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Controlling efforts of green open space provision in East Malang residential areas development, Indonesia

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Abstract. The purpose of this study is to evaluate the control model of providing Green Open Space (GOS) in the development of residential areas, as an anticipative effort to develop rapidly developing housing areas. The rapid acceleration of small cluster housing construction is worsening the achievement of the quantity of GOS. This research uses a descriptive exploration approach, with spatial data analysis of the development of housing areas (large-small clusters) in the provision of green open space. The provision of small cluster housing has the potential to reduce the availability of green space by more than 68% compared to a large-medium scale. This fact has consequences from the importance of efforts to plan, control, supervise, and monitor the provision of GOS in the area of housing development. The conversion of agricultural land into residential areas in the spatial plan has to anticipate by substitute the GOS provided by the developer.

1. Introduction

One of the global issues of urban development today is ensuring the sustainability of urban development (Respati Wikantiyoso & Suhartono, 2018). The city's GOS as an element of the urban landscape has social, cultural, economic, and civic ecological issues (Manea, 2014; Newman & Jennings, 2008). The existence of urban green open space has a very strategic function to create a metropolitan area in harmony and sustainably. The question is, how can we manage green free space, which naturally becomes a natural environment conducive to harmonious, integrated, and sustainable urban human activities (Manea, 2014). One of the successes of the role of the local government is the birth of Goal Number 11 SDGs about "urban and residential occupancy that is inclusive, safe, resilient to disasters and sustainable." The role of local governments in implementing SDG's is very strategic (Hoelman, Parhusip, Bahagijo, Santono, & Hamong, 2015). That is a prominent marker of the critical part of the city and regency governments in realizing SDGs (Terakado & Williams, 2014) throughout the world (Hoelman et al., 2015).

According to Minister of Home Affairs Regulation No. 1 of 2007 concerning the Preparation of Urban GOS, Urban GOS Planning requires an ideal area of green space of at least 30% of the urban regions (Article 9 paragraph 1). The city's GOS consists of public open space and private free space (Article 9, section 2). The provisions of personal open space are the responsibility of the private sector/institutions, individuals, and communities that controlled through the use of space permits by



the City Government (Article 9 paragraph 4). The provision of urban GOS, as outlined in Law 26 of 2007, requires at least 30% of the city area for public green space. The mandate of this law is the responsibility of the City government to make it happen. Providing and utilizing the open space of the city to achieve a 30% balance is a complicated problem for local governments in rapid city development. Efforts to realize the conceptual provision of urban open space have carried out through regulatory requirements related to the provision of urban public space. However, technical regulations that have made substantially still cannot function as guidelines and directives for the provision and improvement of the quality of open urban areas (Munizu, 2010; Pannell & Roberts, 2009; R. Wikantiyoso, 2007).

2. The purpose of this study

The purpose of this study is to evaluate the control model of providing Green Open Space (GOS) in the development of residential areas and establish criteria for supervision and control of the provision of GOS in developing fast-growing suburban housing areas.

3. Methods

This research uses descriptive explorative approach (Heerink, Qu, Kuiper, Shi, & Tan, 2007; Poelmans & Van Rompaey, 2009). The determination of the sample analysis area using the stratified purposive sampling method (Chang, Li, & Chang, 2007). Following the purpose of the study to obtain a model for controlling the provision of GOS in residential development areas, the selection of samples chosen using the following criteria:

1. The research area is the area planned as a housing development area that definitively determined in the Malang City Spatial Plan.
2. The research area is an integral part of the Malang Section City Region.
3. It's a part of the urban area located in peri-urban (Conedera, Del Biaggio, Seeland, Moretti, & Home, 2015) with a high potential for the transfer of function to become an urban settlement area.
4. The pattern of settlement development in the study area has the characteristics of small-scale, medium-scale, and large-scale settlement development (The State Gazette Republic of Indonesia, 2016).

Through the analysis of the spatial data of Malang city and based on these four criteria, the chosen sample of research is the East Malang City Section Region. Spatial data analysis using aerial photographic image analysis (López, Bocco, Mendoza, & Duhau, 2001), to make the classification of settlement clusters (Muriuki et al., 2011) as well as calculating the potential area of the Green Open Space provided in each group.

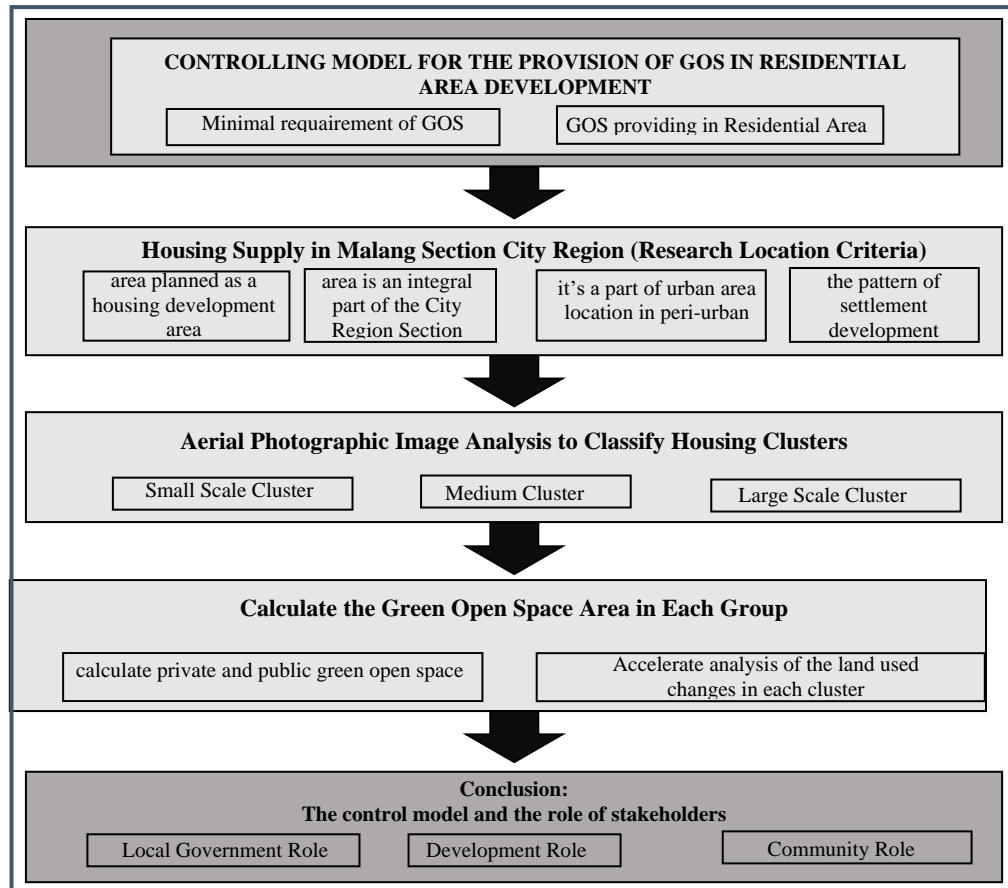


Figure 1. Schematic analysis of GOS supply control models in residential development areas

4. Result and Discussions

Greater Malang is currently developing very rapidly with three Center of growth; Malang City, Batu City, and Malang Regency that there are have different development characteristics. Malang City is the second-largest city in East Java, after Surabaya city. The Malang City Spatial Plan has formed six development areas, namely Central Malang, North Malang, Northeast Malang, East Malang, Southeast Malang, and West Malang (see Figure 2). The six development areas have different development characteristics. Because the East Malang region still has relatively large land reserves, the East Malang region has designated as a residential development area.

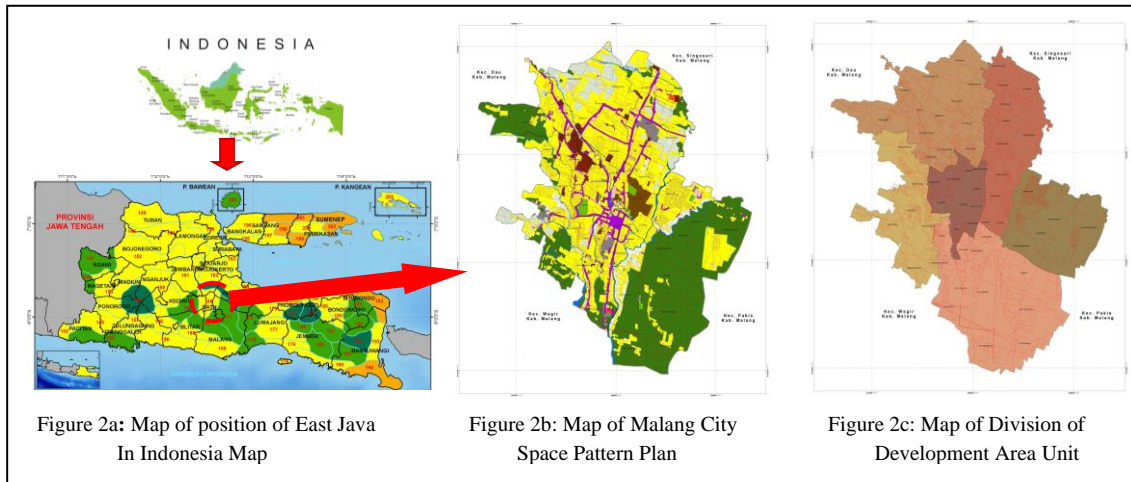


Figure 2: Map of Malang City Spatial Planning 2010-2030 (BAPPEDA, 2011b)

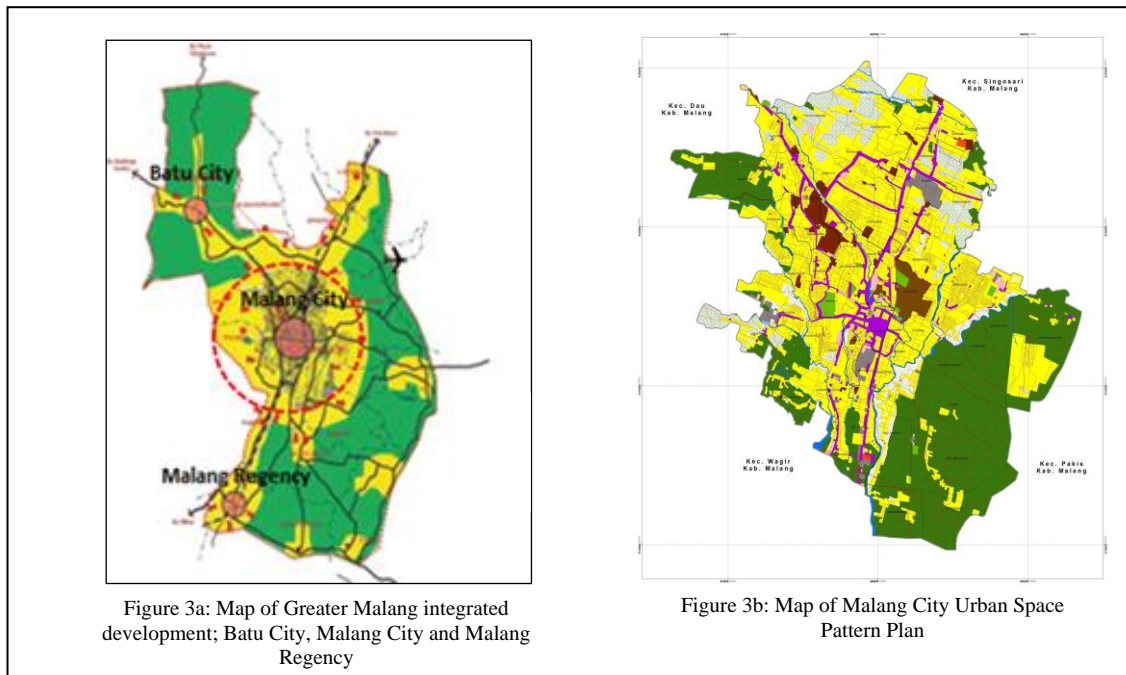


Figure 3. Map of Greater Malang and Malang City Urban Space Structure Plan

The total area of Malang is 11.006 Ha, that divided into five districts namely; Kedungkandang District (3989 Ha); Sukun District (2097 Ha); Klojen District (883 Ha); Blimbing District (1777 Ha); and Lowokwaru District covering 2260 Ha (see table 1). Malang, as an education city, is currently experiencing excessive growth with a population of 861,414 people and 436,324 new arrivals. With a population of more than one million people, it has implications for increasing housing needs in the city of Malang.

Table 1. Land used Characteristic by District in Malang City 2018

| No | Districts | Land Used Characteristic | | | Total Area (Ha) |
|-----------------|---------------|--------------------------|----------------------------|-----------------|-----------------|
| | | Paddy land (Ha) | Not Rice farming land (Ha) | Other Uses (Ha) | |
| 1 | Kedungkandang | 591 | 1,271 | 2,127 | 3,989 |
| 2 | Sukun | 226 | 704 | 1,167 | 2,097 |
| 3 | Klojen | - | 6 | 877 | 883 |
| 4 | Blimbing | 85 | 6 | 1,686 | 1,777 |
| 5 | Lowokwaru | 240 | 8 | 1,932 | 2,260 |
| Total area (Ha) | | 1,142 | 2,075 | 7,789 | 11,006 |

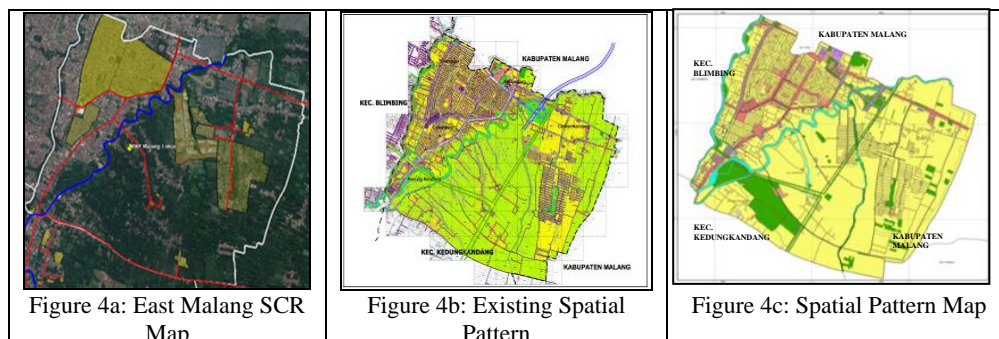
Source: Malang City in Figure (BPS, 2018).

Table 2. Malang City GOS requirements calculation by Section of City Region

| No | Section of City Region | Area (Ha) | GOS needs (30%) | | Minimum requirement of GOS (Ha) |
|-----------------|------------------------|-----------|--------------------|------------------|---------------------------------|
| | | | Private GOS (10 %) | Public GOS (20%) | |
| 1 | West Malang | 1,437.84 | 143.78 | 287.57 | 431.35 |
| 2 | Malang Center | 812.44 | 81.24 | 162.49 | 243.73 |
| 3 | Southeast Malang | 3,004.42 | 300.44 | 600.88 | 901.33 |
| 4 | East Malang | 1,678.36 | 167.84 | 335.67 | 503.51 |
| 5 | Northeast Malang | 1,767.05 | 176.71 | 353.41 | 530.12 |
| 6 | North Malang | 1,109.11 | 239.70 | 497.40 | 719.10 |
| Total area (Ha) | | 11,097.11 | 1,109.71 | 2,219.42 | 3,329.13 |

Source: Green City Development Program analysis 2012 (BAPPEDA, 2011a)

The rapid increase in housing demand by residents of Malang City has led to a rise in housing development. The development of housing in the city center is increasingly limited, so it shifts to the periphery of the city. This condition brings the consequence of land conversion, from green agricultural land to residential areas. The pattern of changes in land-use change needs to be monitored and controlled for the provision of city GOS. Figure 4 shows that changes in land function from existing conditions as agricultural areas into residential area reserves. Planning for land-use change must be done carefully and integrated between the planning and implementation of the provision of housing both by the government, developers, and individuals.

**Figure 4.** Existing Map and Spatial Pattern Plan of East Malang Section City Region

Source: Detailed Plan of East Malang Section City Region 2016-2021

Presently, the provision of GOS in Malang both public and private open spaces controlled by the government. The problem is how the government plays a role in controlling the availability of GOS.

According to the law, the local government is only responsible for providing public open space. So now the city government solely manages the provision of public green open spaces. All public areas include boulevards, parks, monuments and city gates, sports and grave fields, urban forests, and nursery and railroad security parks, spaces along the Extra High Voltage Corridor (EHVC) corridor, river banks and buffer river zones. The provision plan of public green open space in Malang City is approximately 2,350 ha. Private GOS in Malang City currently covers residential, office parks, commercial building parks, and others. Provision plans of GOS in Malang City approximately 1,383 Ha (BAPPEDA, 2011a)

Table 3. GOS requirements calculation of East Malang Section City Region based on sub-district area

| Section of City Region | District | Sub Districts | Areas (Ha) | GOS needs (30%) | | Total GOS needs (Ha) |
|------------------------|---------------|---------------|------------|--------------------|------------------|----------------------|
| | | | | Private GOS (10 %) | Public GOS (20%) | |
| East Malang | Kedungkandang | Sawojajar | 189.94 | 18.99 | 37.99 | 56.98 |
| | | Madyopuro | 405.11 | 40.51 | 81.02 | 121.53 |
| | | Cemorokandang | 494.13 | 49.41 | 98.83 | 148.24 |
| | | Lesanpuro | 309.45 | 30.95 | 61.89 | 92.84 |
| | | Kedungkandang | 179.73 | 27.97 | 55.95 | 83.92 |
| Total area (Ha) | | | 1,678.83 | 167.83 | 335.68 | 503.51 |

Source: *Green City Development Program analysis 2012*



The economic affordability approach to housing supply has more or less influenced the provision of public facilities in the form of green open space. The convenience of residential environments with beautiful and green settings is a common problem in the condition of medium-small cluster settlements. Control and monitoring of the construction of residential neighborhoods (Tu, Abildtrup, & Garcia, 2016) with small clusters do not take into account the availability of public open space. Such conditions must be immediately anticipated and prevented through licensing control mechanisms, as well as supervision of the construction. Developer housing providers divided into two, namely small-scale developers who build housing with small groups and large-scale developers who create large residential areas. Characteristics of settlements in East Malang SCR based on the scale as follows:

Table 4. Characteristics of housing in East Malang SCR

| No | Name of Housing (Year) | Settlement Classification | Area of Settlement (Ha) |
|----|-----------------------------------|---------------------------|-------------------------|
| 1 | Buring Satelit Settlement (2000) | Large scale | 60.00 |
| 2 | Bulan Terang Utama Housing (2012) | Large scale | 88.30 |
| 3 | Buring settlement stage 1 (2009) | Small scale | 1.10 |
| 4 | Buring settlement stage 2 (2010) | Small scale | 0.70 |
| 5 | Oma View Resident (2015) | Medium-scale | 7.72 |
| 6 | Cemorokandang stage 1 (2004) | Small scale | 2.00 |
| 7 | Cemorokandang stage 2 (2005) | Small scale | 6.63 |
| 8 | Casablanca Resident (2010) | Medium-scale | 8.50 |







Source: *processed from various sources*

Table 5. Analysis of land use patterns in middle and upper scale housing

| No | Name of Housing | Land Use Conversion |
|----|--|--|
| 1 |  | Construction of the Bulan Terang Utama (BTU) Housing began in 2012, with a total area of 60 hectares. BTU housing is housing dominated by small-medium type houses through government subsidies. Development is relatively fast because it supported by easier road access. The provision of public green space does not meet the requirements of 20%, and 10% of private green space. The BTU green open space for available facilities has not made by the developer yet. The Green open space dominated by median road in the main housing and distance along the EHVC with a total area of 1% or 6000 m ² . |
| 2 |  | Buring Satalelit Housing (BSH) is one of the housing in Malang, which is relatively less developed. Buring satellites build 2000. There are still many houses that have not inhabited so that the map of satellite imagery looks dominated by green areas. Public open space available even though it not appropriately managed - the GOS of BSH has provided around 2% or an area of 17,660 m ² . The BSH public open spaces are in the form of median roads, sports fields, and environmental parks. Overall, the total area of housing development is 88.30 Ha |

The policy of providing and utilizing space for the development of GOS in the city of Malang aims to maintain the sustainability and balance of urban ecosystems, which include elements of the social and cultural environment (Wikantiyoso, R & Suhartono, 2018). The purpose of GOS Provision and utilization is to improve, maintain the microclimate, aesthetic value, absorb groundwater (Bricker, Banks, Galik, Tapete, & Jones, 2017; Sedyowati, Turijan, Suhardjono, Suhartanto, & Sholichin, 2018). This effort regarding the creating the balance and harmony of the physical environment of the city (Wikantiyoso, R, 2018). The existence of Green Open Space is essential in controlling and maintaining environmental integrity and quality. Urban development control must be carried out proportionally and balanced between development functions and the environment. Malang City's Green Open Space Planning will pay attention to the movement patterns of cities that form the spatial pattern of the city of Malang. This deficiency needs to be addressed by interdisciplinary research and complemented by strong efforts by local authorities to promote sustainable land use (Saint-Macary, Keil, Zeller, Heidhues, & Dung, 2010).

Table 6. Analysis of land use patterns in small medium-scale housing

| Land Use Conversion Description | Land Use Conversion Description |
|--|---|
|  <p data-bbox="285 757 815 819">Buring settlement stage1 (2010) in area 0,70 Ha</p> |  <p data-bbox="855 757 1342 819">Omah View resident (2015) in area 7,72 Ha</p> |
|  <p data-bbox="285 1144 815 1189">Cemorokandang Stage 2 (2015) 6,63 Ha</p> |  <p data-bbox="855 1144 1342 1189">Casablanca Resident (2010) 8,50 Ha</p> |
|  <p data-bbox="285 1547 815 1592">Buring settlement stage 2 (2009); 1,10 Ha</p> |  <p data-bbox="855 1547 1342 1592">Cemorokandang stage 1 (2004); 2,10 Ha.</p> |

5. Conclusions

The main problem in the provision of housing in Malang, which is related to the condition of green open space, is the lack of control over the implementation of the specified spatial plan. Needed integrated and sustainable control efforts between the three primary housing providers, namely the government, developers, and the community. The role of these three actors has to improve their perception of the approach to housing development, not only a matter of economics that is a significant consideration. According to the concept of sustainable development, economic, socio-cultural, and ecological aspects are inseparable. The policy for issuing permits of small cluster housing providing (less than 100 houses) have to review. The development of small clusters that requires the economic-environmental burden that has to subsidize has by the local government. The role of the government in providing subsidies for environmental values is a good alternative. The conversion of agricultural land into housing areas in the spatial plan has to anticipated by replacing green open space

provided by the stakeholders. The housing provision model has to create the concept of compactness between the actors and their respective roles. The same commitments have to be made from the actors who create a comfortable housing environment and equipped with public open space facilities according to applicable standards.

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