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Settlement Quality Mapping Around Universitas Pendidikan Indonesia (UPI) in Relation to Student Learning Achievement

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Abstract

Universitas Pendidikan Indonesia (UPI) is one of the favorite education facilities that attract students from other regions. This fact can cause an increase in the need for a living place near UPI. Limited availability of land and increasing land needs affect the quality of the settlements. The objectives of this research are 1) to identify and analyze the factors that affect settlement quality around UPI, 2) to analyze a settlement quality around UPI, and 3) to examine the possible linkage between settlement quality and the students' learning achievement. The method used is data extraction from satellite imagery to obtain settlement quality parameters: settlement density, building layout, the width of settlement driveway, settlement location, settlement driveway condition, and the existence of vegetation. Another data sets were collected through questionnaires on the students' learning achievement. This research shows that there is no strong correlation between the quality of settlements and the students' academic performance. This is evidenced by the highest GPA points achieved by students who live in only moderate quality settlements.

Keywords: settlement quality, students learning achievement, remote sensing, spatial analysis

1. Introduction

Bandung has a population growth of 0.37% in the period of 2015-2016 [1]. The increasing population growth is not only caused by natural growth (birth) but also because of population movements that occur for various reasons. The high population growth is because the city is a center of human activity and offers better opportunities than in rural areas [2]. For example, urban areas have better livelihood potential, or because

of the lack of educational facilities in rural areas. Public interest in educational facilities raises the possibility of migration.

Bandung has several universities spread in Coblong Sub-district (Bandung Institute of Technology, Padjadjaran University, and Bandung Manufacturing Polytechnic) and Sukasari Sub-district (Universitas Pendidikan Indonesia and POS Polytechnic of Indonesia). Coblong Sub-district has a population density of 17,959 people/km2 while Suksasari District has a population density of 13,080 people/km^2 [1].

Population growth leads to an increasing need for settlements [3, 4]. Settlements are part of the environment consisting of more than one housing unit that has the infrastructure, facilities, and public utilities in urban or rural areas [5]. The development of settlements is an ever-changing dynamic phenomenon. Therefore, it requires a method to analyze and present the phenomenon optimally. One alternative way that can be used is with Remote Sensing technology. Remote sensing is a science that utilizes the sensors brought by a vehicle to obtain information through recording the phenomenon of the earth's surface with the help of natural and artificial energy sources [6]. Successfully recorded data is processed for a particular purpose. Remote sensing can be defined as the acquisition of information about an object through a sensor that is not in direct contact with the object [6, 7]. In this study, remote sensing was used to obtain settlement conditions around Universitas Pendidikan Indonesia, Sukasari District, Bandung City. The ever-expanding settlements have the potential to cause problems of illegal settlements and slums, especially when existing land cannot facilitate those needs [8]. Also, the unequal availability of land with population growth leads to a decrease in the quality of settlements. Remote sensing images have the advantage of the multitemporal resolution. This advantage can be used to see a dynamic earth phenomenon and provides the latest information such as the development of settlements in urban areas.

Typically, the area around the college location is used to build supporting facilities such as a place to live for students. The quality of settlements around UPI can be examined through the following parameters: settlement density, building layout, the width of settlement driveway, settlement location, settlement driveway condition, and the existence of trees (vegetation).

Most students prefer to live near the campus. The choice for this type of accommodation could be influenced from factors such as the quest for personal privacy, larger space accommodation, cheaper accommodation fee and payment flexibility, closeness to shopping centers, groceries stores, and also restaurants [9]. The good settlement was not just useful for attracting students; it would also influence student success, student retention rates, and student satisfaction [10]. The quality of the settlement is assumed

to affect student achievement. This is because, students need support facilities inside and outside the university, such as a comfortable place to live, facilities such as places to eat, grocery stores, stationery stores. This linkage will be analyzed in this study. The objectives of this research are 1) to identify and analyze the factors that affect settlement quality around UPI, 2) to analyze a settlement quality around UPI, and 3) to analyze the possible linkage between settlement quality and the students' learning achievement.

2. Study Area

This research was conducted around Universitas Pendidikan Indonesia (UPI), Sukasari District, Bandung. This location is a dense settlement area that is partly used as a student residence (see Figure 1).
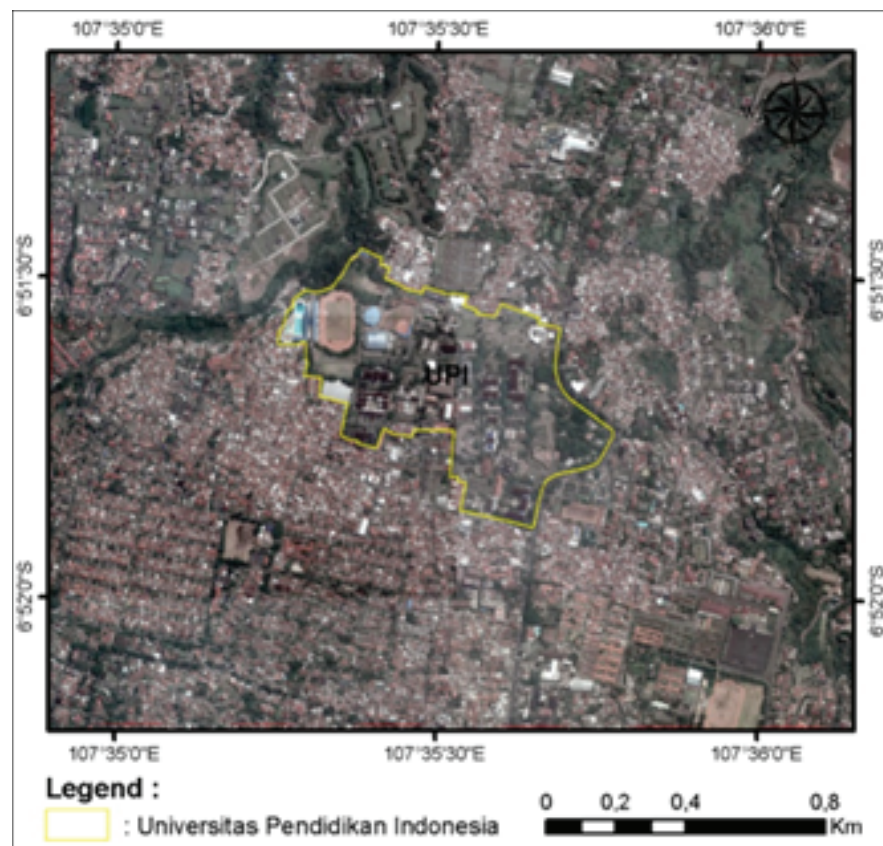

Figure 1: Study area.

3. Methods

This research method is image interpretation and observation. The primarily collected data are satellite image and field observation data, i.e., condition of the building and

student achievement. The secondary data are Peta Rupa Bumi Indonesia sheets 1209 - 313, and sheets 1209 - 311. The map was used to obtain administrative boundaries and road networks around Universitas Pendidikan Indonesia.

3.1. Settlement quality parameters

The data of settlement quality parameters obtained from satellite images interpretation are as follows.

3.1.1. Settlement density

The settlements density is calculated based on the total area of the entire roof divided by the area of the settlement block. The more solid a settlement block, the smaller the value, and the more sparse a settlement block, the higher the value.

3.1.2. Building layout

This parameter is judged by the neatness of the settlement area and the size of the building. Buildings that have the relatively same size and are located following a specific pattern are grouped on the same mapping unit, categorized as an excellent building layout.

3.1.3. Width of settlement driveway

The width of the driveway connecting the road from a settlement to the main road or arterial road. The classification of settlement driveway width is divided into 3: Good if the road width is greater than 6 m. Moderate, if the road width between 4-6 m and Poor if the road width <4m.

3.1.4. Settlement location

The settlement location is assessed from the distance to the source of pollution originating from the bus terminal, factory, trade area and service area or main road. This relates to the level of air quality in the settlement.

Figure 2: Example of quite neat building layout.

3.1.5. Settlement driveway condition

The condition of settlement driveway can be known from the type of material (asphalt or cement). If more than 50% of roads in the settlement block have been paved/cemented, then it is categorized as Good. If 25% -50% of roads in the settlement block have been paved/cemented, then it is classified as Moderate, If less than 25% of roads in settlement block have been paved/cement then categorized as Poor.

3.1.6. Existence of tree (Vegetation)

Trees are located on the entrance side of the settlement block. A good block of settlements is if it has vegetation and unfavorable blocks of settlements if it does not have a plant.

3.2. Settlement quality classification

The settlements quality is divided into three categories: good, moderate, and poor. Category determination is based on the value of settlements quality parameters, and weighting according to the influence of these parameters on settlements quality. The

biggest weight (3) is given for the parameters that most influence the quality of settlements, namely settlement density, the width of settlement driveway. Weight value 2, is provided for settlement location, settlement driveway condition, and the existence of trees (vegetation). The lowest weight is given for the layout of the building [4]

3.3. Observation

The observation aims to identify settlement conditions and to obtain student achievement data using questionnaires. The questionnaire was filled by 33 Geography Education students who live near UPI.

4. Results and Discussion

4.1. Settlement quality parameters

4.1.1. Settlement density

The density of settlements is calculated based on the total area of the entire roof divided by the settlement block area. In determining the units of mapping units (building blocks), it is measured qualitatively based on the level of uniformity. Regions that have relatively homogeneous density levels will be included in the same mapping unit [9]. The calculation results are categorized into settlement density: high, medium, low. Figure 3 is a settlements density map in the research area. Purple gradation indicates the settlement density, the red color is the primary roads, and the non-settlement is shown in gray.

Based on Figure 3, it can be seen that most of the settlements in the south and west of UPI have high density. While in the east and north have medium density settlements. Characteristics of high-density housing are houses used as student residences. Whereas low-density housing is a housing complex built with a uniform design and layout (KPAD housing, Pondok Hijau, etc.).

4.1.2. Building layout

The building layout is categorized into regular, moderate, and irregular. The categories are based on uniform size and settlement patterns.
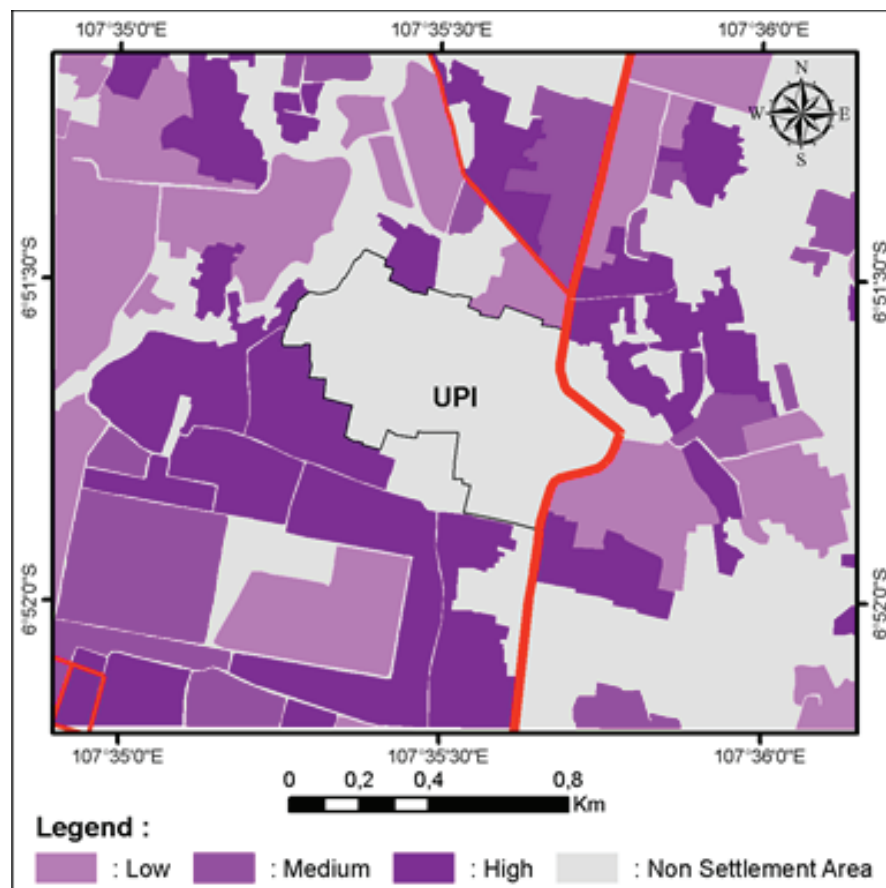
Figure 3: settlement density around UPI.

Figure 4 shows the classification result of the building layout. Settlements around the UPI have variation layouts (regular, moderate, and irregular). Orange color gradation indicates the building layout classification, the red color is the primary roads, and the non-settlement is shown in gray.

4.1.3. Width of settlement driveway

The width of the road is calculated and categorized as: <4m, 4-6m, and > 6m. Figure 4 shows the width of settlements driveway around UPI. Area to the west of UPI has a road width of more than 4 m. While the southern part of the UPI mostly has a road width of less than 4m, which is assumed as a dense area of the building. Space to the east of UPI tends to have a road width of more than 6m. The result of the classification of the entrance width can be seen in Figure 5.
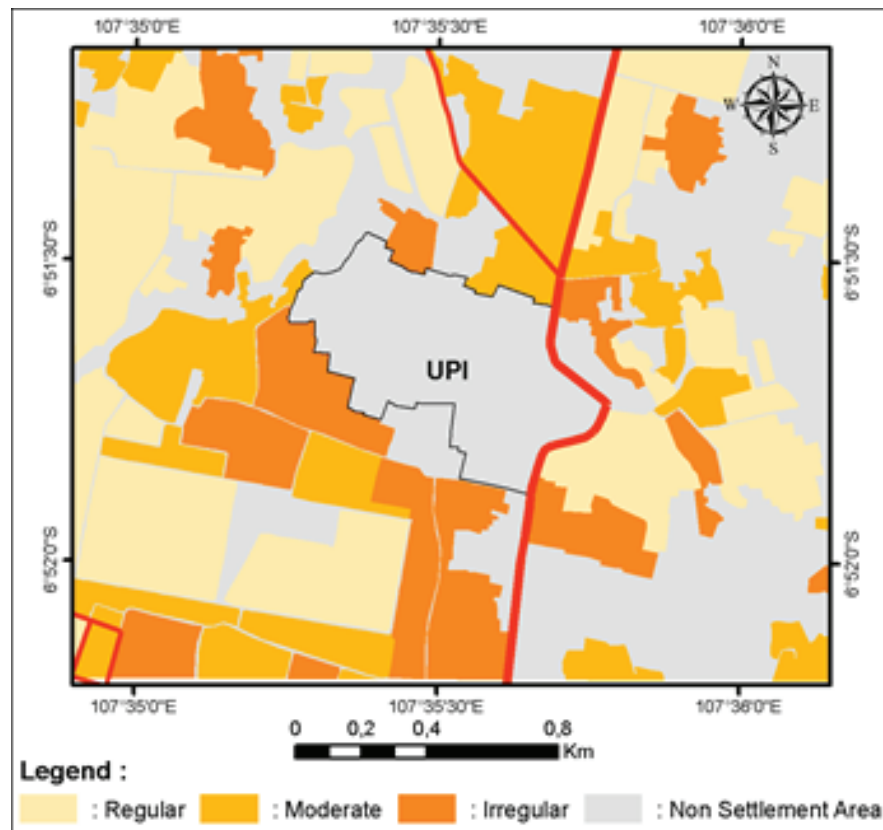
Figure 4: building layout around UPI.

4.1.4. Settlement location

The layout of the building is seen from the image by observing the characteristics of the arrangement or location of the settlement through the pattern of the settlement [4]. Good quality residential areas are located far from sources of pollution (bus terminals, factories, trade area, and service areas or main roads). Based on the measurement of a radius of 5km from the bus terminal, the study area is not covered within it.

4.1.5. Settlement driveway condition

The condition of settlement driveway identified based on the type of material (asphalt or cement).

Based on identification (Figure 6), there is only one block of settlements with bad settlements driveway conditions, namely in the southwest of UPI.
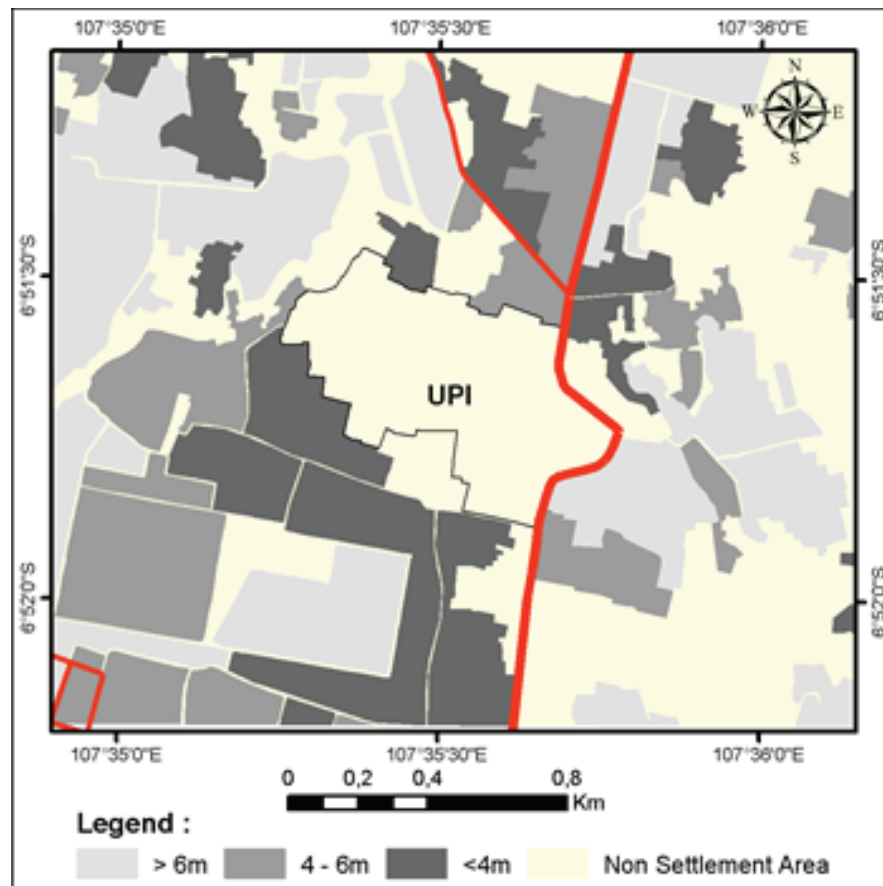
Figure 5: width of settlement driveway around UPI.

4.1.6. Existence of trees (Vegetation)

Trees in the settlement blocks are categorized by their presence. This tree is intended as a shade into the environment [9]. Interpretation results show that most of the residential neighborhoods in the research area have trees.

4.2. Settlement quality around UPI

The settlements quality is divided into three categories: good, moderate, poor. Figure 8 is the result of the settlement quality classification based on the determinant parameter. It can be seen that in the south of UPI tend to have poor quality. Unlike the area in the east and north that are dominated by good and medium quality.

Table 2 shows the percentage of settlements quality classes. Based on calculations, good quality settlements is dominating the research area, while the most narrow is the poor quality settlements.
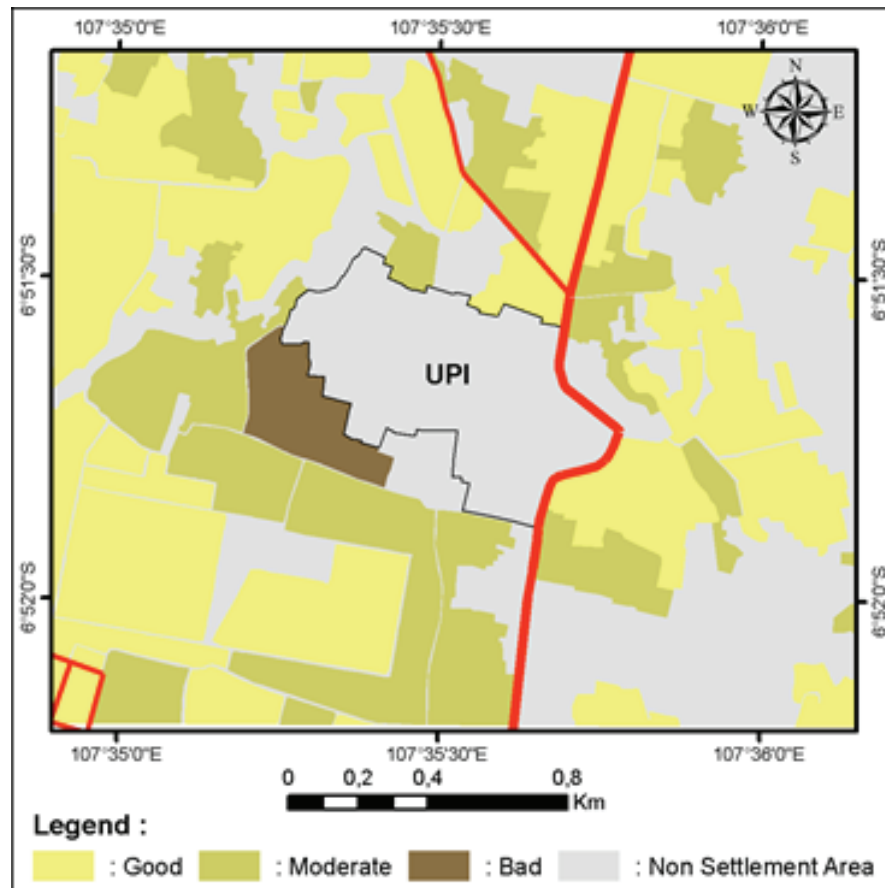
Figure 6: settlement driveway condition around UPI.

TABLE 1: area of settlements quality classes.

Settlements Quality	Area (ha)
Good	140.03
Moderate	72.27
Poor	53.51

4.3. Observation

The sample of observation is 33 students who live near UPI. Four students live in settlement areas with good quality, eight students live in settlement areas with medium quality, and 21 students live in settlement areas with bad quality. Student achievement is measured based on grade point average (GPA). Thirty-three student samples have a grade point average with a range of values from 3.19 to 3.89 (in the scale of 0 to 4). Table 2 shows the student's GPA scores based on the quality class of the settlement.

Table 2 explains that out of 33 students, most of them lived in poor settlements (21 people). However, despite living in poor settlements, some students have a high GPA with a range of 3.66 to 3.89.
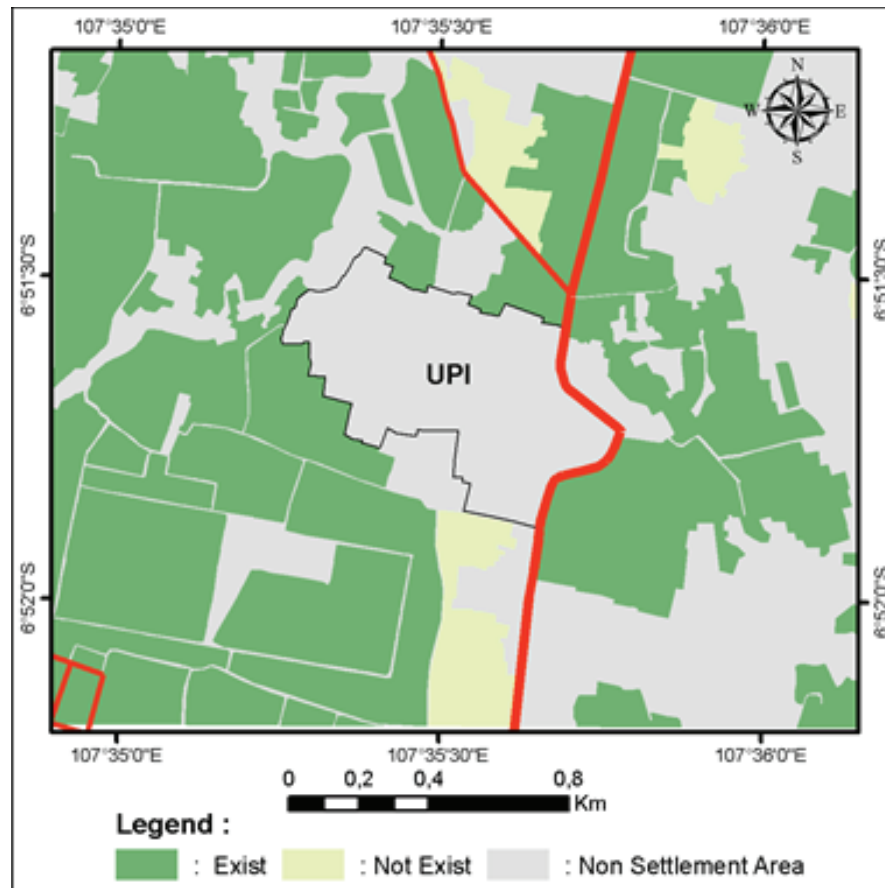
Figure 7: the existence of a tree (vegetations).

TABLE 2: settlement quality classes and students grade point average.

Settlements Quality	The Number of Students Based on Grade Point Average		
	3,19-3,42	**3,43-3,65**	**3,66-3,89**
Good	3	0	1
Moderate	3	4	1
Poor	5	9	7

5. Conclusion

Mapping results show the quality of settlements around UPI that vary from good, medium, and bad. While the observation results show students GPA with similar values across settlements and with a range of values of 3.19 to 3.89. Based on the results of mapping and observation around UPI, it was concluded that the good quality settlements might not be the main factors determining student GPA. This is evidenced by the highest GPA value owned by students living in moderate quality settlements.

There are several factors, such as the small number of samples, so it did not show GPA value range, the number of disproportionate samples between the quality classes
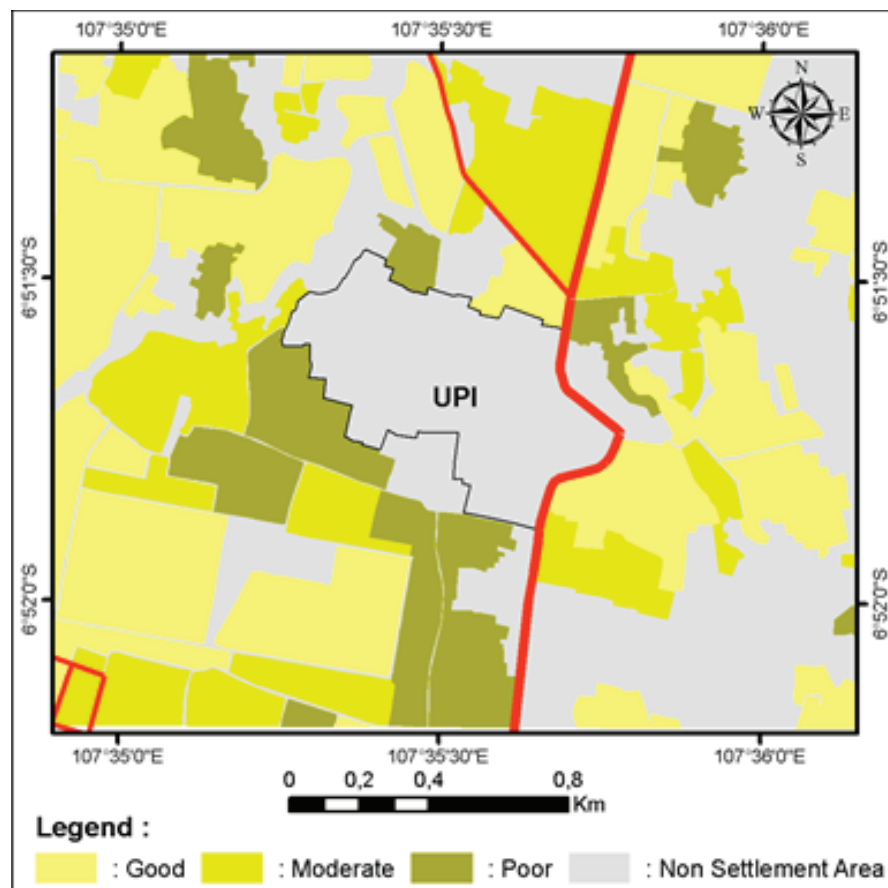
Figure 8: settlement density around UPI.

of settlements. Also, it is possible that the GPA of UPI students is not only influenced by the quality of the settlement, but by other supporting facilities (restaurant, laundry, groceries shop) not examined in this study.

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