land values based on historical movements. The environmental movement of this area can show an increase in the land value in the form of ‘Zona Nilai Tanah’ or ZNT in each area. The ZNT Policy is intended as a guideline and monitoring mechanism for all land-related transactions and is shown in color to identify boundaries. Each ZNT value is based on several determinants: market price transactions, individual transactions, offers and natural conditions, distance to the city center, land use, public and social facilities, and accessibility [36].

### 4. Data Area Mapping

This research took place in an area between Bekasi and Karawang districts that used to be agricultural land converted into an industrial area. Along with the region’s development, new residential, commercial, business, and industrial areas emerged, resulting in higher income levels [9]. To support this, necessary to establish integrated infrastructure and transportation to facilitate the need for mass transportation, which will be a strategic key to regional development [37]. The development of an area will also affect the value of the area and its land value. The urban development within a territory will vary depending on the growth pattern of the surrounding environment. The mapping of the local potentials of the region was performed using satellite imaging in a radius of 10 kilometers surrounding HSR Karawang Station. There are 7648 ZNTs (Zona Nilai Tanah) throughout the location of the study, each has a separated attribute and polygon presented in Figure 1.
5. Analysis
The data is then combined and compared with secondary data obtained from the Bekasi and Karawang Regency Governments (RTRW 2011 – 2031), BPS, and ATRBPN in the form of ZNT data for 2016, 2018, 2020, and 2021 in the form of polygon maps of land value zones as the basis for calculations and maps of other variables. which is determined.

Regional mapping is carried out to see regional developments and detect what developments can significantly affect the environment and land values based on historical movements:
- land use shift (Google Earth)
- activities in zoning (RTRW)
- infrastructure/facility/area development/land
- owner/developer/landowner

The increasing growth of the Road Pattern environment already exists, but not many houses and industries have been built. Source: Google Earth Historical Imagery 2014

The increase in price was due to an increase in housing and industrial area development. Source: Google Earth Historical Imagery 2015

Compared to existing theories regarding factors that affect land value Land Value:
Economic
- Social
- Population
- Street
- Transportation
- Infrastructure
- Facility Support
- Security
- Central government

Massive increase in the growth of the urban environment (supported by affordable and complete infrastructure/facilities)

Rymarczuk dan Slemriska (2012); Ma et al (2013); Giorno et al (2013); Upati & Kubat Sema (2010); BV et al (2010); Wawrine & Thori (2003)

Figure 1. Research Location & Population Sample
Source: Google Earth, ATRBPN and RTRW 2011-2031, Karawang and Bekasi Regencies

Figure 2. Analysis Step.
Source: Google Earth, ATRBPN and RTRW 2011-2031, Karawang and Bekasi Regencies
The mapping of regional strengths and weaknesses is carried out by comparing the restricted zones of the Deltamas area, the area around the Karawang HSR Station, and the THK/KIIC area to see and complete the segmentation and regional potential.

Table 3. Accessibility and Facilities in Surrounding HSR Karawang Area.

| Type            | Deltamas                                      | HSR Karawang            | THK & KIIC          |
|-----------------|----------------------------------------------|-------------------------|---------------------|
| Accessibility   | ![Private car (major road on the road within the area)](image) | ![Shuttle Bus](image)   | Toll Gate (KM 47)   |
|                 | ![Motorcycle (bargroad on the road within the area)](image) |                         |                     |
|                 | ![Medium Bus (big road)](image)               | ![Shuttle Bus](image)   |                     |
| Toll Gate       | East Cikarang Toll Gate (KM 31)               | Toll Gate (KM 47)       |                     |
| Schools         | International school, SMU/K, SMP, INSTITUT ITSB, PESANTREN, SDN. | SDN, SMP                | Pusdiklat BMK, SD, SMP, SMAK/N International School |
|                 |                                               | 17 km to Karawang Regency Government | 14 km to Karawang Regency Government |
| Central Government Area | Close to the Deltamas area (1-2 km) to the Bekasi City Government |                         |                     |
| Hospital        | RS Mitra Keluarga, RS Pemantara Keluarga, OMNI Hospital | 9 km to RS Rosella, 12 km to RS Primaya | 4 km to RS Rosella, 6 km to RS Primary |

Source: Google Earth, ATRBP and RTRW 2011-2031, Karawang and Bekasi Regencies

Figure 3. Density Surrounding HSR Karawang in 2016, 2018, and 2020,2021 with the average increase in population is 0.44 million every year.

Source: Google Earth, 2021 Karawang and Bekasi Regencies

6. Result and Discussion
It is necessary to map the image of a city about determine of strategic locations of the area because the image of a city reflects the social value of the community. A combination of theories [38], [39], combined Brinckerhoff Jackson’s (1984) statement that a city is the image of human life. Strategic locations need to be determined regarding the elements of Accessibility, traffic, visibility, regional complementing facilities, government laws, the environment, competition, and regional expansion are
all factors that must be considered [20]. At this stage, map data retrieved from Google Earth and RTRW were used to map the areas with certain criteria of development and detect the types of development that can significantly affect the environment and land values based on historical movements. The historical movement included (1) land function conversion, (2) zoning, (3) infrastructure development, (4) land ownership, and (5) developer and land ownership. Comparing data and the result of this analysis shows in Figure 4 and Tables 3 to 4.

Figure 4. Comparing Data
Source: GoogleEarth, ATBPBN and RTRW 2011-2031, Karawang and Bekasi Regencies

Table 4. Result for Surrounding HSR Area (KCIC, KCIIC & THK).

| Year & Mapping | Spatial Change Within the Observed Area | Result |
|---------------|-----------------------------------------|--------|
| 2012          | It consists of rice fields and villages along Pasar Jati Street. KIIC developed industrial area near the Karawang Barat I Tollgate | In 2012 to 2014, Land value increased in residential and industrial by 5%. The influencing factors are infrastructure, industrial area, population, and policy. |
| 2016          | KIIC developed the west side area, and industries started to fill up, and in 2018 KIIC started developing the southeast side area. THK land cleared in the south area. | Land value increased in residential by 4% and industrial by 19%. The influencing factors are infrastructure, industrial area, economic, and policy. |
| 2020          | KIIC has become crowded and continued to develop the southeast side area. | Land value increased in commercial areas by 20% residential and industrial by -0.4% to 10%, from 2018. The influencing factors are infrastructure, industrial area, population, economic, and policy. |

Source: GoogleEarth, ATBPBN and RTRW 2011-2031, Karawang and Bekasi Regencies
Table 5. Result for Surrounding HSR Area (Lippo Cikarang, Deltamas & Meikarta).

| Year & Mapping | Spatial Change Within the Observed Area | Result |
|---------------|----------------------------------------|--------|
| 2012          | In 2012, Lippo Cikarang developed the west side area, which is already crowded with the residential and industrial areas, and Tollgate Cibatu is under construction. In 2014, Lippo Cikarang developed the west side area and expanded to the south side for developed residential and industrial areas. | From 2012 to 2014, land value increased in the residential, commercial, and industrial areas by 83%. The influencing factors are infrastructure, industrial and residential areas, population, social, economic, and policy. |
| 2016          | In 2016, the residential area was developed on the south side by Lippo Cikarang and land clearing for Meikarta Land development. Deltamas developed the residential and industrial area in the nearby Lippo Cikarang area. In 2018, Meikarta started constructing the apartment building structure, lake, and park. Cibatu Tollgate has been completed. | Land value increased in the residential area by 37%, Industrial area by 78%, and commercial area by 211% (2014 to 2016). |
| 2020          | In 2020, Lippo Cikarang constructed 8-Cibarusah Deltamas Silicon Road to connect industrial and residential areas. In 2021, Meikarta building apartments and a commercial area. In 2021, lippo Cikarang constructing the 8-Cibarusah Deltamas Silicon Road, to open public road access to Cibarusah. | Land value increased in, commercial areas by 264% to 360%, residential areas by 83% to 139%, and industrial by 146% to 186% from 2018. The influencing factors are infrastructure, industrial and residential areas, population, social, economic, and policy. |

Source: GoogleEarth, ATRBPN and RTRW 2011-2031, Karawang and Bekasi Regencies
The completeness of the road network would increase the value of the land [40]. However, road construction tends to only develop in industrial and residential areas. In contrast, main roads and arteries in other areas have not experienced additions, so from the existing mapping, the land value tends to be higher in areas within industrial and residential clusters due to the completeness of road facilities and landscape lenses that are built in its territory. Currently, the construction of the Karawang HSR station has not experienced a significant increase because it is still in the land acquisition stage. This follows the research of Sharma et al. (2021), where the land value before construction did not increase significantly compared to the post-development and operational periods [41].

Spatial changes strongly influence the increase in land value in the environment. Income levels, inflation, and the purchasing power of settlements affect land prices as an economic factor. Upgrading the area and changing the area's zoning, the value of the property may increase or change. Agricultural areas continued to transform into settlements and industries when changes in regional function affect a country's value in state regulatory factors. Increasing population density, changing types of work, and increasing welfare, affect the value of land in social factors. Improvement of environmental infrastructure and facilities affects the value of land in the spatial factor of the region.

7. Conclusion and recommendation
The development of an area will result in spatial conditions and income levels. A spatially agglomerated area will have greater economic growth. Areas with dense industries will grow faster than non-industrial areas with a greater amount of capital. Industrial areas tend to have higher land values [9], [18]. In addition, infrastructure development inside and outside the area will support economic activities in an area. Supportive regional regulations and planning will also add up to the land value and good transportation infrastructure development. Hence, it is necessary to identify factors related to the area being studied to identify the determinants.

The result of this research is that the changes that exist are more on changes in the landscape, which were initially rice fields converted into industrial land and residential land controlled by developers, resulting in a significant price increase in that area. Adding a network of infrastructure, commercial areas, and facilities to complement the area will increase the potential and quality of the area and automatically increase the value of the land. Furthermore, the results obtained can answer the purpose of this research, by altering the landscape and improving land function, the addition of buildings, roads, and properties, along with supporting areas above the land, will automatically increase the land value. This can be demonstrated by examining the causes and relationships between infrastructure development and land value. Land for various development initiatives and spatial development can alter the physical landscape. The city's sustainability is impacted by these changes, which is crucial for the growth of cities and attaining sustainable urban development. Moreover, from legislation, urban planning in many sectors, and development control, governments need to include city sites created to link people, activities, buildings, and public spaces with excellent walking and bicycle connections. They started by structuring and structuring cities in multiple industries and managing regional growth in multiple sectors [42]. The limitation of this research is that the land value maps obtained from ATRB PN in 2012, 2014, 2016, 2018, 2020, and 2021 do not have complete data for each year. Thus, mapping the entire area within a certain period needs to be carried out to provide an overview of changes in land values in each area studied. This research needs to be supported by quantitative calculations to get the determinants that affect the land value, and then it is mapped again on the unfilled land value map.

8. Further Research Recommendation
This study tries to map as many variables as possible that affect land values. In the future, the determining factor will alter based on the territory's development by both the government and the private sectors. Future researchers are encouraged to confirm the results of this finding in quantitative research that links the determinants of land value which can be later used to calculate the value of vacant lands.
9. Reference

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