Determining Sustanaibility Of Urban Settlement In The Center Of City Yogyakarta Indonesia

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Abstract.
Urban settlements where urban areas in Indonesia are known as urban villages are one of the distinctive characters of cities in Indonesia, especially in Java. Many urban villages are threatened with sustainability due to the impact of urban development. This research is one of the research models that examines the sustainability of urban villages in Yogyakarta, call it 'kampung kota'. Measurement of sustainability is carried out both from qualitative aspects, namely socio-economic observations, as well as quantitative aspects by measuring the value of Floor Area Ratio (FAR), Energy Consumption Intensity, and Mobility which consists of walkability and bikeability. The conclusion is that urban village life in Yogyakarta currently still has a good level of sustainability, for example in the FAR aspect which is still safe, and the level of mobility is walkable and bikeable. However, the life of the urban village faces a threat of sustainability with the intensity of energy consumption being quite wasteful and several socio-economic aspects such as environmental conditions, government support, economic stability, and community initiatives. To be able to maintain the sustainability of a number of development efforts are needed to maintain the urban village so that it can remain sustainable.

Keywords: *Urban settlement, urban village, sustainability, city, and development*

I. INTRODUCTION

The definition of urban village has several definitions seen from various disciplines [1]. Urban village is a form of settlement in urban areas in Indonesia with characteristics of residents who still carry the nature and behavior of rural life, physical conditions of buildings and the environment tend to be unfavorable and irregular, building density is high, population density is also high, and land use patterns are mixed [3-6].Urban village is also defined as a form of settlement in urban areas that is characteristic of cities in Indonesia, namely residents who still carry the nature and behavior of rural life can be intertwined in close family ties, the physical condition of buildings and the environment is not good and irregular, density buildings and high population, as well as basic service facilities are lacking (such as clean water, waste water and rainwater, garbage disposal and others) [7]. The character of the urban village is formed from the existence of strategic locations within the city area and becomes the character of urban development inherent in cities in Indonesia. The character of the urban village in general has local wisdom that raises the potential of the local community in the planning process, identity, and locality [2]. The image of urban villages in Indonesia forms distinctive ethnicities, values and symbols in informal settlements that function as complex spaces (living space, economic space, social and cultural space, learning space adapting to city life).There are quite a number of studies that discuss this urban village phenomenon in urban settlement form issues, both using a quantitative approach with measurement techniques on various physical aspects such as Floor Area Ratio (FAR), Mobility, Embodied Energy or Thermal Comfort, as well as qualitative research that focuses on socio-economic and cultural aspects of society [1, 8-10].

The objectives achieved generally discuss sustainability and resilience. In this study, qualitative and quantitative aspects will be studied with the support of the Urban Modeling Interface (UMI) software which has been developed since 2012 by the Massachusetts Institute of Technology (MIT) [11] which will be used to complement the results of field data testing and survey results of community perceptions of sustainable settlement conditions.In social economic aspect, an interesting study, which was conducted in a number of urban villages in Surabaya, said that urban villages in Surabaya managed to maintain their condition so that they did not become slum areas due to local socio-cultural factors (the spirit of mutual cooperation, mutual care between residents) [9]. Through this research Shirleyana, et al. [9] also found a number of factors that

became elements of the resilience of the urban village community, i.e : 1) adaptation 2) social ties 3) place attachment 4) place identity 5) environmental protection 6) Government support 7) economic stability 8) security; and 9) community initiatives.By using a number of resilience indicators, this study will attempt to examine how the resilience of urban village residents in Yogyakarta, especially in one of the Malioboro Street sections, is between Suryatmajan Village, Sosrokusuman Village, Pajeksan Village, and Jogonegaran Village. Administratively, the research area is in Sosrokusuman Village and Suryatmajan Village, which are part of the Suryatmajan Village, Danurejan District. Pajeksan Village and Jogonegaran Village are located in the Sosromenduran Village, Gedong Tengen District. These indicators are expected to give an idea of whether the condition of urban villages in Yogyakarta, especially those in the city center are still able to survive? further discussion will be discussed in this paper.

Fig 1. Village observation area in the center of City of Yogyakarta

II. METHODS

To be able to carry out this research activity, the following stages will be carried out: first, by measuring the existing condition of the urban village which will be observed using a building height measuring device (laser meter), a laptop supported by Autocad, Rhinocheros, and UMI software. Second, prepare other supporting equipment such as digital cameras, maps, and questionnaires to be distributed to residents in the observation area. The third is to perform a simulation of the input data from measurements in the field into the program so that the results of the existing conditions of the area will be obtained on aspects of FAR, Operational Energy or the amount of energy use of buildings in the area, and mobility as measured by walkability and bikeability [12, 13]. Fourth, the distribution of the questionnaire instrument to determine the socio-economic cultural variables or factors that affect the sustainability of the urban village as will be explained in the following variable operational table :

Table 1. Variabel and Indicators of Socio Economic

1.	**Adaptation**
	a. I've lived in this village for a long time
	*Please mention how long been lived ? .....years
	b. I feel at home living in this village for a reason
	*Please mention your special reason ? ……
	c. This neighborhood makes me feel at home
2.	**Social ties**
	a. Residents trust neighbors, good and trustworthy people
	b. Feel safe by putting things around the house with minimal security
	c. There is a special closeness with fellow village neighbors
3.	**Place attachment**
	a. There's an emotional attachment to the location I'm currently in
	b. There is a special message for the family that requires me to stay here
	c. Psychologically, I feel relaxed, comfortable and at home by living in this village
4.	**Place identity**
	a. This place has a specialty that makes me proud
	b. Because living in this village I feel I have a sense of belonging
	c. This place is popular easy to be recognized
5.	**Enviroment protection**
	a. This village has a temporary garbage shelter
	b. People are quite aware of the need for 3Rs in order to reduce environmental waste

	c. This village has enough clean water
	d. This village has a communal waste management area
	e. This village already has proper communal toilets
6.	**Government support**
	a. The community supports development programs provided by the government
	b. The government routinely has programs related to urban settlements
	c. The government is involved in improving the welfare of the urban village community
7.	**Economic stability**
	a. Residents have sufficient economic adequacy according to their needs
	b. Residents have the economic resources to meet their needs
	c. Citizens need an increase in economic resources
8.	**Safety**
	a. This village is relatively safe, there are no residents who commit crimes
	b. There has never been a crime incident in this village
	c. Residents Together maintain the security in the environment
9.	**Community initiative**
	a. Residents have green programs individually or communally
	b. The village has a good environmental protection programs
	c. The village has programs that aim to continue to strengthen togetherness among residents as a commitment to maintaining environmental sustainability
	*Please mention kind of program that you were mind ?

The method that will be used in qualitative analysis is descriptive statistical method. This method is used because it is able to analyze a number of data related to perceptions that can be quantified so as to be able to provide an overview of research results [14]. The samples taken were residents of urban village settlements in the previously mentioned research area, i.e city villages of Suryatmajan, Pajeksan, Sosrokusuman, and Jogonegaran. The number of samples is 40 families in each village, this pattern uses a quota sampling technique. The sampled families are families who have lived in the village for more than 10 years.

III. RESULT AND DISCUSSION

Location Spatial Description

Suryatmajan and Sosromenduran villages have a distribution of building and non-building land uses. The buildings that spread in this area consist of residential buildings, trading buildings or retail stores, hotel buildings and public facilities such as offices, schools, and places of worship. Meanwhile, non-building land consists of green open spaces or fields and non-green open spaces such as roads and ex-building land.The Suryatmajan and Sosromenduran areas are separated by Jl. Malioboro which is included in the Malioboro area. The area that is the location of this research has an area of ± 9,78 Hectares devided into two districts. Suryatmajan districts has an area of ± 4,62 Hectares which consists of Sosrokusuman city villages with an area ± 0,70 Hectares dan Suryatmajan city villages has an area ± 3,92 Hectares. In the west area there os Sosromenduran district with an area ± 5,24 Hectares and consists of Pajeksan city villages with an area ± 2,45 Hectares dan Jogonegaran city village with an area ± 2,66 Hectares.

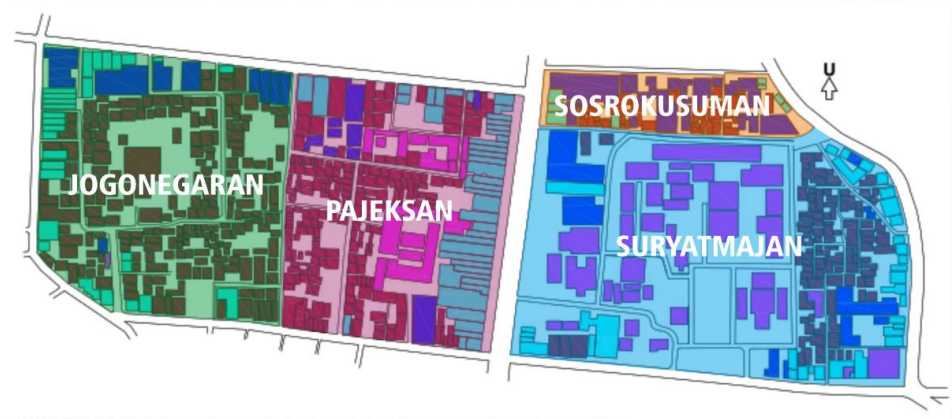

Fig 2. Land Use in The Research Area

Fig 3. Distribution of Buildings Block

Table 2. Land Use and The Size of The Area

Land Use		Size (m^2)	Percentage (%)
Residential		28.004	28,71
Trade and services	Hotel	30.120	30,88
	Retail	19.186	19,67
Public facilities		17.719	18,17
Open space		2.504	2,57
Total size of the area		**97.533**	**100,00 %**

The four villages spread over the two urban villages consist of 790 buildings which are divided into 4 (four) building functions. The functions of residential buildings are 577 buildings, hotel buildings are 43 buildings, retail buildings are 112 buildings, and public public buildings (offices, schools, and places of worship) are 58 buildings.

Fig 4. Map of buildings function

In detail, the functions of the buildings in each village are as follows:

Table 3. Number of Buildings

Type of Buildings	City Villages				Total	
	Sosrokusuman	Suryatmajan	Pajeksan	Jogonegaran	Amount	(%)
Residential	35	105	202	235	577	73.04
Hotel	15	10	9	9	43	5.44
Retail	8	33	43	28	112	14.18
Public Fac.		40	17	1	58	7.34
Total number of buildings	**58**	**188**	**271**	**273**	**790**	**100.00**

The buildings that dominate in Suryatmajan and Sosromenduran are residential buildings, with a percentage of 73%. These buildings are located in each of the studied villages with details of 35 buildings in Sosrokusuman Village, 105 buildings in Suryatmajan Village, 202 buildings in Pajeksan Village, 235 buildings in Jogonegaran Village.

Fig 5. Bangunan Residensial di kampung Sosrokusuman

Fig 6. Bangunan Residensial di kampung Suryatmajan

Fig 7. Bangunan Residensial di kampung Pajeksan

Fig 8. Bangunan Residensial di kampung Jogonegaran

Floor Area Ratio

FAR is the ratio of the total floor area of the building (gross floor area ratio) to the total area. The results of the FAR simulation using UMI in Kampung Kota in the Suryatmajan and Sosromenduran areas in the existing conditions have a value of 0.97.Referring to research that has been done previously in Chicago (0,5-1,0)[15], in British Colombia (0,75-3,0)[16], in Cina (1,5-2,5)[17], in Sleman Indonesia (0,47) [11] and Yogyakarta City Regulation Number 2 Year 2021 about Yogyakarta City Spatial Planning year 2021 – 2041 with maximum FAR 4,2. So the FAR value in this research area is low and indicates that the villages in the Suryatmajan and Sosromenduran areas are in a decent and sustainable condition.

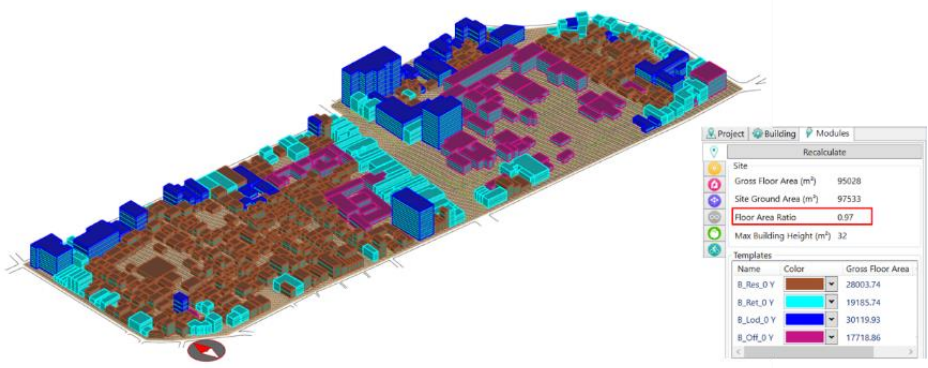

Fig 9. The Simulation Result of FAR (Floor Area Ratio) using UMI

Operational of Energi

Operational energy is meant here is the amount of energy consumption per building in an area that can determine whether the area can be sustainable or not. Energy consumption limits refer to the regulations in force in the area. For residential buildings in the Suryatmajan and Sosromenduran areas, the limit issued (Energy Consumption Intensity / ECI) is 95 to 185 kWh/m²/yr with a reference standard value of 145 kWh/m²/yr. The maximum ECI limit for residential buildings is 185 kWh/m²/yr. Meanwhile, the results of the simulation of energy operations in Sosrokusuman Village are 64.15 kWh/m²/yr or below the standard reference limit. In other villages in the vicinity, namely Kampung Suryatmajan, Pajeksan, and Jogonegaran, the value of energy consumption is higher than the reference value limit, each of which has a value of 264.08 kWh/m²/year, 480.63 kWh/m²/year, and 483.38 kWh/m²/yr. Thus, it can be said that this area has a low level of sustainability, so it is necessary to reduce the value of energy operations efficiently to produce minimum environmental damage.

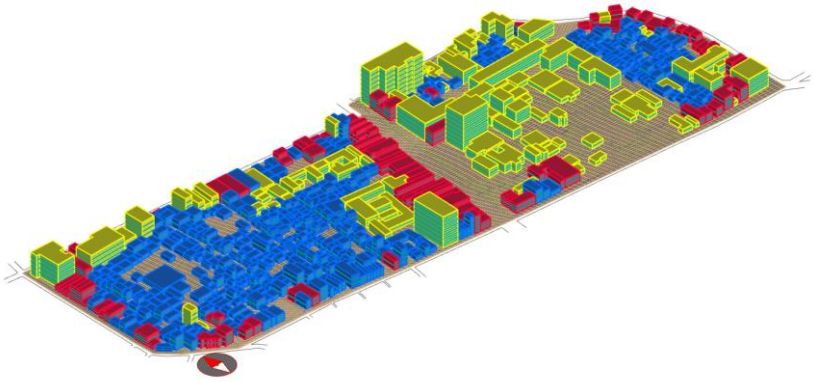

Fig 10. Visualisation of Operational of Energi using UMI

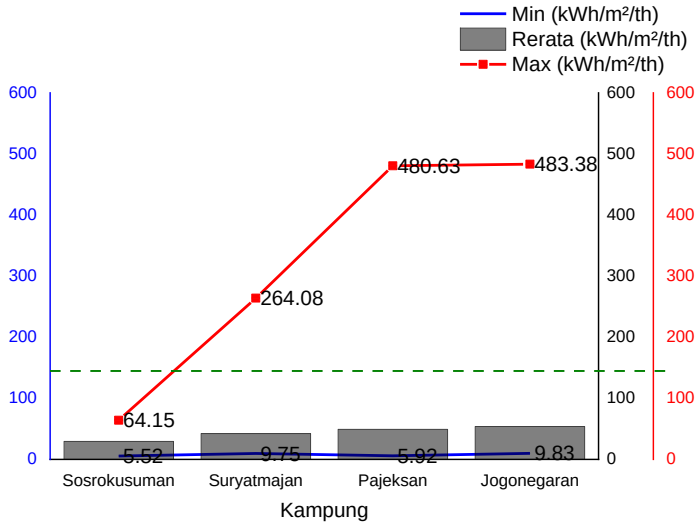

Fig 11. The Graph Result of Energy Operational Simulation

Mobility

Simulation of mobility aspects with UMI software consists of walkability and bikeability. Walkability is the result of area analysis in supporting people's mobility to walk, while bikeability is the result of area analysis that plays a role in people's mobility for cycling. The simulation results on the existing conditions in the Suryatmajan and Sosromenduran areas have a walkability level with a value of 67/100 and a bikeability value of 68/100. Reviewing the results of walkscore [18], The walkability value of 67 is in the range of 50 – 69 which means some walkable (some activities can be completed on walking). While the value of bikeability of 68 is in the range of values of 50 - 69, which is bikeable, meaning that there is a special infrastructure for cycling.

The results of the mobility value at UMI are obtained from the block length, the number of intersections, and the variety of amenities in retail buildings. The length of the length of the road from home

to buildings such as grocery, restaurant, coffee, books, schools, shopping, entertainment, and banks has a distance of 300 m to d. 600 meters. Although the mobility results in the Suryatmajan and Sosromenduran areas are considered comfortable, sustainability in this area should still be improved in order to achieve maximum throughput by increasing the walfare through mobility.

Fig 12. The Result Mobility Simulation

Table 4. The measurement the Village in The Center of City Yogyakarta

UMI		Result	Reference	Analysis	Level of Sustainability
FAR		0,97	0,5 – 1,5	The FAR value within the reference value range	√ (High)
Operational of Energy (kWh/m²/th)		5,51 – 483,38	95 - 185	The OE value over the reference value range	X (Low)
Mobility	Walkability	67	0 - 100	The value of Mobility within the reference value range	√ (High)
	Bikeability	68	0 - 100		√ (High)

Socio Economic

There are several socio-economic aspects that will support how to determine a sustainable residential area or not. There is a scale assumption used to analyze these factors, i.e. 1 = very unsustainable, 2 = not sustainable, 3 = neutral, 4 = sustain, 5 = well sustain. There are 9 variables used based on the results of perceptual observations, the results are as follows:

1) Adaptation : in this aspect most people feel quite well adapted to their environment. Based on the survey results the average score is 3.44 (Neutral)
2) Social ties : in this term most people feel they have good social ties. Based on the survey results the average score is 3.54 (Neutral to Sustainable)
3) Place attachment : in this term most of people have good impression. Based on the survey results the average scores is 3.30 (Neutral)
4) Place identity : in this aspect most of people have a good perception and feeling comfort with the space. The average score is 3.37 (Neutral to Sustainable)
5) Environment protection : unfortunately most of people hava a bad perception with the average score is 2.55 (Not Sustainable to Neutral)
6) Government support : same with above, in this term most of people alos have bad perception with average score is 2.58 (Not Sustainable to Neutral).
7) Economic stability : in this aspect most of people have a bad perception too with average of the score is 2.83 (Not Sustainable to Neutral).
8) Safety : according to perception of community most of perception is good with the average of score is 3.58 (Neutral to Sustainable)
9) Community initiative : most of community have a bad perception with a average score is 2.67 (Not Sustainable to Neutral).

A number of explanations on those socio-economic aspect can be seen in the following figures :

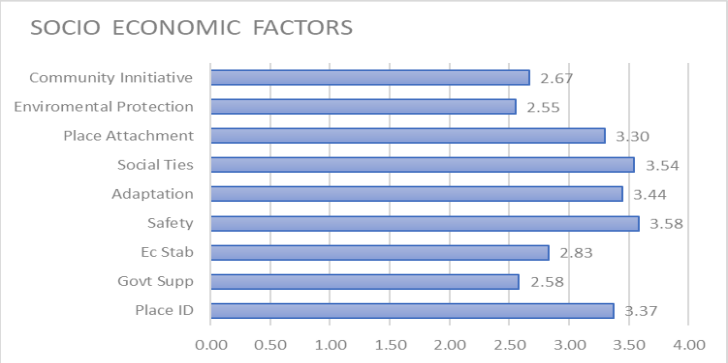

Fig 13. Rate of Cumulative Perception from Community Related to Socio Economic Indicators

IV. CONCLUSION

Urban settlements or urban villages in Yogyakarta, which are located in the city center, especially in the Malioboro area, can now be said to be relatively sustainable. It is based on a number of measurements both quantitatively and qualitatively. The sustainability criteria in this case in terms of the FAR (Floor Area Ratio) value are in a safe condition with a value of 0.97 while the reference value is 0.5 – 1.5. The definition of safe has also been compared with various previous similar studies. In the aspect of operational energy intensity (OE) of the village group observed in the research area consisting of four villages, two villages resulted in OE calculations which were below the reference values of 64.15 kWh/m²/yr and 145 kWh/m²/yr while Therefore, the reference value is 95 to 185 kWh/m²/yr. The other three villages produced energy consumption intensity calculations above the reference values of 264.08 kWh/m²/year, 480.63 kWh/m²/year, and 483.38 kWh/m²/year. Based on the measurement results, urban villages in Yogyakarta related to the intensity of energy consumption are threatened with being unsustainable. Energy operations must be derived by various relevant approaches.Another aspect of sustainability that can be assessed is mobility as measured by walkability and bikeability.

The walkability value of urban villages is 67/100 with a reference value of 50-69 or interpreted as 'some walkable', meaning that the ratio of space and buildings for pedestrians is still reasonable. Meanwhile, the bikeability value is 68/100 or is interpreted as 'bikeable', meaning that there is infrastructure for cycling activities. The conclusion is that mobility in the region is quite sustainable, of course, mobility can still be optimized with a number of development interventions. Based on the socio-economic point of view, based on the results of measurements carried out using questionnaires distributed to residents, the indicators of adaptation, social ties, ties to living space, place identity, and security are sustainable with a perceptual average value between 3 - 4 (neutral to sustainable).). On the environmental aspect, government support, economic stability, and community initiatives have an average value of less than 3 or tend to be unsustainable.In general, it can be seen that the trend of urban village life in Yogyakarta is currently still good and sustainable, but in some factors it is threatened to be unsustainable, for example in the aspect of energy consumption which tends to be excessive. Therefore, some improvements are needed to maintain the sustainability of the urban village as one of the characteristics of the city.

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