Shaping Factors of Urban Fringe Characteristics, With Case Study Semarang City, Indonesia

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ABSTRACT

Cities always grow and develop through sustainable urbanisation. In the beginning, this process takes place in city core, but recently it is more prominent in urban fringe especially in big cities. Urban fringe Semarang growth in Meteseh village which is identified to be increasingly spreading shapes an urban fringe characteristic. This research aims to look for the shaping factors of urban fringe characteristics in Semarang through rationalistic positivistic paradigm and quantitative approach. The method of data processing is done through statistical test using SPSS 19. Deeper understanding of urban fringe theory and visual area characteristics theory are used as grand theory, resulted in 13 shaping factors of urban fringe 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 similarity in the society’s activity patterns. It is expected that this result can be used as recommendation in the urban fringe planning and designing so that urban fringe can still have specific characteristics and there will not be a sharp disparity caused by the rapid growth of new settlements.

INTRODUCTION

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 urban fringe 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 urban physical appearance spreading process to the outside (urban sprawl indication phenomenon). Based on an observation on the physical characteristics of a city, the spread of urban sprawl in all areas of the city, tend to have a negative effect. The impact that occurs is the destruction of land quality and disorder to the land use planning.

Moreover, from the view point of visual characteristics, the rapid growth of urban sprawl lead to uncontrolled development and create visual character disorders. Phenomena the spread of urban sprawl make a new settlement characteristics follows the pattern of land use that is derived from a community on the fringe areas of the city.

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 urban fringe area.

2.0 Literature Review:

There are a lot of definitions of urban-sprawl, but the known one is physical development taking place in sub-urban area, spread of unplanned settlement which has low building density, without any urban basic facilities. Urban-sprawl is also known as sub-urban settlement, because they usually lie in sub-urban area. Urban-sprawl has 4 basic elements: (1) ownership and land-usage layout, (2) transportation pattern, (3) technology of communication, (4) standard and regulation [1].

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Visual value of an area is shown by the existence of physical quality formed by the relationship among the city landscape visual elements. Visual character may be seen through the visual guidance, image perception sensed by eyes. Several theories above affirmed some statements of visual character. We can conclude that visual character is physical specific characteristic which can be seen by someone’s eyes and sense while conducting observation. [2]

There are 4 matters that should be concerned in forming new area, (1) Natural Setting, (2) Settlement Pattern, (3) Vegetation, (4) Manmade Element [3]. The next matters that should be concerned in forming visual character of an area are building mass ordering and relationship among the buildings in the area. Building mass ordering will visually form a relationship between buildings which has different altitude, so it results a silhouette known as skyline. Specifically, physical element of a vision will be recorded in someone’s observation. They include: (1) paths, (2) degrees of enclosure, (3) street trees, and (4) architectural pattern. [3]

It is explained in urban integration that visual linkage of two or more urban fragments joined visually are able to unite an urban area in various scale [4]. We need to mention 2 elements in understanding place and space, (1) a collection of building and artifacts, and (2) a site for social relationship. [5].

3.0 Methodology:

This research is conducted through positivistic paradigm with quantitative approach. Besides, data processing method is done through statistical test using factor analysis.

3.1 Selecting Case Studies:

The location which has become the object of this research is Bukit Kencana Jaya, Meteseh village, Tembalang Sub-district, South Semarang. According to the neighborhood 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 urban society and rural 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. Figure 1 shows the Location Map of Meteseh Village, Tembalang Sub-district.

Fig. 1: Location Map of Meteseh Village, Tembalang Sub-district.

Fig. 2: Settlement Characteristics in Meteseh Village; (a) planned settlement, (b) unplanned settlement, (c) Autonomous settlement.

3.2 Research Population and Respondent (Sampling):

The number of respondents is 100 (level 95% confidence interval)
3.3 Factor Analysis Method:
3.3.1 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. After knowing the validity, then reliability level is examined through Corrected item-Total Correlation with SPSS software. 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:

- 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 variable Y is 0.469, therefore variable X falls under 0.60 until 0.80 categories with reliable predicate. Whereas, variable Y falls under 0.40 to 0.60 category with a quite reliable predicate.

3.4 Mean Factor Analysis:
3.4.1 Mean Factor Variable Analysis of Visual Area Characteristic (Variable X):

Table 1 shows the mean factor instrument of visual area characteristic in the research location.

<table>
<thead>
<tr>
<th>No</th>
<th>Factor</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>(X1) Floor Area Ratio</td>
<td>2,52</td>
</tr>
<tr>
<td>2.</td>
<td>(X2) Building Set Back</td>
<td>3,30</td>
</tr>
<tr>
<td>3.</td>
<td>(X3) Tree</td>
<td>2,74</td>
</tr>
<tr>
<td>4.</td>
<td>(X4) Scale and Proportion</td>
<td>2,38</td>
</tr>
<tr>
<td>5.</td>
<td>(X5) Road Pattern</td>
<td>2,02</td>
</tr>
<tr>
<td>6.</td>
<td>(X6) Parking Element</td>
<td>3,35</td>
</tr>
<tr>
<td>7.</td>
<td>(X7) Shape of tree canopy</td>
<td>3,36</td>
</tr>
<tr>
<td>8.</td>
<td>(X8) Building Style</td>
<td>3,58</td>
</tr>
<tr>
<td>9.</td>
<td>(X9) Activity Pattern</td>
<td>3,29</td>
</tr>
<tr>
<td>10.</td>
<td>(X10) highlighted land plot of the residence block</td>
<td>3,37</td>
</tr>
<tr>
<td>11.</td>
<td>(X11) Public Parking Area</td>
<td>2,72</td>
</tr>
<tr>
<td>12.</td>
<td>(X12) Enclosure (façade)</td>
<td>2,87</td>
</tr>
<tr>
<td>13.</td>
<td>(X13) Visual Linkage</td>
<td>2,52</td>
</tr>
</tbody>
</table>

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.

3.4.2 Mean Factor Variable Analysis of Urban Sprawl Characteristic (Variable Y):

The lowest mean factor in public space variable lies in urban fringe 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.

3.4.3 Mean Factor Variable Correlation Analysis of Visual Area and Urban Fringe Characteristic Factor Variable of Visual Area and Urban Fringe Characteristics:

In the table, 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 urban fringe 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 urban fringe variable.

3.5 Statistical Analysis:

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

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. Based on factor analysis, there are some factors that 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), and 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.

After performing variable analysis, all variables needs to have MSA value of 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.

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.

The interpretations about the suitable factor to be urban fringe characteristic shaping factors are only those with an eigenvalue of > 1. 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:**

**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

**Factor 2:**
- Building coverage ratio (X2.5) with loading factor of 0.706

**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

**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 0.79. Building style (X8.5) with loading factor of 0.770

**Factor 5:**
- Road pattern (X2.1) with loading factor of 0.567. Road shape (X5.1) with loading factor of 0.672

**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.

**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

**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

**Factor 9:**
- Proportion scale (X4.2) with loading factor of 0.806.

**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

**Factor 11:**
- Tree (X3.1) with loading factor of 0.673
3.6 Statistical Analysis Result:

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 urban fringe Semarang characteristic shaping factors which consist of some variables for each factor. The conclusions of influence factor from variable X are: Factor1. 26.544%, factor 2. 12.025 %, factor 3. 5.728 %, factor 4 5.087 %, factor 5. 4.177%, factor 6. 3.873%, factor 7. 3.652 %, factor 8. 3.411%, factor 9. 3.275 %, factor 10. 3.091%, factor 11. 2.929 %.

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

The conclusion of influence factor from variable Y is: factor 1: 34.339 % and factor 2. 29.071 %.

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

RESULTS AND DISCUSSION

After conducting factor analysis which results in the shaping factors of urban fringe settlement characteristic, hence, it is necessary to undertake signification of research finding. Signification on the analysis of shaping factors of urban fringe Semarang settlement characteristics found in research location will be related to visual area characteristic theory and urban sprawl theory. In the finding of shaping factors of settlement characteristics in Meteseh village, there are 11 factors of visual area characteristic variable and two factors of urban sprawl variable.

4.1 Shaping Factors from Visual Characteristics Variable:

Visually, urban sprawl supports interaction between city and village. The characteristic difference between rural and urban settlements in Semarang urban fringe is not significant. It is because the society’s activities both in rural and urban settlements tend to be similar. According to the theory analysis employed, it is apparent that the urban fringe in Meteseh village has rural urban settlement characteristics. The following is the signification of each shaping factor of settlement characteristics in Semarang urban fringe from visual area characteristic variable towards grand theory discussed in chapter 2. There are 11 shaping factors of settlement characteristics in Semarang urban sprawl from visual area characteristic variable as follow: 1. factor area border and activity pattern consist of area border, demarcation line of building, height of tree, activity intensity, activity volume, mass of monument building, 2. Factor Building Land Use consist of building coverage, 3. Factor Building Height and Meaning Of Environment consist of building height, building skyline, meaning of environment , 4. Factor Building Architectural Pattern consist of Shape of Tree Canopy, Building Texture, Building Material, Building Style, 5. Factor Road Pattern and Shape consist of Road Pattern and Road Shape, 6. Factor Building Form and Massing consist of Building Mass Form, Front Appearance of Building, Highlighted Land Plot of the Residence Block, 7. Factor Building Scale and Open Space consist of Building Scale, Open space inside or surrounding the building mass, 8. Factor Open Space Shape and Public Parking Area consist of Open space system in linear or linear-curve shape, Public Parking Area, 9. Factor Building Form and Proportion consist of
Proportion Scale, 10. Factor Main Network of road and Physical aspect in a place consist of Main network of road and field, Physical aspect in a place, 11. Factor Vegetation Area consists of tree.

4.2 Shaping Factors from Urban Sprawl Variable:

Based on the factors formed from urban sprawl shaping elements, therefore, communication technology in urban sprawl in Meteseh village is considered to be more advanced. In addition, the relationship among society is influenced by transportation quality, particularly public transportation. If the availability of public transportation gets better and can support society’s activity, thus the phenomenon of urban sprawl growth would be less and settlement would be denser. The following is the signification of each shaping factor of settlement characteristics in Semarang urban sprawl from visual area characteristic variable towards grand theory discussed in chapter 2.

Factor Order of Tenure, Public Transportation Availability, and Communication Technology: 1. Order of Tenure. 2. Waiting time of public transportation. 3. Communication Technology.

5.0 Conclusion And Recommendation:

5.1 Conclusion:

According to analysis and statistical test, hence, this research yields 13 shaping factors of Semarang urban fringe characteristics. From this research finding, it can be concluded that there is no significant difference in visual characteristics between rural and urban settlement since the society’s activity pattern are relatively the same. Signification towards shaping factors of urban fringe Semarang settlement characteristic is as follows:


5.2 Recommendation:

Recommendation which can be given based on the research finding is as follows:

a. In planning and developing urban fringe, it is better to consider the existence of earlier settlement, specifically rural settlement. It is aimed to preserve uniqueness and urban fringe characteristics from the massiveness of modernization. b. To develop fringe areas especially if will build a massive modern housing, it is advisable to conserve the natural conditions and respect to social conditions of rural people. Therefore is expected the fringe areas able to grow fast but not emerged sharp disparities between rural and urban communities.

The availability of transportation facility, particularly public transportation in Meteseh village needs to be improved so that it can accommodate society’s activity and mobility in urban fringe settlement which is getting denser.

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