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Urban Sprawl and Public Knowledge in Planning Process

(Case Study: Land Use Control in Urban Areas of Malang City)

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Abstract—**Urban sprawl is an emerging issue underpinning several dynamic changes in the peri-urban of Malang. While the environmental impacts (e.g. Land use changes, resource degradation) are inevitable, socioeconomic changes (e.g. social cohesion, economic transformation) is also tangible. Being neglected beforehand, planning had delivered considerable efforts to regulate land uses and controlling growth within the peri-urban. However, urban planning and management instruments such as zoning and urban expansion zones, have become increasingly consistent in leading cities toward an uncertain and chaotic future. Land use maps derived from Landsat imagery between 2010 and 2015 show a process of accelerated urban sprawl whereby built-up lands have more than doubled and scattered centers have merged into megacities. Urban areas in Malang City is spread on farmlands and it's driven by profit-oriented development strategy and ineffective land use planning. Our finding demonstrate how spatial analysis can help to investigate the integrated effects of land policies on landscape. There are several causes of urban sprawl in Malang City, it is due to the lack control of urban planning by the government and the public ignorance about spatial planning regulations. This paper also explains the result of field survey about the public response about zoning regulation in Malang City, which is based on the Social Network Analysis (SNA). With the data presented here, it is hoped that debates emerge on the importance of rethinking how to give an understanding to the public about zoning regulation in Malang City and how to control urban sprawl phenomenon with the establishment of zoning regulation, licensing, provision of incentives and disincentives as well as the imposition of appropriate sanctions.**

***Keywords*—urban sprawl; zoning regulation; urban planning**

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I. Introduction

Sprawl has been the dominant pattern of urban and metropolitan development over recent decades and one that is likely to persist into the near future. It is not merely a spatial phenomenon. The rising poverty and inequality occurring in the urban outskirts for instance, is another prominent impact due to the segregation of income classes delivered by sprawl. Apart from the generally revealed impacts the cause and consequences of sprawl towards economic restructuring and social inequalities are highly emerging [1].

Agriculture is one of the most important resources regarding food security, which now have become scarce in Malang. Similar and common among several regions in Indonesia, Malang experienced a dramatically urban expansion driven by the overwhelmingly growth of its population. The demand of lands for housing and public services made a notable increase, leading to further urban investment at the peri-urban. Peri-urbanization caused agricultural lands to decrease over years, while planning failed to deliver control and management to make sensible intervention beyond the problem. The fact that providing a spatial zoning regulation is compulsory to all local authorities across Indonesia, which means instrument to regulate and manage land use (not excluding the peri-urban) is prevalent, proves how ineffective are zoning based approaches in preventing the negative outcomes of sprawl. Indonesia in general, adopts building permit (IMB) scheme as an approval of developing urban infrastructures, including housing, commercial, etc. The peri-urban community was not introduced to this at the earlier phase of peri-urbanization, leading to uncontrolled residential development. Private developers apparently took the advantage beyond the absence of planning by dominating land acquisition, partly was done by shutting down irrigation systems, leading to abandoned farming activities. The seemingly unproductive land addressed a "reasonable" excuse for residential investment to take place in the formerly agricultural parcels.

II. Study Area

Malang is the second largest city in East Java and it has a total area of 252.136 km². Malang city is an enclave located within Malang Regency. Brantas River flows through the city, as well as Amprong and Metro Rivers. The climate in Malang city features tropical monsoon climate (Am) as the climate precipitation throughout the year is greatly influenced by the monsoon. Malang municipality has a population slightly over 800 thousand, with around 2 million people clustering in the peri-urban, making it the province's second most populous city. Corresponding with many cities in Indonesia, Malang also faces various challenges, mostly triggered by ever-growing population resulting in traffic congestions, slum areas, limited public space, flooding, and other environmental degradation.

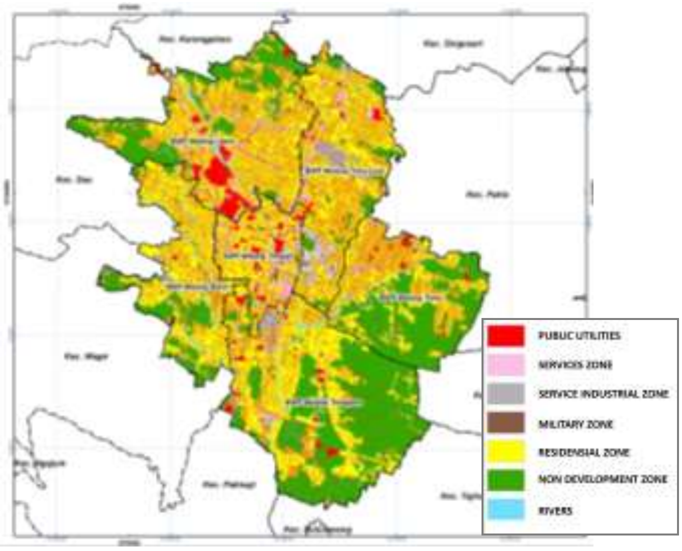

Figure 1 Land Use Map of Malang City, 2015

III. DATA SETS

The 2010 and 2015 Landsat TM satellite images and land use planning map of Malang 2010-2015 were used to identify the sprawl pattern. Detailed information about the remotely sensed images is listed. The city boundaries map, district shape file and land use maps were obtained from BAPPEDA (Regional Development Department of Malang City). The demographic details were obtained from BPS (Statistic Center of Malang City).

IV. RESULT

A. *Urban Sprawl in Malang City*

Delivering land use planning is a one of the most important government roles in the development of city-regions. As it determines the well-being and contributes to the urbans civilization, conducting land use planning with respect to public participation can lead to a robust planning and control mechanisms. When public leaders formulate new plans, they must put in place processes that actively involve citizens, interest groups, stakeholders and others. Also, where land development projects are initiated by the private and non-governmental sectors, there must be procedures that ensure that interested parties have an opportunity to express their views towards the object.

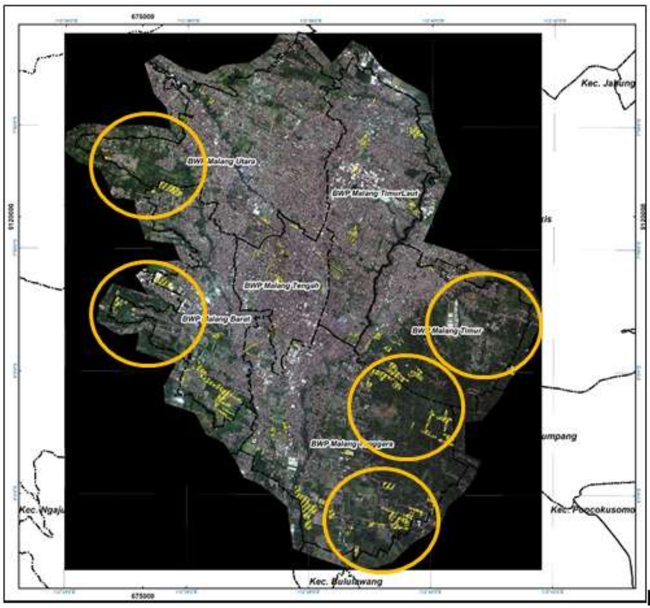

Figure 2 Urban Sprawl Map in Malang City, 2015

Based on Figure 2, it shows how sprawl delivers conflict within the of peri-urban agricultural zones. The uncontrolled peri-urbanization is happening due to the growth of the housing occupied within the formerly agricultural areas in the lowlands of Malang City. The problem situation in Malang City are [2] :

a. Conversion rate from agriculture to residential areas counts 4,5% annually
b. Malang is facing the possibility of losing even more prime agricultural parcels, causing farmers to surrender their enterprises
c. Agriculture being the main source of income for almost 70% of households, and economic transformation will trigger wicked problems
d. Demand for peri-urban housing is considerably increasing, exceeding the potential supplies.

Land use management is divided into three steps:

1. Planning/ conception

   Planning is the first step of land use management and the land use planning process steps are:
   a. Identify issues
   b. Develop planning criteria
   c. Collect inventory data
   d. Analyze the management situation
   e. Formulate alternatives
   f. Estimate effects of alternatives
   g. Select preferred alternative
   h. Prepare the final concept of spatial planning

2. Monitoring and Evaluation

   The government which work in planning and implementation need a functioning tools of control. They must be able to accompany, check, evaluate and, if necessary, correct the implementation process of the planned measures. Monitoring and evaluation requires attention and causes costs as well as work. A monitoring and evaluation system must provide information to the project management about the following:

a. Which physical degree of implementation the project has reached;
b. What ecological, social and economic impact previous interventions have had on the beneficiary population;
c. Which measures have already been taken to qualify the indigenous partner and other partner in co-operation;
d. What costs have been caused by the process.

The precondition for using monitoring and evaluation is the availability of a basis to which it can be related. This basis is the land use plan, which has been drawn up, and the monitoring and evaluation system should influence the process of its implementation.

3. Implementation

The implementation of the plan is the real and original task of the target population. It is important for the implementation that the measures have a binding character, i.e. the nature of the superior directives (e.g. identifying protected zones), the dynamics of changes of the general conditions relevant to planning and implementation as well as the participation by the intervening authorities. The implementation should be organized in such a way that the authorities concerned can participate in the measures according to their sectoral orientation.

B. *Social Network Analysis*

In this study, Social Network Analysis (SNA) [3] used to determine levels of public involvement and to identify the levels of community understanding about land use planning. The object of SNA is not only the society of Malang City, but also the government and private or non-government actors. Symbols in Figure 3, 4 and Figure 5 explain the participants, include the citizens and government in SNA:

A : City's Development Planning Board (research department)
B : City's Development Planning Board (economy, social and cultural department)
C : City's Development Planning Board (urban planning department)
D : City's Development Planning Board (data collector department)
E : Environmental agency (environmental documentation department)
F : Environmental agency (environmental control department)
G : Environmental agency (conservation development department)
H : Environmental agency (community empowerment department)
I : Department of industry and trade (Agroindustry department)
J : Department of industry and trade (metal, machinery, electronics, textiles and multifarious department and Transport equipment and telematics department)
K : Department of industry and trade (trade department)
L : Department of industry and trade (consumer protection department)
M : Department of state and public works (building regulation department)
N : Department of state and public works (highways and water resource management department)
O : Department of state and public works (settlement and urban planning department)
P : Department of state and public works (land use planning department)
Q : Department of transportation (traffic department)
R : Department of transportation (control and orderly department)
S : Department of transportation (public transport department)
T : Department of transportation (Parking area management department)
U : Department of sanitation and landscape (cemetery department)
V : Department of sanitation and landscape (Park Planning department)
W : Department of sanitation and landscape (hygiene department)
X : Head of Kedungkandang district
Developer 1
Developer 2
Developer 3
Developer 4

The steps and results of SNA are:

1) Affiliate Network

Affiliate networks obtained by multiplication matrix called Adjacency Matrix that will be used as input to a SNA calculations [4]. Questions posed to the respondents for SNA calculations are based on the community in terms of spatial planning. The results of the interview will be shown with a value of ‘1’ if the respondent who answered yes, and the value ‘0’ if the respondent answered no.

2) Rate of Participation Analysis

The level of public participation seen from the public's understanding of the spatial planning control. The level of public participation is calculated using formula (1):

$$\bar{a}_{i+} = \frac{\sum_{i=1}^{g}\sum_{j=1}^{h} a_{ij}}{g} = \frac{a_{++}}{g} = \frac{\sum_{i=1}^{g} x_{ij}^{N}}{g} \quad (1)$$

g = code / respondent
n = number of institutional
x_{ij}^{N} = primary matrix of respondents i to j

There can also be obtained from the calculation by total of Diagonal Matrix divided by Number of Respondents. Category level of participation be divided into three categories, such as:

TABLE I LEVEL OF PARTICIPATION CATEGORY

Category	Level of participation
Low	1-6
Medium	6,1-12
High	12,1-18

Rate of Participation = Sum of Diagonal Matrix / Numb of Respondents = 177/129 = 1.37.
It shows that rate of public participation is on 1.37 in a low category. It means, each respondent just understand an answer from 18 questions about land use regulation.

3) Density

The density used to see how large the proportion of respondent knowledge about land use management. The density ranges between 0-1, with the following formula

$$\Delta(N) = \frac{\sum_{i=1}^{g}\sum_{j=1}^{g} x_{ij}^{N}}{g(-1)} = \frac{2L}{g(g-1)} ; i \neq j \quad (2)$$

$\Delta(N)$ = The density / density relationship

g = node / respondents with an affiliate network with other respondents

(g-1) = Node / respondents isolated

x_{ij}^{N} = Primary matrix of respondents i to j

L = the number of lines connecting the respondents

Result of density analysis is on 0.019 (low level), it means that most of respondents are isolated. They don't understand about the regulation of land use planning, therefore they really don't care about the establishment of zoning regulation, licensing, provision of incentives and disincentives as well as the imposition of appropriate sanctions.

4) Centrality

Some of the measures can be used to determine the centrality among others

a. Degree centrality

The main actors by degree centrality is an actor with the widest network coverage with the formula:

$$C_D^{'} = \frac{d\,(n_i)}{g-1} \quad (3)$$

(g-1) = Number of respondents who are isolated
D (n_i) = Value of degree centrality
Xij = Xji = matrix adjacent to respondent i to j and vice versa

Centrality analysis help to identify the level of public knowledge about land use regulation.

TABLE II CENTRALITY RESULT

G = 129			
Centrality	C_D	C_C	C_B
Mean	0,0187	0,009	0,002
Min	0	0	0
Max	0,14	0,009	0,018
Level of centrality			
0-0,333	129	129	129
0,334-0,666	0	0	0
0,667-1	0	0	0

Based on those results in Table II, it explained on a network of SNA to be more easily to understand about classification of the respondents. There are two types of actors, first is the actors whose are not connected to the network; secondly is the actors whose are connected to the network.

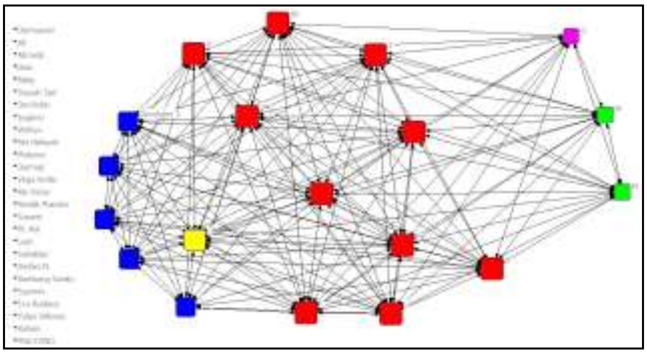

Figure 3 Degree Centrality Network

Degree centrality calculated using one-mode centrality and it has mean value on 0,0187. It indicates that the public knowledge about land use planning is still in low rate. And from the result of questionnaire about level of public participation in the planning process, it describes only 50% of respondents understand their rights to participate on it.

b. Closeness centrality

The centrality of an actor is inversely proportional to the geodesic distance. In this sense, we can see that the size closeness centrality depends on both the direct and indirect relationships, especially for non-adjacency pair of actors.
The distance between actors i is denoted as d (ni, nj) is the number of rows in a geodesic linking actors i and j, as a function of distance and the length of each path is the shortest path between the actors. Therefore, a total distance of one actor against all the other actors are $\sum_{j}^{g} = 1^{d(ni,nj)}$,

where the sum is taken over all j $\neq i$.

$$Cc(n_i) = \left[\sum_{j=1}^{g} d(n_i, n_j)\right]^{-1} \quad (4)$$

$Cc(\text{ni})$ = Value closeness centrality actor i

$d(\text{ni}, \text{nj})$= Distance actors i and j

$\sum_{j=1}^{g} d(\text{ni}, \text{nj})$= Total distance of one actor to another actor, $j \neq i$

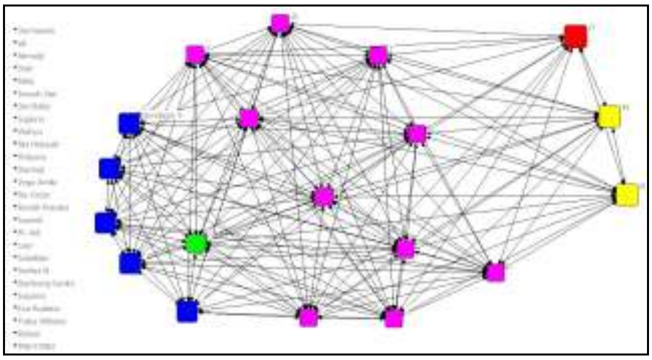

Figure 4 Netdraw Closeness

From Table 2, the value of closeness centrality is on 0,009 (in low level). It means that the relationship among respondents is in bad condition especially related to participate in planning process socialization.

c. Betweenness Centrality

Betweenness centrality quantifies the number of times a node acts as a bridge along the shortest path between two other nodes. It was introduced as a measure for quantifying the control of a human on the communication between other humans in a social network.

Betweeness Centrality utilized in the calculation of the probability centrality of communication using the path chosen by the inverse of CHF. In consideration of the different actor's probability, i, as the actors involved in the communication between the two actors which CHF (ni) be the geodesic distance relationship two actors who are both linked to actor i, so it can be formulated:

$$Cb\ (ni) = \sum_{j<k} g_{jk}(n_i)/g_{jk} \quad (5)$$

$Cb\ (ni)$ = Betweenness index

$\sum_{j<k} g_{jk}(n_i)/g_{jk}$ = Total estimated probability of all pairs of actors outside the actor's distance i from j and k.

Betweenness centrality of a central actor is the total of the probabilities in a minimum value can be 0 (zero) when n_i falls on the geodesic distance relationship without the actor. Then the number of pairs of actors are not included n_i will have a maximum value (g-1) (g-2) / 2. So the actor betweeness value is between 0 and 1, as formulated in the following models.

$$C'_B(ni) = C_B(n_i)/\ [(g-1)(g-2)/2] \quad (6)$$

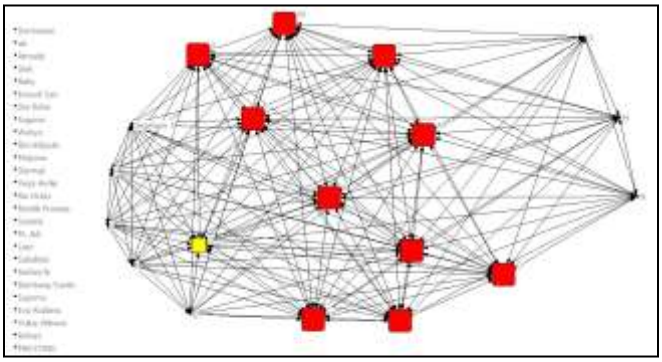

Figure 5 Betweenness Centrality

The result of betweenness centrality analysis has a mean on 0,002 (in a low rate). It determines, there is no actor as a bridge along the shortest path between two other nodes. It explain that there is no relationship among the respondents related in planning process, because we cannot find the actor who has a contribution to relate among the respondents as a facilitator.

V. CONCLUSION

Urban sprawl in Malang City has a bad impact in agricultural existence. The uncontrolled urbanization is happening due to the growth of the housing industry that occupied agricultural areas in the lowlands. Based on this situation, we tried to identify the public knowledge about the regulation and implementation of land use planning in Malang City. The result from Social Network Analysis (SNA) explain that all of steps in SNA indicate the low rate of public participation, public knowledge and public relationship in planning process. It means, there is no good government influences, especially in urban planning topic whose can makes citizens understand their rights and obligations in spatial planning. Therefore, there are many urban sprawl cases in Malang City because of the poor public knowledge.

References

[1] Squires, G. D. (2002). Urban Sprawl: Causes, Consequences and Policy Responses. Washington, DC: The Urban Institute.I. S. Jacobs and C. P. Bean, "Fine particles, thin films and exchange anisotropy," in Magnetism, vol. III, G. T. Rado and H. Suhl, Eds. New York: Academic, 1963, pp. 271–350.

[2] Adrianto, D. W. (2015). Improving The Awareness for The Common Public Interest Among All Groups of Society and Developing a Trans-Boundary Planning Regulatory Framework. Connective Cities Practitioners Workshop. Surabaya: Connective Cities.R. Nicole, "Title of paper with only first word capitalized," J. Name Stand. Abbrev., in press.

[3] Wasserman,Stanley. Katherine Faust.2009.Social Network Anlaysis : Methods and applications. New York: Cambridge

[4] Ari,Ismu R D. 2013.Communiti Based Water Managemenr and Social Capital : Social Network of Membership in Community Groups, London : IWA Publishing.

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