**Shaping Factors of Semarang Suburban Characteristics**

(The Sustainability of Urban Growth in Suburban Area: Semarang City Case Study)

\*1Bambang Setioko

\*2 Deasy Olivia

*\*1 Lecturer of the Department of Architecture, Faculty of Engineering, Diponegoro University, Indonesia*

\*2 *Student of the Graduate School, Department of Architecture, Faculty of Engineering, Diponegoro University, Indonesia*

[keliek2000@yahoo.com](mailto:keliek2000@yahoo.com)

[deasyolivia24@gmail.com](mailto:deasyolivia24@gmail.com)

**Abstract**

Cities always grow and develop through sustainable urbanisation. In the beginning, this process takes place in the core of the city, but recently it is even more prominent in suburbs especially in big cities. The decline of centrality in city core and the increasing role of suburbs happen almost in all big cities around the world.

The growth of suburbs, in general, is identified as urban sprawl development. By environmentalists, urban-sprawl is stated as one of the natural environment degradation causes and the declining quality of social life. By economists, the development of urban-sprawl in suburbs is criticized as a waste for its inefficient ways in making use of city infrastructures. Semarang suburban growth in Meteseh Village which is identified to be increasingly spreading shapes a suburban characteristic.

This research aims to look for the shaping factors of suburban characteristics in Semarang through rationalistic positivistic paradigm and quantitative approach. The method of data processing is done through statistics test using SPSS 19. Deeper understanding of urban sprawl theory and visual area characteristics theory are used as grand theory, resulted in 13 shaping factors of suburban characteristics in Semarang. Based on the results of this research, it can be concluded that in visual area characteristics there is no significant differences between planned, unplanned, and autonomous settlement, because of the similarity in the population activity patterns. It is expected that this result can be used as recommendation in the suburbs planning and designing so that suburbs can still have specific characteristics and there will not be a gap caused by the rapid growth of new settlements.

***Key words: suburb, urban sprawl, settlement characteristic, visual characteristic.***

1. **Background**

Kota Cities always grow and develop through sustainable urbanisations. In the beginning, this process takes place in the city core, but in recent decades it is even more prominent in suburban area especially in big cities. The problem caused by city growth is the shifting tendency of city functions to urban fringe which is commonly known as cities physical appearance spreading process to the outside (*urban sprawl indication phenomenon*) (Astuti,et al, 2012).

There are many definitions of urban sprawl but the most common one is physical growth which takes place in suburban area in the form of unplanned scattered groups of settlements which have low building density without basic city facilities. Aside from that, it is necessary to be understood that there are four essential urban sprawl shaping elements, they are: [1] the order of land tenure and land use; [2] telecomunication technology; [4] standard and regulation (Gilham in Setioko, 2010).

(Setioko, 2010) Urban sprawl in Indonesia consist of: [1] planned settlement; usually it is built by developer; [2] unplanned settlement; usually in the form of native village settlement; and [3] autonomous settlement; which is built autonomously by the society, its location is right up next to planned settlement which already has full infrastructures.

The spreading existence of urban sprawl in all city areas, if observed from city area physical characteristics, this settlement spread tend to give negative impact. The occuring impact is damaging land quality and land use order which is not in accordance with the land regualtion. Besides, from visual area characteristic side, urban sprawl spreads which has become uncontrolled make visual area character unorganized. But, if seen from space setting side, the existence of urban sprawl spreads makes a new settlement characteristic which is shaped following land use pattern coming from society’s activities in suburbs.

The points stated above are triggers to the emergence of ideas to know deeper and find characteristics shaping factors as a result of urban sprawl growthin suburban area.

1. **Research Location**

The location which has become the object of this research is Bukit Kencana Jaya, Meteseh Village, Tembalang Sub-district, South Semarang. According to the neighbourhood and hamlet of Semarang 2014 this area is included in BWK VI area and settlement zone.

Bukit Kencana Jaya Residence was built in 1988, firstly inhabited in 1990. The residential area managed by developer is more than 300 ha, but only small part of it has been developed while the rest is still in advanced development. Settlement characteristics in Bukit Kencana consist of planned settlement, unplanned settlement and autonomous settlement. However, the interesting part of this region is that the difference in the settlement characteristics does not create social gap between city society and village society. However, these diverse settlement characters have brought this area to life through its community activities so that in terms of visual area, this shows unique settlement characteristics.

1. **Research Method**

This research is conducted through positivistic research paradigm with quantitative approach. Besides, data processing method is done through statistics text using factor analysis. The stages of this research are as follows:

1. **Research Population and Respondent (Sampling)**

The number of respondents is determined based on the theory of Bungin (2009),

Descriptions:

n : number of sample

N : number of population

d : precision value (for example 90% or d=0,1)

1. **Factor Analysis Method**
2. **Validity and Reliability Test**

The process of validity and reliability test uses *pearson* method to determine valid variable which can be seen from variable that has signification value <0.05. Besides, *pearson* correlation value for valid data of > 0.3 (Sugiono, 2010) should be noted too, among others:

After knowing the validity, then reliability level is examined through Corrected item-Total Correlation with SPSS software (Budi, 2006).

In Budi (2006), reliability test using Cronbach’s alpha value is measured based on scale Alpha 0 to 1. If the scale is classified into 5 classes with the same range, then the alpha constancy level can be interpreted as follows:

**Table 3.** Reliability Criteria

|  |  |
| --- | --- |
| Cronbach’s Alpha | Reliability Level |
| 0,00 - 0,20 | Less reliable |
| >0,20 - 0,40 | Rather reliable |
| **>0,40 - 0,60** | **Quite reliable** |
| **>00,60 - 0,80** | **Reliable** |
| >0,80 - 1,00 | Very reliable |

From Cronbach’s Alpha table of variable X and Y above, it can be seen that Cronbach’s Alpha on variable X is 0.775 and Cronbach’s Alpha on veriable Y is 0.469, therefore variable X falls under 0.60 until 0.80 category with reliable predicate. Whereas, variable Y falls under 0.40 to 0.60 category with a quite reliable predicate.

1. **Mean Factor Analysis**
   1. **Mean Factor Variable Analysis of Visual Area Characteristic (Variable X)**

The following tabulation is of mean factor instrument of visual area characteristic in the research location.

The lowest mean factor in visual area characteristic variable is in the road shape factor as visual area framer with the value of 2.02. This is the value that lies at the range of 1.5 – 2.5 with low interpretation. It can be interpreted that visual characteristic in this area is not really influenced by road shape of the residence.

* 1. **Mean Factor Analysis of Urban Sprawl Variable (Variable Y)**

The lowest mean factor in public space variable lies in suburb factor with the value of 3.16. This is a value that lies at the range of 2.5 – 3.5 with average/enough/ordinary/neutral interpretations. This can be interpreted that transportation intensity is quite affecting on the shaping of visual characteristic in the area.

**2.3 Mean Factor Variable Correlation Analysis of Visual Area and Suburb Characteristic**

In the table above, it is known that the average mean factor of variable Y is 2.92. This average mean is taken from median calculation of factors in the area visual characteristic variable. Seeing that mean variable value of visual area characteristic is 2.92 and if it is converted into semantic differential element, or opposing adjectives in the scale of 1, 2, 3, 4, 5, who stated agreement and disagreement, then 2.92 is categorized between 2.5 – 3.5, lying in the neutral/ordinary range.

Further, when we see suburb variable, the average value of the mean factor is of 3.16. This number falls under neutral/ordinary category. And the gap value between visual area characteristic variables is of 0.24 so respondent response to visual area characteristic variable is less than 0.24 point towards suburb variable.

1. **Factor Analysis**

In the factor analysis, not all variables are involved in the analysis process. Only valid variable which will be included in it, among others:

To determine whether the collection of factors is worth to be analyzed, the initial step is performing KMO and Bartlett Tests, if the KMO value > 0.5 then it is worth for the factors to be analyzed.

. In the following table, it can be seen that some of the factors have MSA value of < 0.5. For variable X that are X1.3 (0.399a), X6.2 (0.450a), X6.3 (0.402a), X7.2 (0.433a), X9.4 (0.392a), X12.4 (0.428a), X12.5 (0.484a). By taking a look at the factors that have MSA value of < 0.5, one factor with the smallest value is chosen to be eliminated, it is factor X9.4 with MSA value of 0.392 which becomes the first one to be eliminated.

Meanwhile, for variable Y that are Y1.1 (0.475a) and Y1.3 (0.315a), upon looking at factors that have MSA value of < 0.5, one factor with the smallest value is chosen to be eliminated, it is factor Y1.3 with MSA value of 0.315a which becomes the first one to be eliminated.

**Table 9.** Variable Elimination before factor X analysis

|  |  |  |
| --- | --- | --- |
| **Steps** | **Eliminated Variable**  **(MSA value)** | **KMO-MSA Value** |
| 1 | All variables included | 0.637 (meets requirement) |
| 2 | X9.4 (0.392) | 0.670 (meets requirement) |
| 3 | X1.3 (0.399) | 0.691 (meets requirement) |
| 4 | X6.3 ( 0.402) | 0.700 (meets requirement) |
| 5 | X12.4 ( 0.428) | 0.714 (meets requirement) |
| 6 | X7.2 ( 0.433) | 0.719 (meets requirement) |
| 7 | X6.2 ( 0.450) | 0.726 (meets requirement) |

After performing variable analysis, all variables needs to have MSA value 0f 0.5 by the end of the analysis. The final output of KMO value and Bartlett’s Test is as follows.

After observing correlation and KMO values of the variables, then there will be some factor components that are formed and correlating variables, as follows.

Looking at the table above, there are 40 components of factor X, but among those factor components that have significant influence are components with eigenvalue of > 1, so that components with eigenvalue of > 1 are selected. Therefore, there will only be 11 factor X that meet the eigenvalue > 1 criteria, that are:

**Variable X**

1. Factor 1

Eigenvalues: meets the criteria of 10,617

Has influence factor of 26,544 %

1. Factor 2

Eigenvalues: meets the criteria of 4,810

Has influence factor of 12,025 %

1. Factor 3

Eigenvalues: meets the criteria of 2,291

Has influence factor of 5,728 %

1. Factor 4

Eigenvalues: meets the criteria of 2,035

Has influence factor of 5,087 %

1. Factor 5

Eigenvalues: meets the criteria of 1,671

Has influence factor of 4,177%

1. Factor 6

Eigenvalues: meets the criteria of 1,549

Has influence factor of 3,873%

1. Factor 7

Eigenvalues: meets the criteria of 1,461

Has influence factor of 3,652 %

1. Factor 8

Eigenvalues: meets the criteria of 1,364

Has influence factor of 3,411%

1. Factor 9

Eigenvalues: meets the criteria of 1,310

Has influence factor of 3,275 %

1. Factor 10

Eigenvalues: meets the criteria of 1,236

Has influence factor of 3,091%

1. Factor 11

Eigenvalues: meets the criteria of 1,172

Has influence factor of 2,929 %

**Variable Y**

1. Factor 1

Eigenvalues: meets the criteria 2,060

Has influence factor of 34,339 %

1. Factor 2

Eigenvalues: meets the criteria of 1,744

Has influence factor of 29,071 %

To understand the *eigenvalue* from the total factor components can be seen in the diagram below. But, with an interpretation that the suitable factor to be suburb characteristic shaping factors are only those with an *eigenvalue* of > 1.

**4. Factor Analysis Result**

Variable that has loading factor value of > 0.5 on one of its factor component column, it can be concluded that said variable is the one included in the factor component. However, if loading factor of > 0.5 is not found, then the highest one will be chosen.

**FACTOR X**

1. **Factor 1**

Area border (X2.4) with loading factor of 0,682

Building demarcation line (X2.7) with loading factor of 0,615

Tree height (X7.1) with loading factor of 0,531

Activity intensity (X9.1) with loading factor of 0,690

Activity volume (X9.2) with loading factor of 0,746

Monument building mass (X10.3) with loading factor of 0,646

1. **Factor 2**

Building coverage ratio (X2.5) with loading factor of 0,706

1. **Factor 3**

Building height (X1.1) with loading factor of 0,568

Building skyline (X1.2) with loading factor of 0,628

Meaning of environment (X12.2) with loading factor of 0,690

1. **Factor 4**

Shape of tree canopy (X7.3) with loading factor of 0,519

Building texture (X8.3) with loading factor of 0,522

Building material (X8.4) with loading factor of 0,791

Building style (X8.5) with loading factor of 0,770

1. **Factor 5**

Road pattern (X2.1) with loading factor of 0,567

Road shape (X5.1) with loading factor of 0,672

1. **Factor 6**

Building mass form (X8.1) with loading factor of 0,712

Front appearance of building (X8.6) with loading factor of 0,771

Highlighted land plot of the residence blocks (X10.1) with loading factor of 0,711

1. **Factor 7**

Building scale (X2.3) with loading factor of 0,569

Open space inside or surrounding the building mass (X11.2) with loading factor of 0,761

1. **Factor 8**

Open space system in linear and linear-curve (X11.4) with loading factor of 0,701

Public parking area (X11.5) with loading factor of 0,768

1. **Factor 9**

Proportion scale (X4.2) with loading factor of 0,806

1. **Factor 10**

Main network of road and field (X11.3) with loading factor of 0,759

Physical aspect in a place (X12.5) with loading factor of 0,742

1. **Factor 11**

Tree (X3.1) with loading factor of 0,673

**FACTOR Y**

1. **Factor 1**

Order of Tenure (Y1.2) with loading factor of 0,657

Waiting time of public transportation with loading factor of 0,799

Communication Technology (Y1.6) with loading factor of 0,561

1. **Factor 2**

Order of land use (Y1.1) with loading factor of 0,880

Transportation intensity (Y1.4) with loading factor of 0,401

Standard and regulation (Y1.7) with loading factor of 0,851

From the factors calculation with rotation method, it can be summarized into 11 factors as stated in the table below:

|  |  |
| --- | --- |
| **Factor** | **Variable** |
| 1 | Area border, building demarcation line, tree height, activity intensity, activity volume, monument building mass |
| 2 | Building coverage ratio |
| 3 | Building height, building skyline, meaning of environment |
| 4 | Shape of tree canopy, building texture, building material, building style |
| 5 | Road pattern, road shape |
| 6 | Building mass form, front appearance of building, highlighted land plot of the residence block |
| 7 | Building scale, open space inside or surrounding the building mass |
| 8 | Open space system in linear or linear-curve shape, public parking area |
| 9 | Proportion scale |
| 10 | Main network of road and field, physical aspect in a place |
| 11 | Tree |

**Table 19.**  Shaped Factors from Variable Y

|  |  |
| --- | --- |
| **Factor** | **Variable** |
| 1 | Order of tenure, Waiting time of public transportation, Communication Technology |
| 2 | Order of land use, Transportation Intensity, Standard and regulation |

**5.** **Factor Analysis Result Conclusion**

After performing factor analysis, it can be concluded that in the settlement area at Bukit Kencana Jaya, Meteseh Village, there are 11 visual area character variable factors and 2 urban sprawl variable factors, moreover those are Semarang suburbs characteristic shaping factors which consist of some variables for each factor, they are:

**Table 20.** Conclusion of Variable X Factor Analysis

|  |  |  |
| --- | --- | --- |
| Shaping Factor of Suburb Characteristic | Variable | Influence Percentage (%) |
| Factor 1 | (X2.4) Area Border  (X2.7) Demarcation Line of Building  (X7.1) Height of Tree  ( X9.1) Activity Intensity  (X9.2) Activity Volume  (X10.3) Mass of Monument Building | 26,544 % |
| Factor 2 | (X2.5) Building Coverage Ratio | 12,025 % |
| Factor 3 | (X1.1) Building Height  ( X1.2) Building Skyline  ( X12.2) Meaning of Environment | 5,728 % |
| Factor 4 | (X7.3) Shape of Tree Canopy  (X8.3) Building Texture  (X8.4) Building Material  (X8.5) Building Style | 5,087 % |
| Factor 5 | (X2.1) Road Pattern  (X5.1) Road Shape | 4,177% |
| Factor 6 | (X8.1) Building Mass Form  (X8.6) Front Appearance of Building  (X10.1) Highlighted Land Plot of the Residence Block | 3,873% |
| Factor 7 | (X2.3) Building Scale  (X11.2) Open space inside or surrounding the building mass | 3,652 % |
| Factor 8 | ( X11.4) Open space system in linear or linear-curve shape  ( X11.5) Public Parking Area | 3,411% |
| Factor 9 | ( X4.2) Proportion Scale | 3,275 % |
| Factor 10 | (X11.3) Main network of road and field  ( X12.5) Physical aspect in a place | 3,091% |
| Factor 11 | ( X3.1) Tree | 2,929 % |

These 11 factors of visual area characteristic variable above are significant as suburb characteristic shaping factors by 73.792%. Meanwhile, the other 26.208% is influenced by other factors outside of this research.

**Table 21.** Conclusion of Variable Y Factor Analysis

|  |  |  |
| --- | --- | --- |
| Shaping Factor of Suburb Characteristic | Variable | Influence Percentage (%) |
| Factor 1 | (Y1.2) Order of Tenure  (Y1.5) Waiting time of public transportation  (Y1.6) Communication Technology | 34,339 % |
| Factor 2 | (Y1.1) Order of land use  (Y1.4) Transportation Intensity  (Y1.7) Standard and regulation | 29,071 % |

Both factors of visual area characteristic variables are significant as a shaping factor of suburban settlement by 63.41%. The other 36.59% is influenced by other factors outside of this research model.