

# Identification a Residential Fast Growing and Causative Factor (Case Studi: Urban Settlement in Lumajang City, East Java)

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**Abstract**— The phenomenon of urban sprawl occurred because the development of urban settlement that uncontrolled. Development of uncontrolled settlement have an impact on the decreasing quality of environment as a result of a change the function certain land use. Need a comprehensive research against characteristic settlement to understand conditions and cause residential development that occurs.

The purpose this study is to identify a residential fast growing and causative factor of growth then formulated the concept of control. The identification process is done by examining the elements in the form of settlement describing characteristic settlement thoroughly in the research area. The research approach used is positivistic with descriptive quantitative exploration methods. Analysis techniques used is a combination of analitical hierarchy processes and overlay using devices gis ( geographic information system )

Based on the results of study known that development of settlements in the area indicated by the fast growing due to the influence of urban residential center. The pull of economic activity by economic institutions in the urban center residential led to high migration of people from outside the area. These migrations led to the construction of the new settlements around road infrastructure. The choice of that location occurred due consideration of ease of accessibility to the center of the settlement. The condition has an impact on the quality of settlements (indication of slums). Control measures that can be done is to define a planning instrument based on indicators of sustainable settlements that are divided by physical and non-physical aspects. Planning instruments based on research results is : 1) the physical aspects (sustainability in environmental terms) is done with the consolidation of land by zoning criteria land suitability and compliance arrangements of facility and basic infrastructure according to the needs and scale of service; 2) non-physical aspects (sustainability in terms of economic and social) is done with formulation efforts to establish their identity with increased public participation, increase the intelligence community about living culture and establishment of new economic institutions in the settlements (villages thematic program) to reduce dependence on economic institutions at the center of urban settlements

**Keywords**— *Characteristic of Settlements, Development Of Settlement, Urban Sprawl,*

## I. INTRODUCTION

Within the scope of the city , found a lot residential development uncontrolled without any planning process. The phenomenon of the development of such settlements is called

urban sprawl [1]. Urban sprawl lot to contribute to the decline in the quality of settlements, because most settlement growing due to urban sprawl is not served infrastructure in effisien, reduce catchment area, increased pollution (soil, water, and air) and that condition is the beginning of the formation of slums if the development not planned correctly [2].

For example the phenomenon of urban sprawl is the development of settlements in metropolitan areas such as Jabodetabek and Bandung where residential development occurs tend to spread to the suburban/peri-urban area. In the peri-urban of Jabodetabek, especially Tangerang has many large scale housing development. Overall there are  $\pm$  60 developers who have assets of housing construction. The peri-urban area of Bandung as Districts Parongpong, Lembang, Cimenyan, Cilengkrang, Cileunyi, Bojongsoang, Dayeuhkolot, Margahayu dan Margaasih there are also 51 new formal housing development with 93 permits location and extent of conversion of 2382.13 Ha [3]. As a result of development sub-urban area, happen many problems in terms of physical city, economy, and social like a bottleneck due to the effisiennya mobility to work, ( water pollution, land, air ) reduced arable land for agricultural land the conversion, the slum settlement, etc [4].

Identification a residential fast growing and factor that affects be important to know because it can help to formulate the right strategy and the policy to control the development of the settlement [5]. Each residential area in the region has certain characteristics that cause the growth of settlements. Understanding the characteristics of settlements can be done by looking at the aspects of forming a settlement. Aspects in the form of settlement this can be understood of elements in the form of residential [6]. According to Doxiadis (1976), understanding characteristic settlement must do in comprehensively at a “total settlements patterns”. Total settlement pattern is done by studying the settlement in a two-way classification scheme. The first classification relates to the hierarchy of settlements based on the scale while the second relates to the classification of the elements of the settlement, namely *nature, anthropos, society, shells, networks* [7]. The dimension of time is also a thing that should be considered in addition to the characteristics of the

settlement. The dimension of time may be based on historical and forecast how the future settlement [8].

Lumajang is one of the regions in East Java who run into the process of development of the rural area into an urban. That is characterized by an increase of land use due to conversion of agricultural land into settlements (Surabaya.net). Land conversion that occurs is in the area around the urban centers (Peri-Urban) that are spread out and only on a small cluster housing. Starting from two to three years there are some housing only around roads (national highway wonorejo) that connect Lumajang district to the City of Probolinggo and the new road lanes that connect District Lumajang to the Jember City.

A housing development recently indicated convert farmland that should not be change because its productive land. The expensive land prices in urban centers Lumajang District causing the developer prefer to develop a new housing that is a little bit far from the city center in order to obtain more affordable land prices. Unfortunately, these conditions it has implications for the allocation of land and space that is incompatible with the purposes and provisions of spatial development.

Restrictions on land use change has actually been done by stipulation regulation No. 2 of 2013 regarding the determination of spatial and perennial agricultural land by decree LP2B (Sustainable Food Agricultural Land). but there is no significant impact related efforts to control land use change. The main obstacle encountered was related to the status of the land is private land where most of the major powers (to convert or not) is fixed for the land owner [9].

Urban settlements of Lumajang District have become an area of research because of Lumajang is an urban area (in the process of developing) and its impact can be seen. if these developments are not immediately addressed, maybe the residential area in Lumajang District will face the problem of housing like Jakarta or Bandung (slum area). Identification of the fast growing residential area and factor in the growth of the results of this study can be used as a basis for determining the settlement growth control policies by the government as stakeholders.

## II. LITERATURE REVIEW

### A. *Housing and Settlement*

Settlement is the unit housing area complete with environmental infrastructure, public infrastructure and social facilities containing cohesion and harmony of interests as the utilization of the environment. The settlements also provide space, resources, and services for improving the quality of life of citizens and the intelligence that functions as a platform occupants and the intelligence activities of the social, cultural and economic [10].

The main function of home as a place for living, a good and orderly settlement will be created if it meets the ideal criteria for physical and non-physical aspects [11]. The physical aspects include the geographical location, natural environment, and neighborhood; while the non-physical aspects include the social, economic, cultural, and psychological (feeling safe, happy, and peace).

### B. *Characteristics of Settlement*

An understanding of the characteristics of the settlement in this study broadly refers to multiple sources namely Turner related to the characteristics of settlements based on the character and characteristics of settlements related Doxiadis views of constituent elements and units

According to Turner (1976) [12] in his book "Housing By the People", there are two types of settlements by their character that is formal and informal settlements. Formal settlements are settlements built by the formal sector refers to a housing development built by some of the rules of development and through legal procedures. While the informal settlements are settlements built by the informal sector refers to the building without going through building regulations and without going through legal procedures.

Based on its constituent elements, the settlement consists of human beings with the culture (the content) and the culture of human physical place to stay (the container), which includes elements of natural and artificial environment (home and networks) [12]. Overall constituent elements combined to form a scale of residential units that can be divided into residential units based on a scale from the smallest to the largest unit. Group settlement units is:

1. Temporari Human Settlement
2. Villages
3. Polises
4. Metropolises
5. Megalopolises
6. Nasional System
7. International System

### C. *Settlement Growth*

Growth and development of settlements can be understood by observing the component of its constituent aspects. Settlement is part of sustainable development concept and it has three pillars forming by the economic, social, and environmental [13]. Balanced interaction between the pillars in the development of the settlement will shape a sustainable environment. The concept of sustainable settlement is a strong global concept which is expressed and actualized locally. Sustainable settlement must have a strong economy, harmonious environment, relatively similar levels of full social justice, community participation levels are high, and energy conservation are well-controlled.

According Doxiadis (1976) [14], to understand the settlement and make a sustainable settlement, settlement can be analogous to living creatures that have body parts as forming. When one part of the body is not functioning properly then it will affect another part. Physically, for example relating to buildings and infrastructure, if the physical part is not necessarily filled with good environmental quality that is formed will not be good anyway and resulted in many indicators of quality of life were not achieved.

To determine the factors that affect the growth of settlements, two major theories about sustainable development and characteristics of the constituent elements of the settlement which has a close connection. If translated between the pillars of sustainable development and the constituent elements of the economic and social settlements

related to the human element and the community (the content) while the environment associated with the natural elements, the condition of the house / housing, and the network (the container). Result complementary balanced interaction between the elements forming this settlement adapted to the pillars of sustainable development will establish a sustainable settlement and ideally with the good aspects of the physical and non-physical.

### III. METHODOLOGY

#### A. Variables

The variables research used in this study are the constituent elements of settlements that illustrates the characteristics of a comprehensive settlement. These variables obtained from literature review related theories about the settlement.

TABLE 1 variables

ASPECT	VARIABLES	SUB VARIABLES
Physical : • Nature • House / Housing • Network	Natural Conditions	1. Availability of Natural Resources 2. Land ability
	Condition of the house / residential	1. Type of housing (permanent or non-permanent) 2. Housing Model 3. Location of settlements 4. Density of residential area 5. Housing facilities (completeness and distribution) 6. Land use
	Condition of Infrastructure	1. Clean Water Infrastructure 2. Electric Infrastructure 3. Road 4. Waste and sewage treatment Infrastructure 5. Telecommunications infrastructure
Non Physical : • Man • Society	Social conditions of society	1. Number of population 2. Livelihood 3. Level of education 4. Existence of social institutions 5. Human growth
	Economic conditions of society	1. Distribution of income levels 2. existence of economic institutions
	Cultural characteristics of society	1. The habit of living 2. Activities

#### B. Sources of data and information

##### 1. Determination Analysis Unit:

The unit of analysis of this study is urban neighborhoods in Lumajang District. Neighborhood that be unit of analysis is all the settlement units within the scope of the administrative area delineation Lumajang district as a center for the development of urban settlements as well as the districts of Padang, Sukodono, Summersuko, and Tekung as districts around Lumajang district region as the center of the affected area settlements development.

##### 2. Determination of the observation unit :

Observations unit from this study is the variable that indicates the characteristics of the settlement based on the constituent elements of settlements on the territory of settlements in the study area.

##### 3. Determination Information Unit (data source):

Information unit from this study are government stakeholders in the settlement area (in the scale of the

district, sub-district and village) as influencers and understand the conditions of the settlement developed in Lumajang and developers (formal sector) as the provider of formal housing is contributing to the development of settlements ,

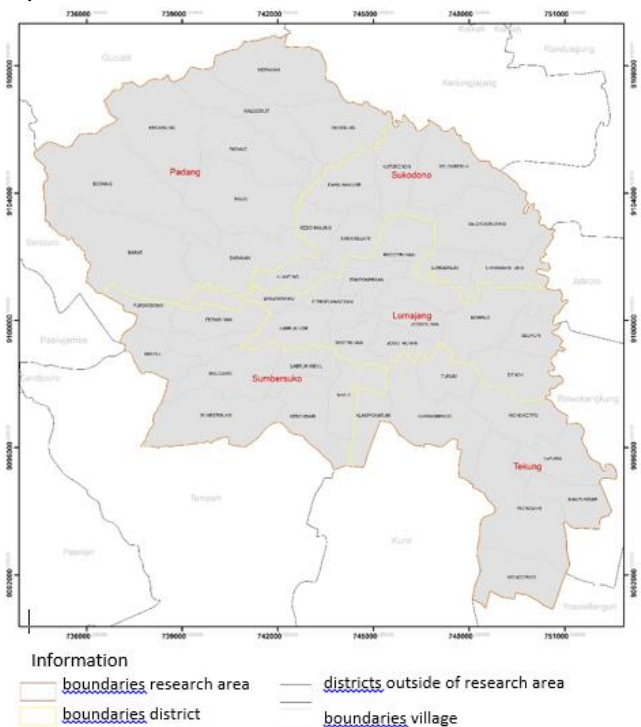


Figure 1. Boundaries Research Based on Rural and District Administration

#### C. Stages of Analysis

TABLE 2 Stage of Analysis

No	The Analysis Stage	Data Input	Analysis Tools	Output
1.	Mapping the state of settlement Growth	periodic image map area	Analysis of the image map area with GIS	Knowing the tendency towards the growth of settlements
2.	Identification of the factors causing the growth of settlements	questionnaire based on variables	analysis Hierarchy process that is supported by the description of stakeholders	Knowing the factors causing the growth of settlements
3.	Identification of the fast growing residential area	Result from the 2 <sup>nd</sup> analysis	Overlay with GIS (geographic information system)	Knowing the residential area that has a fast-growing indications
4.	Formulation the concept of control	Result from the 2 <sup>nd</sup> , 3 <sup>n</sup> analysis and in-depth interviews with stakeholders	Triangulation analysis	Concept of controlling fast-growing residential

##### Stage 1. Mapping the state of settlement Growth

Mapping the conditions of the settlement developed regions conducted by image analysis in order to see the shape and direction growth of residential development is done by comparing every period of the year. The development area

that is built or not built periodically can be determined with the help of ArcGIS software on remote sensing tools.

Stage 2. Identification of Settlement Growth Causes

Analysis technique used at this stage is the analysis hierarchy process (AHP). AHP is used to determine the amount of weight the priority interests of each criterion variables that affect the growth of settlements is based on studies that have

1. Formulation the hierarchy

Hierarchy is the translation effect of any variable that has been determined on the growth of settlements. This hierarchy is based understanding of appropriate study of theory that the growth of settlements affected by the settlement characteristics and aspects of sustainable development which is described by its constituent elements

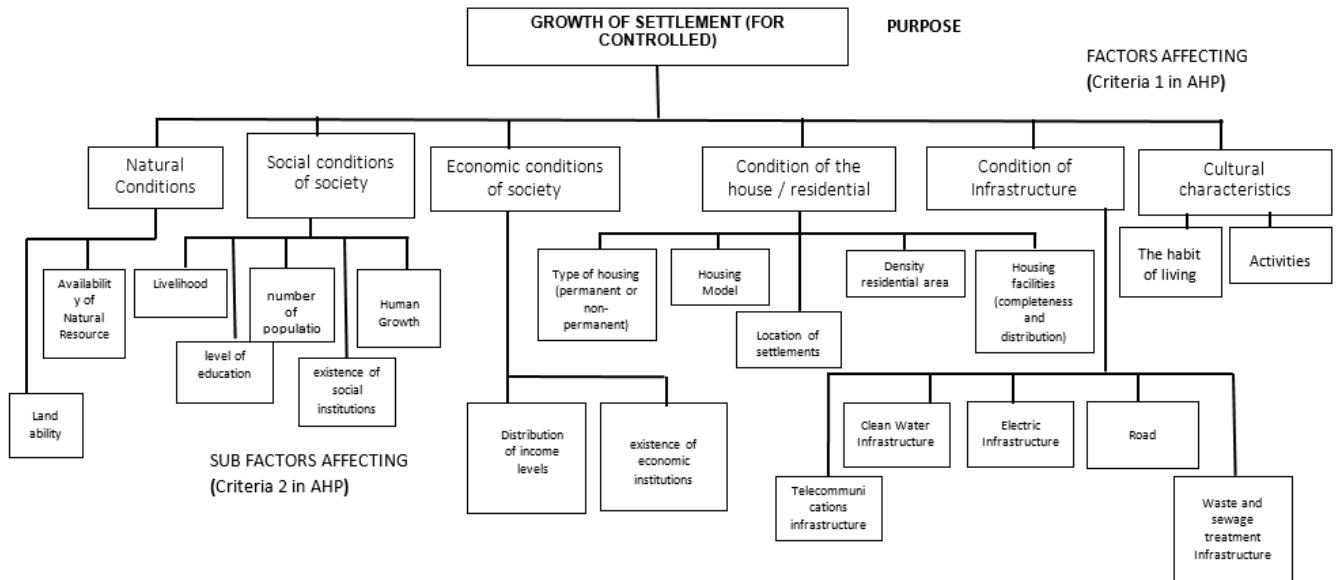


Figure 2. Hierarchy structure of criteria in AHP (factors that influence the development of settlements by elements forming)

2. Distribution of the questionnaire

Distribution of questionnaires which contain criteria comparison between determinants that influence the growth of the settlements that will be used as a reference in controlling the development of settlements.

3. Processing with Matrix Pairwise Comparisons

Results of the questionnaire that contain criteria comparisons processed with matrix criteria pairs (Pairwise Comparisons), where treatment with pairwise matrix is to determine the value of an interest rate comparison criterion relative to other criteria that are then processed to determine the rank / relative priority of all criteria

4. Comparison to obtain priority (Test Normality)

5. Consistency Test

6. Merger Opinion Respondents

The output of AHP analysis is knowing the weight of influence of each factors and sub-factors constituent elements of settlement to the phenomenon of settlement growth in the area of research. This output of analysis is supported with an explanation by stakeholders (results of in deep interview) who

been done. In the process, each of the variables indicated have an influence on the development of settlements in this study compared each other then assessed by the respondents (stakeholder experts who understand the condition of the study area). Step of AHP :

have been determined to be sampled. Results in deep interview is a form of effort to understanding the phenomenon from the perspective of some relevant stakeholders.

Stage 3. Identification of Fast Growing Settlement

Analysis technique used to obtain settlement growth tendency is overlay technique several criteria maps forming elements settlements that affect the growth of settlements in the study area. Analysis tool used to overlay teknik is the application of Geographic Information System (GIS) using the aid of computer software ArcGIS 9.3.

In this analysis, overlay technique used is the method of Weighted Sum. Weighted Sum is one of the tools available in ArcGIS 9.3 that combines a wide range of input in the form of a map grid by weighting the criteria of the AHP. The results of weighted Sum show the influence of the output maps of each input criteria in a geographical region. Overlay operational stages using ArcGIS 9.3 are:

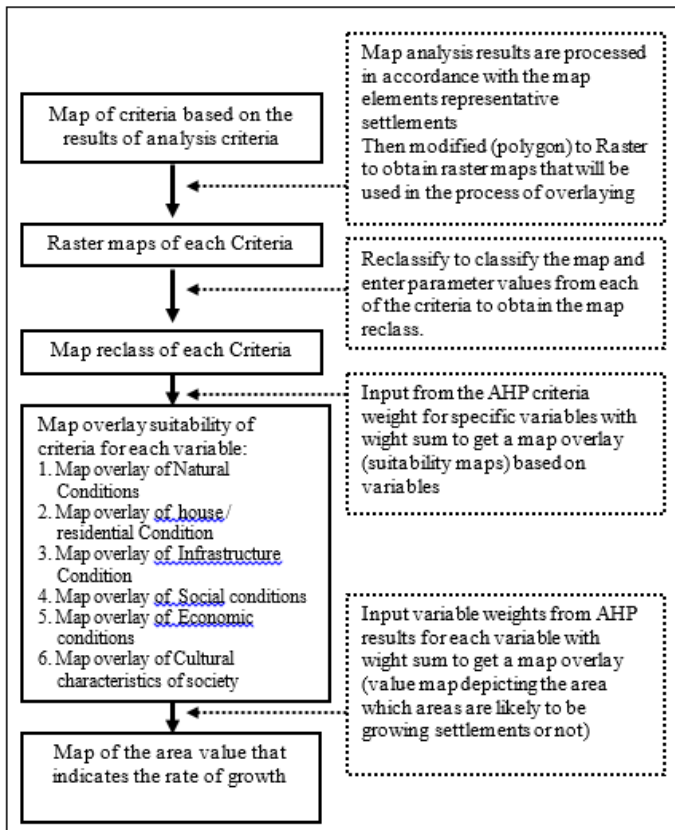


Figure 3. Overlay Process

Stage 4. Formulation the concept of control

Stage 4 is done by observing the detail of constituent elements of settlements in fast-growing residential areas to formulate concepts and control strategies. Analysis techniques used in this stage is triangulation. The purpose of triangulation is to strengthen the understanding of the findings of researchers, and determining appropriate sustainable housing concepts based on the input source analysis. The input is; 1) the research findings; 2) opinion of stakeholders; and 3) the concept of sustainable development indicators. Results from concept and strategy formulation is then described its application in the fast-growing residential areas through a planning process approach to sustainable living environment based on standards

IV. DISCUSSION

A. The development of settlements in the period 2006 to 2015

Based on analysis of the image of the region, stage of development settlement in area of research can be divided into three periods that is in period 2006-2010, 2010-2013, and 2013-2015.

• Period of 2006-2010

In 2006, the settlement developed concentrated in central urban settlements (districts Lumajang), these developments form the pattern of octopus due to the influence of the road connecting the district that is not only one. Path of many role in shaping the pattern of this is the route to Tekung districts, Summersuko, and Sukodono. In addition to the distribution of settlement developments are heading out of urban centers

Subdistrict Lumajang (but not too significant. The development settlement that occurred in this period is the increase in density in the residential area of the city center

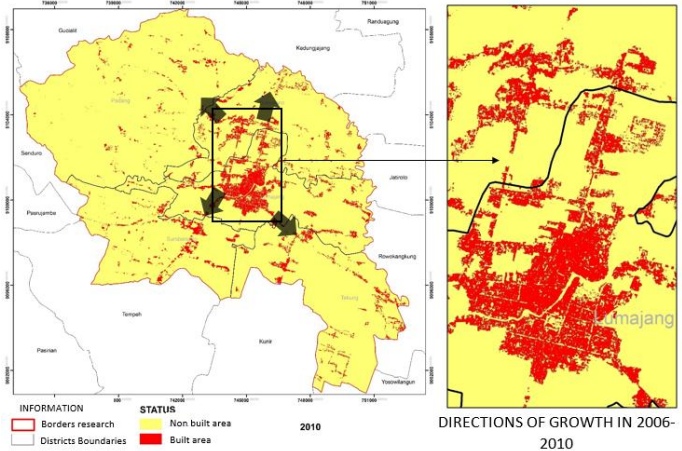


Figure 4. The Point of Settlement Growth (period of 2006-2010)

• Period of 2010-2013

Point of growth seen sporadic (spread) grew follow roads shape a pattern of the ribbon (ribbon settlement). The primary effect of this condition is due to the development of a new ring road lanes east (the area indicated by the point of growth settlement)

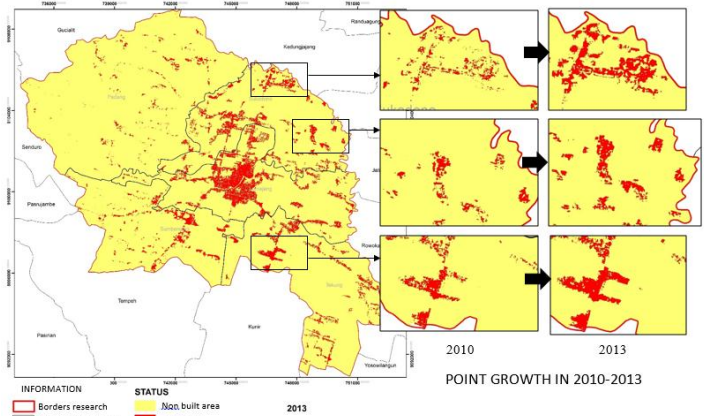


Figure 5. The Point of Settlement Growth (period of 2010-2013)

• Period of 2013-2015

In the period of 2015 sporadic growth not only in the eastern region, but also occur in the western part of the settlement (districts Summersuko and Padang). Similar to the pattern in 2013, development occurs sporadically linearly follow the path connecting roads between districts.

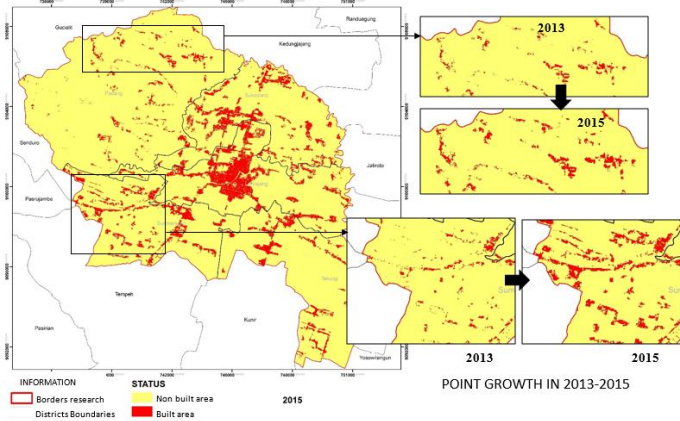


Figure 6. The Point of Settlement Growth (period of 2013-2015)

If presented in the model graph it can be seen that the district has the addition of undeveloped land area (settlement) rose consistently higher than other districts are districts Lumajang with total area reaches 540, 80 Ha. However, in percentage, average rate - the highest average residential development occurred in the District of Summersuko (11.98%) followed by subdistricts Sukodono (9.58%).

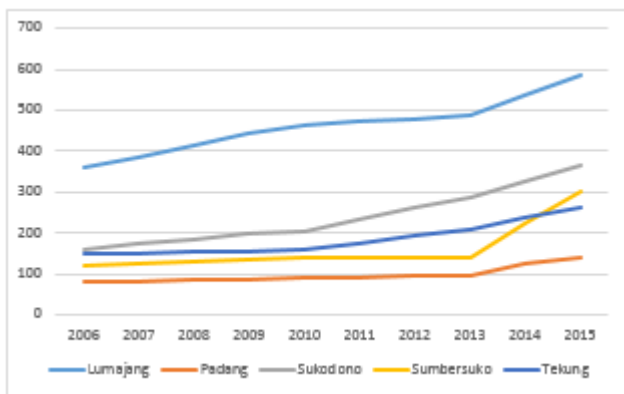


Figure 7. Graph of Development Land Settlement in The Area of Research Period Of 2006-2015

Conclusions from the interpretation of the settlement developed based on the analysis of the settlement developed by analyzing the image of the area periodically obtained some indications that represent development settlement in the area of research, namely:

1. Process of development settlement in area of research during the period 2006 to 2015 was initially concentrated in the central area of urban settlements which Lumajang districts. However, during the period of 2010 to 2015, the settlement developed sporadically scattered in every district (not concentrated). Sukodono settlement developed in the districts and the eastern part of Lumajang seen following of the ring road east. The existence of this road is probably to trigger the emergence of new activities into the pull of development settlement.
2. In general, the first stage of development settlement in each district occurring linearly follow the pattern of the nearby street (main street) with the physical organization of space ribbon pattern forming settlements.

Characteristics of the second stage is the presence of the physical organization of space tends to form a cluster pattern, which is a simple combination of elements shelter adjacent to each other and do not necessarily form a geometric shape or symmetry properties

3. If it is associated with the characteristics of community activities, districts with the majority engaged in agriculture has spread pattern forming settlements (sprawl) is different from the characteristics of the people engaged in trade and services tend to be concentrated. The pattern of spread occurred in Padang districts while the concentrated pattern occurred in Lumajang districts and Sukodono. The development settlement in the District Tekung and Summersuko occur more regularly follow the pattern of the road network.

*B. Identify the factors causing the growth of settlement*

Identify of the factors that influence the development settlement obtained by the results of the analysis hierarchy process. Variable observations on AHP is forming elements arranged to form a hierarchy settlement that influence the level of interest among the variables. From the analysis found that the stage of the growth settlement in area of research as a whole is due to the effect of economic conditions, followed by infrastructure conditions and social conditions of society. With inconsistensi value of 0.009 means that the data of the respondents have a consistent level of more than 95,%. Of each - each main variable economic, infrastructure conditions, and social conditions in mind also the sub-variables that have the highest level of influence.

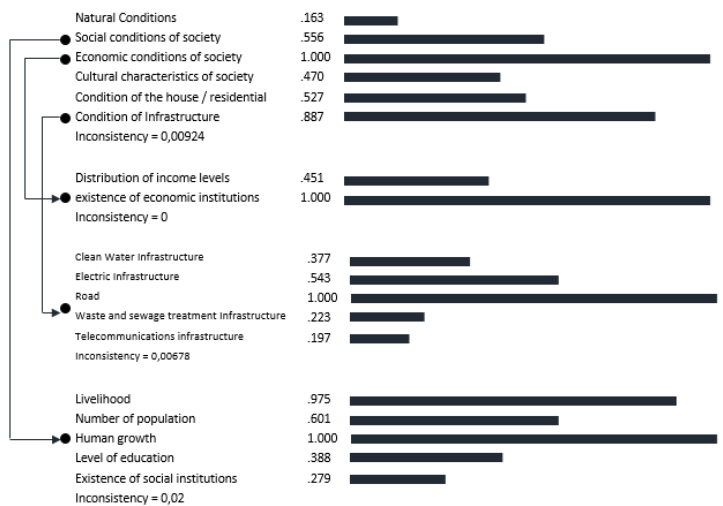


Figure 8. Weight of Variables Influence on The Forming Elements The Overall Settlement Area of Research

When seen at scope of districts, condition variables that have highest influence on the growth of settlement tend a slight difference between the condition of districts, especially districts Lumajang. Subdistrict Lumajang dominantly influenced by the condition of infrastructure (especially roads) then followed conditions of the house / housing, especially in land use. Meanwhile, four other districts tend to be affected by the same variables that the first dominant economic conditions (particularly the presence of economic

institutions), followed by sub-variable infrastructure conditions of road infrastructure. A slight difference in the districts of Padang where the second dominant variable is the cultural characteristics of the community with a balanced weighting between living habits and daily activities of the average - average citizen. In detail the results of the analysis of AHP generate value level of influence with the consistency of respondents more than / equal to 90% (incosistance <0.1) are presented in Table 3

Table 3 Value of Criteria Variables Influence on Growth of Settlement Each Subdistrict

VARIABLE AND SUB VARIABLE	Value of Criteria Variables (District)				
	Lumajang	Sumbersuko	Padang	Tekung	Sukodono
Natural Conditions	0.068	0.129	0.119	0.126	0.142
Land ability	1	1	1	0.447	1
Availability of Natural Resources	0.632	0.866	0.5	1	0.577
Social conditions of society	0.155	0.298	0.362	0.687	0.4
Livelihood	1	1	1	0.317	1
Number of population	0.494	0.370	0.335	0.425	0.634
Human growth	0.802	0.277	0.672	1	0.561
Level of education	0.252	0.178	0.324	0.545	0.614
Existence of social institutions	0.229	0.154	0.234	0.455	0.454
Economic conditions of society	0.370	1	1	1	1
Distribution of income levels	0.183	0.169	1	0.250	0.258
existence of economic institutions	1	1	1	1	1
Cultural characteristics of society	0.248	0.252	0.516	0.383	0.272
The habit of living	0.258	0.2	1	1	0.408
Activities	1	1	1	0.224	1
Condition of the house / residential	0.643	0.291	0.185	0.351	0.653
Type of housing (permanent or non-permanent)	0.131	0.205	0.139	0.164	0.163
Housing Model	0.081	0.151	0.132	0.104	0.138
Location of settlements	0.347	1	1	1	0.694
Density of residential area	0.349	0.375	0.258	0.332	0.369
Housing facilities (completeness and distribution)	0.431	0.351	0.336	0.422	0.839
Land use	1	0.607	0.520	0.790	1
Condition of Infrastructure	1	0.469	0.471	0.788	0.963
Clean Water Infrastructure	0.563	0.276	0.219	0.295	0.407
Electric Infrastructure	0.480	0.417	0.390	0.309	0.456
Road	1	1	1	1	1
Waste and sewage treatment Infrastructure	0.185	0.290	0.177	0.168	0.204
Telecommunications infrastructure	0.358	0.334	0.210	0.274	0.367

The most dominant variable
  Second Dominant Variable

The results of analysis variables influence on the growth of settlement in the districts scale obtained by calculating the data input in the levels of stakeholder questionnaire districts, villages, and developers. So the results of the calculations in table 3 may represent interpretations influence on the overall development settlement that occurred in area of research. Descriptions weight calculation the influence of a more micro level, namely rural districts conducted to input the next stage of the process is overlay with GIS applications to determine the settlement area which indicated a growth rate of rapid settlement.

C. Identify of rapidly growing residential area

Identification of fast-growing residential area is done with the overlay analysis techniques of each variable to see which areas have a tendency to grow and evolve faster than other areas. In principle, analysis overlay in this process is the incorporation amount of weight the influence of each variable owned unit of observation within the limits of the administration (counties, districts, and villages), From the result of the merger of overlay weight of influence between the variables, the results obtained new weight that describes the tendency of fast or slow growth settlement by weight higher weight range of influence (the merger of influence between variables) owned unit of observation villages / wards, the more rapid settlement growth trends in the

observation unit and vice versa the lower the weight of the influence of the slower growth trend settlement occurs.

Overlay analysis generate output of maps that indicating the area settlement with the level of certain growth rate is based on a scale of low, medium, to high, and very high

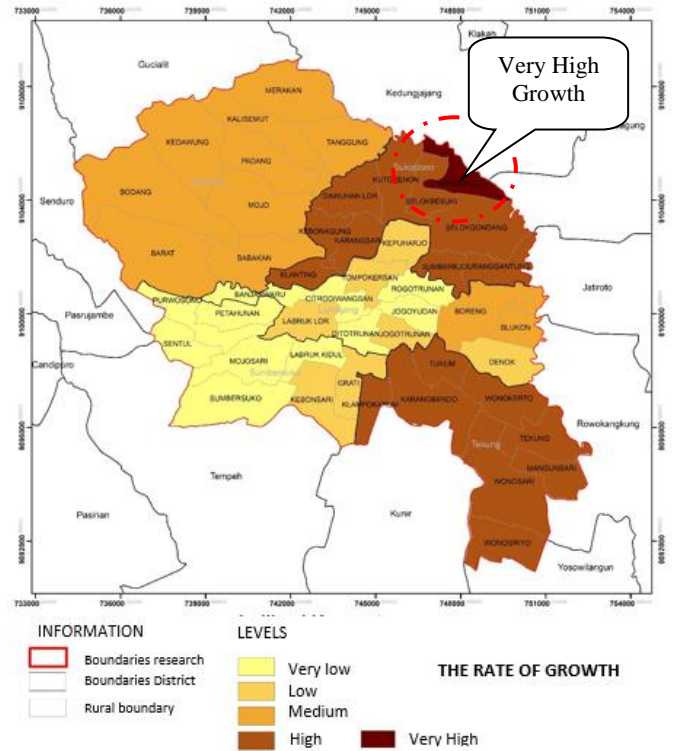


Figure 9. A Growth Rate of Settlement Based on The Results Overlay Analysis

Residential areas with indications of growth category of high rate that are in the districts of Sukodono and Tekung. While a residential area with a very high rate of growth indications are Bondoyudo village at Sukodono districts.

Subdistrict Lumajang which is the center of urban settlements been identified have rate of growth in category low to moderate. This condition happen because of variable's effect that influence condition of Lumajang District is infrastructure and housing conditions / housing. While based on the results of the overall analysis, the growth of settlement in research area affected by conditions of the economy, especially where economic institutions. Beside that, from mapping analysis known that in the period 2006 to 2015 the growth of settlement occur spreads to the areas outside the districts Lumajang.

Based on interviews with the public works department Lumajang as respondents who understand the condition of the development settlement in the area of research in general obtained a logical reason from the analysis. He said that " a dynamic growth of settlements happen at the outside of Lumajang districts, but it happens under the influence of his own existence. Development of settlements outside urban areas due to the increasingly high price of land in urban areas and the construction of the east

ring road lanes (strategic plan of infrastructure). The trend phenomenon occurs ultimately citizens who choose to build houses outside the Lumajang districts, but with the option that the house is built to be easy to access to the urban centers of sub-district Lumajang".

Subdistrict identified as having high growth indication based on the results of analysis are Bondoyudo village at Sukodono districts. The location of Sukodono districts are flanked by the center of community activities also affect the growth of urban settlements. Beside that, the location are supported by the road connecting the district to be the cause of migration population. The village authorities in subdistrict Sukodono states that his territory of land become public option outside of the districts to stay because the price of land is relatively low compared to surrounding districts. In addition, for the accessibility, there is a public transport that connects the urban area. Sukodono sub-district is the region with the main access traffic lane east where there is a public facility development plan, market, and other facilities such as health and education.

1. The existence of roads that facilitate access to potentially attractive urban center residents from outside the area which led to the addition rate of population growth so that condition impact on the increasing demand for residential.
2. The growth of settlements has led to the conversion of productive land into smaller plots.
3. There was a gap of settlement conditions both in terms of physical buildings and availability of infrastructure between settlements and the non-formal settlements developed by the developer.
4. Dependence Bondoyudo rural residential areas to urban settlements that do not create independence. This dependency occurs on the various aspects of both facilities and activities. In terms of activity, this condition occurs because of the lack of diversification of economic activities. The indigenous people of the rural areas tend to farm workers were migrants are economic institutions that exist in urban settlements. In terms of facilities it is urban areas tend to be better in terms of service facilities.
5. The lack of social facilities as a means of gathering the community. This can cause the formation of identity / community character specifically.
6. Pull economic institutions in urban areas causing no effiennya use of energy in transport because of the location of the home and workplace are far apart residents
7. Inefficiency of population mobility. because the settlement areas not serviced public transport.

**D. Concepts and Control Strategies**

From the analysis of the triangulation, the formulation of the concept of controlling the growth of settlements in the village Bondoyudo (fast-growing settlements) constituent elements of the settlement is divided into physical and non-physical aspects. Details of the formulation described on table 4.

Table 4 Concept of Control in Every Aspect

Aspect	
Physical	Non Physical
<ul style="list-style-type: none"> <li>• Natural Conditions Consolidation of land for restrictions on land use and protection of the ecosystem by setting the proportion of green areas accompanied by establishment no waste settlements.</li> <li>• Condition of the house / residential The develop of settlements base on planning with the fulfillment of basic needs and restrictions built area by zoning.</li> <li>• Condition of Infrastructure Settings fulfillment network infrastructure according to the needs and scale of services.</li> </ul>	<ul style="list-style-type: none"> <li>• Social conditions of society Establishment of community identity with increased public participation and community empowerment and the fulfillment of access to public facilities and public services as needed scale.</li> <li>• Economic conditions of society Gap reduction the spread of economic institutions by establishing new economic institutions in residential areas Sukodono districts.</li> <li>• Cultural characteristics of society Establishment of good living culture by not infringe indicators of sustainable settlements</li> </ul>

**Control of Physical Aspect At Bondoyudo Village**

*Natural Conditions : land consolidation*

With zoning settlements should be built or not. The determination of this zone is determined based on criteria appropriate settlement results of the analysis are: 1) served by the network infrastructure; 2) outside the productive land (ecosystem protection); 3) according to criteria of physical natural conditions and 4) outside the protected zone

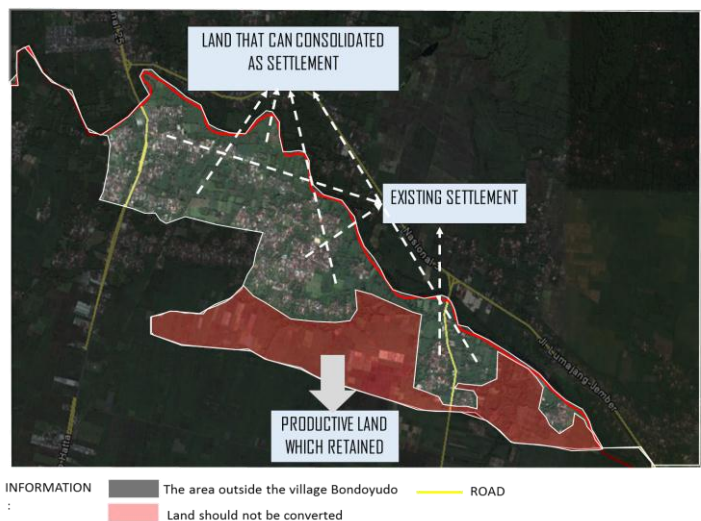


Figure 10. The Concept of Control Natural Conditions At Bondoyudo

*Condition of the house / residential : fulfillment of basic needs*

Demand calculations public infrastructure and facilities is based on the standard of SNI 03-1733-2004. Bondoyudo village area is 2.72 km<sup>2</sup> or equal 0.089% of the total districts Sukodono. Existing condition at this time, and the built area amounted to 0.6538 km<sup>2</sup> while the maximum land that can be built is of 1,414 km<sup>2</sup> (52% of the total area of the village). By the standards of SNI 03-1733-2004 (Standart National of Indonesia), with assumptions of land use proportion for settlement as 50% for houses, 25% for the road network, and 25% for public and commercial facilities then area houses allotment amounted 707.000 m<sup>2</sup>.



The Plot allocation area of settlement follows the concept of housing balance, with the pattern of of 1: 3: 6 (every one unit of a large houses there should be three medium-size housing units and 6 units of small size) spacious plots respectively assumed to be 300 m<sup>2</sup> for plots large, 150 m<sup>2</sup> for the plots being and 100 m<sup>2</sup> for plots small. Thus obtained for each package needed land for housing amounted to 1,350 m<sup>2</sup> ((300 m<sup>2</sup> x 1) + (150 m<sup>2</sup> x 3) + (100 m<sup>2</sup> x 6)). Assumed all housing units occupied by one household and the number of residents per household is assumed as many as 5 people / families. Of these approaches, it can be estimated capacities Bondoyudo village are as follows:

- Land area for large houses type is 156 900 m<sup>2</sup>, so the number of homes is 523 units:
- Land area for medium houses type is 235.650 m<sup>2</sup>, so the number of homes is 1.571 units:
- Land area for small houses type is 314.400 m<sup>2</sup>, so the number of homes is 3144units:
- Total Unit are 5.238 house

With the assumptions above calculation, where each unit consists of 5 plots of family members of the village area Bondoyudo able to accommodate population approximately 26.190 inhabitants (9135 households). With an estimated population of 26.190 inhabitants, the village Bondoyudo in its development belongs in the small town. Of the maximum number of people that can be accommodated are used to determine the needs of public infrastructure and facilities area that should be available. Based on the standard of facilities need calculation results obtained at rural settlement Bondoyudo as follows:

Table 5 Facilities Needs in the village bondoyudo

FACILITIES	DETAILS NEED
Education	Nursery Scholl : needs 20, the existing 1 Primary School: needs 16 existing 2 Secondary School: 5 requirements, the existing 1 High School: 5 requirements, the existing 0
Health	Health Center: 0 requirements, the existing 0 Sub health center: needs 1, the existing 0 Medical Clinic: 10 requirements, the existing 1 Maternity Hospital: needs 1, the existing 0
Observance of religious	Citizens Mosque: needs 11, the existing 3 The mosque village: needs 1, the existing 0
Trade and services	Market: needs 1, the existing 0 Minimarket: 4 needs, the existing 0 Stalls / shops: 105 needs, the existing 50 Shops: 52 needs, the existing 5
Social Facilities	Parks: needs 10, the existing 0 Parks and sports fields: needs 1, the existing 0

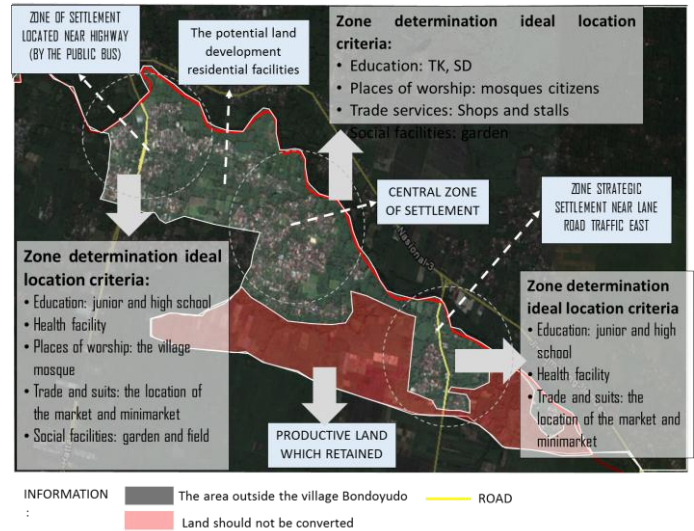


Figure 11. Facility Location Criteria Based Settlement Zone

*Condition of Infrastructure*

In parallel with the needs of the facility, which was built utility should be able to serve the entire population. Details of utility requirements are: 1) the need for clean water (liters): 6.0237 million liters; 2) electricity; 124 926 300 KVA; 3) Waste water: total runoff volume was 2.619 million; 4) waste: 34 trash cans, garbage carts 33, 15 garbage truck, 1 unit of TPS, 4 Transfer depot; 5) telecommunication towers: 2 units; and 6) the road: road repair pathway connecting node neighborhood settlements. This is a basic Demand calculations that can be used in planning the fulfillment infrastructure.

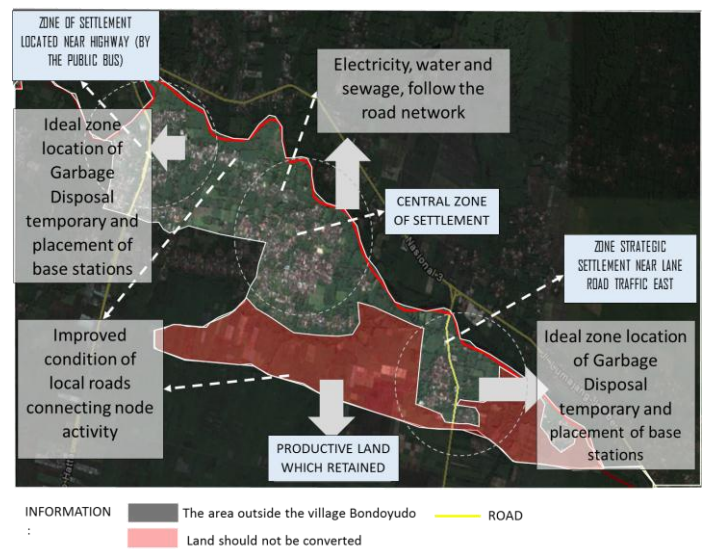


Figure 11. Fulfillment Concept of Settlement Infrastructure

### *Control of Non-Physical Aspect at Bondoyudo Village*

#### *Social conditions of society*

- Establishment of community identity in order to build a sense of belonging at neighborhood and the community (the expected impact is a reduction in the gap condition of settlements between urban settlements and peri-urban) with the implementation of the strategy in the form of program villages thematic as community empowerment efforts and increase public participation at every node kampong with add functionality in addition to houses as a residence as well as a place of business such as home industry (batik, wooden furniture, etc. according to the development plan of the government).
- The integration of rural and urban settlement areas in public facilities and social facilities with the implementation of the development strategy of public facilities and social facilities according to the needs and scale of service as the provision of infrastructure and access to public space.

#### *Economic conditions of society*

- Home-based job creation in order to form a community self-reliance industries with skills training and financial capital.
- Increasing the diversity of land use at residential areas (especially land-use trade and services) Strategy: raising program houses - trade (houses with economic function as well as a function of residence).

#### *Cultural characteristics of society*

- Tightening regulation of housing construction permits related prerequisites before houses. Building Permit may only be issued when access to basic infrastructure at houses can be seen clearly
- Increased knowledge of living cultures linked through socialization strategies regarding the requirements of a good settlement
- The introduction at culture and society of habituation vertical residences, especially for people at the location of slums and low-income communities that do not have access to a decent houses.

## V. CONCLUSION

Residential areas with fast-growing settlements tendency is on Bondoyudo, Sukodono District. Cause of the rapid growth of settlements at Sukodono District influenced by economic conditions variable, especially economic institutions and infrastructure variable, especially road condition. Based on the results of image analysis shows that residential areas at Sukodono Districts began to develop in

2010 similar with Lumajang Districts as centers of urban settlements (in the research area). Typical equality between districts Lumajang and Sukodono which tends settlement activity in the sector of trade and services led to their corresponding relationships in economic activity. Economic institutions into a factor in growth of settlements because of the existence of institutional power pull the economy led people to settle. On the other hand, the construction of the eastern ring road positioned to answer why the influence of the variable road infrastructure (AHP analysis results) in influencing growth of settlements is very high.

Strategic road infrastructure being the main trigger of growth of settlements is a product of government planning as stakeholders. But the conditions of settlement developments arising from the existence of this road infrastructure is therefore beyond the context of planning. Outside the context of planning because in fact when viewed from the aspect of sustainable development, a lot of things that do not fit the category of "sustainable" meant. The results of this study are expected to finally complete the scientific rules regarding the settlement method of solving problems emerging in urban areas of Indonesia.

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