

# Application of the compact city concept in Caturtunggal Educational Area

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**Abstract.** The existence of university can be a new growth center area that causes affect to increased carrying capacity areas such as residential area and trigger development of commercial and service areas to support educational activities. Development uncontrolled area will give problems to the surrounding area. In the Kaliurang km.5 street corridor, precisely in Caturtunggal Village, Yogyakarta experienced regional development that is because there are two campuses such as Gadjah Mada University and Yogyakarta State University which have high student attractiveness. This causes a problem impact to traffic in main street, land use change in green open space, and high building density. The concept of a compact city is a concept sustainable development one of the carious sustainable development approaches to solve this problem by considering environmental, economic, and environment aspects. This study aims to examine the characteristics of compact cities in the region Kaliurang km.5 street, as well as providing direction for regional development in realizing it sustainable areas with qualitative descriptive analysis technique.

## 1 Introduction

The phenomenon of urban development can also be caused by increasing the population in the city and migration of people to cities (urbanization). The existence of university can also provide affect the development of a region marked by development of commercial and service area. This condition is worrying about the availability of carrying capacity of the region. Increased the land up can also be caused by concentration of activity to provide for student needs. Changes in land use can affect to decreasing of green open space. Increased intensity activities may indirectly impact in physical changes to the area without any control and proper planning will have an impact on the quality of the area that is declining as well as the number land use changes that are not in accordance with regional conditions. Supplying of community needs increasingly diverse ranging from the availability of infrastructure, housing, energy, transportation, services and commercial.

These conditions provide demands on the development of the city in improving welfare and consider future needs. Building the city sustainable is considered a very strategic agenda to be implemented in embodiment of a better city. Report of the World Commission on Environment and Development [1] defined sustainable development is able to provide a balance between humans and nature, this development is a development that meets the needs of the times now without reducing the ability of future generations to meet their own needs.

Roychansyah, Widyastuti, and Paramita [2], considered implementing compact city is one of strategy to response sustainable urban development goals. Application the concept of *compact city* has an influence on the quality of life in urban areas especially on economic, social and environmental sectors [3]. Corresponding with the program sustainable development which is targeted to be realized in 2030 by upholding economic, social and environmental aspects, the concept of a compact city facilitates the availability of transportation sustainable land use, social sustainability, and economic viability [4]. According to [5] important elements in implementing the concept of compact city is mixed land use and high density, comprehensive service facilities, short distances, pollution reduction, dependency car use, encourage bicycle use, social interaction, high density population, encourage walking, easy accessibility, efficient use of public transportation, well-ordered urban infrastructure, energy performance.

Special Region of Yogyakarta which has an image of the city as an Educational City with the existence of public and private universities with international and national service levels be an attraction for students to stay. One area that has increased carrying capacity and carrying capacity in the corridor Kaliurang km 5 street precisely in Caturtunggal Area. The south is bordered by Gadjah Mada University and the east is borderd by Yogyakarta State University. Physical development on road corridors occur rapidly with support functions for campus services such as commercial activities and services with that conditions can cause problems such as traffic jams and reduced green open space. The function

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the area on the layer afterwards becomes a residential service for the community and students so resulting in uncontrolled development with sub-optimal road infrastructure. Based on data obtained from Depok Subdistrict in Figures 2019 of Caturtunggal Area it is the area with the highest density compared to the other two area with the highest density a population of 7,357 people / km<sup>2</sup>.



**Fig. 1.** Kaliurang Km. 5 Corridor Street

## 2 Research methods

The research method used is a qualitative descriptive study of variables which explains compact city in the Kaliurang km 5 street corridor. The purpose of analysis this is to identify the quantitative characteristics of compact cities in the study area. Data collection in this research was carried out through secondary methods. Data collection with this secondary method through field observations using software such as Google Earth 2019, The software can provide spatial information in the form of a map of existing conditions in the corridor area of Kaliurang km 5 street; through a literature study related to previous compact city research at some regions; data collection through government agencies such as the Badan Pusat Statistik Depok District, Sleman, data that can be obtained related to population demographic data, information geographical; Sleman Regency Regional Development Planning Institution with data obtained is spatial data in the form of maps in the form of ArcGIS related to land use in Caturtunggal Area.

## 3 Literature review

### 3.1 Concept of compact city

Based on Lee et al. [3] the strategy concept of a compact city has been considered a concept development that supports the sustainable development agenda. This concept also gives the impact on improving the quality of people's lives. In its implementation the concept of *compact city* has important factors that attribute to the creation of a compact city including density population, concentration of activities, intensification of public transportation, size and optimal access to cities, targets community welfare, as well as a process towards compact conditions [6]. These attribute factors must be integrated and support each other so that they are

realized a condition of sustainable development. Burton [7] explains the concept of compact city classified based on three dimensions of *compactness* namely density, mixed-use, and intensification movement. Kotharkar's [4] opinion, the principle of the concept of a compact city is to show density high city, providing open space protection, diverse land uses, revitalization of the city center, utilization of housing in the CBD area, and optimization of use public transportation. Implementing the concept of *compact city* in each region availability of facilities to mobility or transportation trips at close range, optimization of pedestrian pathways, more efficient land use, sustainable social aspects as well cultural development, the cost of providing infrastructure is less so that it provides economic viability as well as supporting small economic activities.

### 3.2 Implementation strategy for compact city

Implementation of the concept of compact city development has been widely applied to cities that in a developed country. The opinion of Burgess and Jenks [8] the application of the concept of a compact city in a country developing the need for modification or alignment with existing conditions because in general the characteristics between developed and developing countries have differences so that the strategies do not practical. Cities in developing countries have great potential in implementing them compact city strategy, on the aspect of high population density, mixing activities on a residential area with non-residential activities is often found and the size of the city relatively medium size [9].

The issue of applying the concept of compact city development in developing countries needs to pay attention to elements densification of residential areas, intensifying economic, social and cultural activities in the area certain, as well as designing city sizes, shapes and structures in realizing that environment sustainable [8]. The positive aspects are given in the form of a compact city within developing countries according to Kotharkar [4] are mass transit systems, compaction policies an area provides success in sustainable development. Concept strategy compact city that can be applied in developing countries, namely densification and intensification activities by realizing polycentric growth patterns, as well as linear transit-oriented, as well embodiment of mixed land use.

### 3.3 Compact city variable

Based on the previous discussion, there are three variables in the first compact city, namely density, mix use, and intensification. In table 1 variables and indicators are formulated that can be used as a strategy to apply the concept of compact city in Kaliurang Km. 5 Street.

**Table 1.** Variables and Indicators of Compact City

Variables	Indicators
Density	1. Population density 2. Density of residential area 3. Safe Community
Mix Use Land	1. Land Use 2. Facility Availability
Intensification	1. Availability of mode public transportation 2. Provision of pedestrian ways 3. Affordability of facilities

## 4 Result and discussion

### 4.1 Density analysis

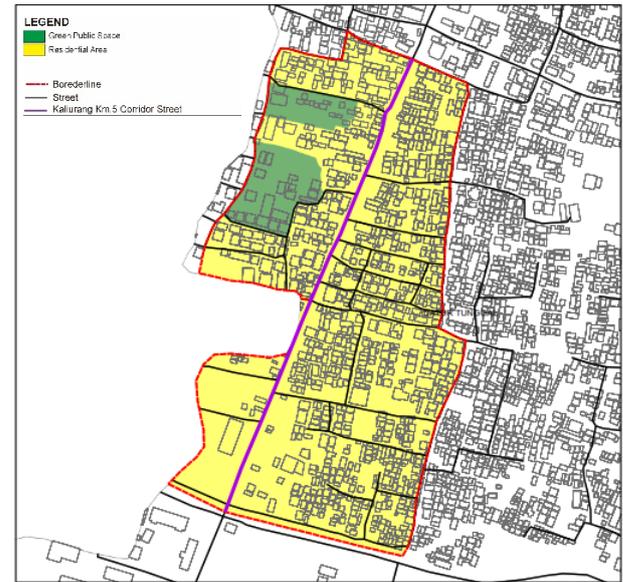
Depok Sub-district consists of three villages namely Caturtunggal, Maguwoharjo, Condongcatu based on data from the Central Statistics Institution of Sleman Regency in 2019. Caturtunggal area is the area with the highest density in this district with 7,357 inhabitants per km<sup>2</sup>. Kaliurang Km. 5 corridor street included in the administrative area of Caturtunggal. Area the observation area is about 2,192 Ha with 2,186 Ha of built land, availability land in the observed areas for development is dwindling. This has resulted in development vertically which increases the number of building floors. Strategic location resulted the condition of settlements in observation is included in the dense settlement. In general land use in the observation area has been used to its full potential.

Based on BAPPEDA Sleman Regency (2015) document, land use in the observed area dominated by the function of settlements with an area of 2,186 Ha with building structures that have been it is permanent in interpreting the welfare of the people in the area observation has been included in a prosperous society supported by the condition of the Per capita GRDP Sleman Regency which occupies the second highest after the City of Yogya. As in Figure 2. The availability of green open space in the observation area is still experiencing shortages the decline in water catchment areas in the region, it is not uncommon when the rainy season is often there are puddles of rain water along the corridor area of Kaliurang Km. 5 street.

This problem indicates that the rainwater runoff infrastructure system is not yet optimal resulting in flooding. Besides the drainage utilities that have not been able to provide carrying capacity the condition of population density in the observation region still does not indicate a saving energy like the characteristics of a compact city concept.

Generally based on density analysis in the Kaliurang Km. 5 corridor street the application of the compact city concept is still not optimal which is the carrying capacity of the utility population density is still not optimal and the availability of green open land is still very minimal development planning program in implementing the concept of compact city in the region. Characteristics of compact city concepts such as carrying capacity within accommodating population density has been realized in

this region, as well as the conditions of rising prices land has also occurred in the Kaliurang Km. 5 corridor street.

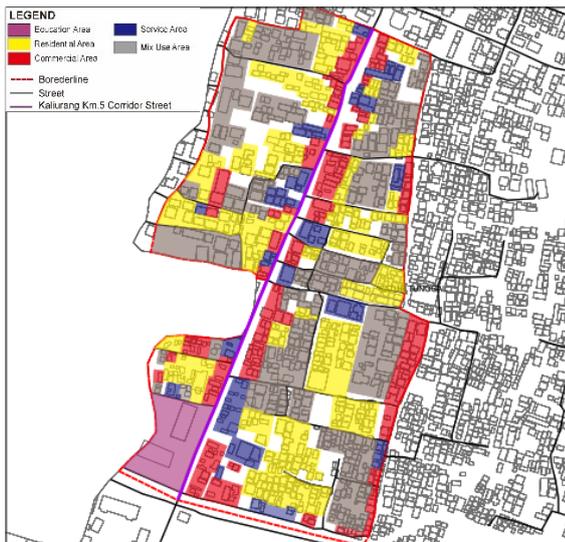


**Fig. 2.** Land Use Map in Caturtunggal Area

### 4.2 Analysis of land mix use

The diversity of activities and the designation of mixed land as optimization characteristics land use in the concept of compact city. Diversity of activities in the Kaliurang Km. 5 corridor street is the impact of the existence of Gadjah Mada University and University Negeri Yogyakarta. The activity that appeared on the street corridor was a supporting factor for the activity education.

The activity function which is on Kaliurang Km. 5 street consists of commercial functions, services, offices, and education. Diversity of activities does not only occur in layer 1 of the road corridor but the impact on the layer behind it that functioned as a residential area has been changed function as a mixed region. The mixed area is dominated by function buildings with boarding house functions that are intended for student needs. The facilities available in the corridor as illustrated in Fig. 3. have affordability service with 500 m to 1000 m. The available facilities can be reached with walk for 5-10 minutes from the surrounding residential areas. Concentration of activities This provides a high level of efficiency in the distribution of services and goods equitable and provides convenience in accessing the needs of students. Mix characteristics use in the concept of compact city has been applied in the corridor area of Kaliurang Km. 5 street, will but the existing conditions that occur in this corridor provide problems that are occurring congestion and increased energy expenditure by vehicles. These conditions are not in accordance with the goal of building a compact city concept. This relates to the third variable such as intensification of public transportation.



**Fig. 3.** Land Mix Use Map in Caturtunggal Area

### 4.3 Intensification of public transportation

The availability of public transportation facilities and pedestrian facilities is very important in the concept of the city compact so that it can serve the capacity of the movement of people and goods intensively sustainable without relying on private vehicles. Conditions that occur in the Kaliurang Km.5 street still has shortcomings in facilitating the transportation system general, among others, the condition of bus stops that are less than optimal by only using temporary shelters (portable), the diversity of public transportation is minimal because it only has one mode of transportation which is a Jogja trans bus. In addition to inadequate modes of public transportation, pedestrian facilities feet such as pedestrian paths and also crossing paths are still not optimal which is the path pedestrian is still widely used by street vendors and there are damages quite disturbing pedestrians. Besides that, the people crossing path on Kaliurang Km. 5 street has not available making it difficult for users to access the activity center which is on the other side bike lanes are also not yet available on these roads, so users and the surrounding community still depend on private vehicles in accessing needs. Then the improvement of a comfortable and safe pedestrian path is needed in support the implementation of the compact city concept in the Kaliurang Km. 5 corridor street other than that the provision of diverse and environmentally friendly modes of transportation with a sufficient fleet help reduce the number of dependencies on private vehicles and the provision of bicycle lanes can help reduce the use of private vehicles and implement city concepts compact.

## 5 Conclusion

Based on a literature review related to the characteristics and elements that support the conceptualization of the city compact. The concept provides an important role in controlling and controlling the development of an area with high population density. In this paper there are

three variable that determines the implementation of the compact city concept consisting of several indicators in supporting sustainable development.

Based on the analysis of the compact city concept variable, Kaliurang Km. 5 street which is street corridors that experience the development of activities caused by UGM educational activities and UNY. This condition has high potential in character of population density and function activities mix in it to implement the concept of compact city. But still there deficiencies in the provision of supporting infrastructure in trying to achieve the concept compact city in sustainable development. The effort that needs to be done is provision of green open spaces, pedestrian paths, drainage systems, diversity of modes of public transportation and policies governing boarding-lodging services.

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