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SUSTAINABLE DEVELOPMENT  
(1<sup>st</sup> ISORSDEV 2014)  
*by A. Tutut Subadyo*

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# PROCEEDING



INTERNATIONAL SYMPOSIUM  
ON REGIONAL SUSTAINABLE  
DEVELOPMENT

June 19<sup>th</sup>  
2014

1<sup>st</sup> ISoRSDev

Diselenggarakan Dalam Rangka



UNIVERSITAS  
**MERDEKA**  
MALANG

In Cooperation with:



PROCEEDINGS OF  
1<sup>st</sup>INTERNATIONAL SYMPOSIUM  
ON REGIONAL SUSTAINABLE  
DEVELOPMENT (1<sup>st</sup> ISoRSDev 2014)

2014June19<sup>th</sup>

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## PREFACE

Assalamualaikum Warahmatullahi Wabarakatuh

Good morning,

Selamat pagi dan salam sejahtera,

- The keynote speakers, the invited speakers,
- The honorable guests, ladies and gentlemen

Good greetings for all of us,

Allow me to welcome you to attend the 1<sup>st</sup> International Symposium on Regional Sustainable Development at the University of Merdeka Malang. This Program is held to commemorate the 50<sup>th</sup> anniversary of the University of Merdeka Malang.

First of all, let us offer our gratitude to the Almighty God for all of His Blessings and grace so that today we can organize this international symposium in a very pleasant atmosphere.

Secondly, I would like to thank and welcome all of you to the University of Merdeka Malang, especially to Dr. Samsul Ma'arif, the Head of National Disaster Management Agency of Indonesia, Prof. Peter Newman of Curtin University Australia, Prof. Zhenjiang Shen of Kanazawa University Japan, Prof. Normah Omar of UiTM Malaysia, and Prof. Robertus Wahyudi Triweko, the Rector of Parahiyangan University Bandung, and Dr. Suptono of the University of Merdeka Malang, who have been willing to be the keynote speakers in today's symposium on "Regional Sustainability Development".

Distinguished Guests, ladies and gentlemen,

On this opportunity, I also would like to convey a high appreciation to all of the committee members who make the symposium happen and possible, considering the fact that the topics discussed in this event are very relevant to some strategic global development issues. Some of the issues are follows:

- The development of landscape has changed drastically. On one side the developing countries today have become the engine of the world growth. On the other side, large numbers of world citizens are classified as poor, and they are from the developing countries. Meanwhile, in the developed countries conflict and social tensions are triggered by the gap and they have emerged as a new face of poverty.
- In the coming 2050, the world will be inhabited by nine billion people, most of whom are connected by unsustainable patterns of production and consumption, the increase of the magnitude of climate change, and the widening gap of the depletion of natural resources.

- Another issue needs considering is the current natural disaster in the world including Indonesia that are caused by unsustainable development programs and imbalance between the economics, social and environment.

Based on the complexity of the global development issues, it is necessary to change the government perspectives on the development resources.

In this matter, the government should emphasize a balance between the economic growth social aspect and environmental sustainability and place them within the limits of the planetary boundaries. Thus, the principle of the sustainable growth with equity will be a guide in formulating the global development agenda in the future. I think these are very important issues to discuss in this symposium.

Honorable guests, ladies and gentlemen

On behalf of the academic community of the University of Merdeka Malang I would like to apologize, if you might find our service in convenient during your visit to Malang.

Finally, by saying Bismillahirrohmannirrohim, I officially open the 1<sup>st</sup> International Symposium on Regional Sustainable Development.

Thank you very much for your kind attention.  
Wassalamu'alaikum Warahmatullahi Wabarakatuh

Prof. Dr. Anwar Sanusi, SE., M.Si.  
**Rector of the University of Merdeka Malang**  
Head of the Committee

The 1<sup>st</sup> ISoRSDev Schedule  
University of Merdeka Malang, East Java - Indonesia  
Thursday, June 19<sup>th</sup>, 2014  
Theme: REGIONAL SUSTAINABLE DEVELOPMENT

No.	Time	Program	Venue
1.	08:00 – 08:45 a.m.	Confirmation of <b>First Registration</b> & Getting the Symposium kits	Head Office, 2 <sup>nd</sup> floor
2.	08:45 – 09:00 a.m.	Coffee Morning / Refreshment	PPI Hall
3.	09:00 – 09:15 a.m.	<b>Opening by MC</b> <b>National Anthem: Indonesia Raya</b> <b>Prayers</b> Speech of the <b>Rector of University of Merdeka Malang</b>	PPI Hall
4.	09:15 – 09:45 a.m.	<b>Session I</b> Presentation of the 1 <sup>st</sup> Keynote Speaker: <b>Dr. Samsul Ma'arif S.IP, M.Si</b> of Indonesian National Board for Disaster Management ( <i>Badan Nasional Penanggulangan Bencana</i> ). Title: " <b>Sustainable Development for Disaster</b> ".	PPI Hall
5.	09:45 – 10:00 a.m.	<b>Session II</b> a) introduction about the book by <b>Ir. Suroptono, Ph.D.</b> b) book launching - " <b>Cities as Sustainable Ecosystems: Principles and Practices</b> " by Rector of <b>UNMER Malang</b> c) photo session	PPI Hall
6.	10:00– 10:30a.m.	<b>Session III</b> Presentation of the 2 <sup>nd</sup> Keynote Speaker: <b>Prof. Peter Newman AO</b> , Curtin University, Perth, Western Australia. Title: " <b>Sustainable Development: Is it Mainstreaming?</b> " Moderator: <b>Ir. Suroptono, Ph.D.</b> , University of Merdeka Malang	PPI Hall

No.	Time	Program	Venue
7.	10:30 a.m. – 12:45 p.m.	<b>Session IV</b> <b>Presentation of Invited Speakers:</b> 1) "Spatial Planning for Achieving Sustainable Urban Forms" – presenter: <b>Prof. Zhenjiang Shen</b> of Kanazawa University Japan 2) "Corporate Integrity System: Ethics and Integrity Benchmark" – presenter: <b>Prof. Dr. Normah Hj. Omar</b> of UiTM, Malaysia 3) "Challenges and Opportunities for Sustainable Water Resources Management in Indonesia" – presenter: <b>Prof. Ir. Robertus Wahyudi Triweko, M.Eng., Ph.D.</b> , Rector of Parahyangan Catholic University, Bandung 4) "Sustainable Building towards Sustainable Development : Principles and Practices" – presenter: <b>Ir. Suroptono, Ph.D.</b> of University of Merdeka Malang <b>Questions and Answers:</b> Moderator: Dr. Kun Aniroh, SST.Par.,M.M.,MP.d of University of Merdeka Malang	PPI Hall
8.	12:45 – 13:00 p.m.	<b>Awarding souvenirs to the invited speakers by Rector</b>	PPI Hall
9.	13:00 – 14:00 p.m.	Lunch Break ( <i>Ishoma</i> ) corresponding with Cultural Performance of <b>Anggana Raras Gamelan, Unmer Malang</b>	PPI Hall
10.	14:00 – 14:15 p.m.	<b>Second Registration &amp; Getting snacks</b>	Head Office, 2 <sup>nd</sup> floor
11.	14:15 – 15:45 p.m.	<b>Session V</b> Presentation of <b>Call Papers</b> Participants Social Sustainable Development Moderator: Prof. Dr. Bonaventura Ngw MS.	Room 1: Puskom / 1 <sup>st</sup> floor
		Economic Sustainable Development Moderator: Prof. Dr. Grahita Chandrarin, M.Si., Ak., CA	Room 2: R. Rapat/ 2 <sup>nd</sup> floor
		Environment Sustainable Development Moderator: Dr. Praptining Sukowati, S.H., M.Si	Room 3: PPI Hall / 3 <sup>rd</sup> floor
12.	15:45- 16:00 p.m.	Closing (in each room)	

**Note: all the activities of the 1<sup>st</sup> ISoRSDev will be conducted at the Head Office of University of Merdeka Malang.**

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## THE ROLE OF GREEN INFRASTRUCTURE FOR GREEN CITY (A Case Study in Malang City - East Java Province)

H.A.Tutut Subadyo

Architecture Department, Merdeka University, Malang

### Abstract

Green infrastructure is a fundamental part of urban development and management in sustaining the quality of urban environment and the welfare of urban dwellers. A high rate of population growth and limited land owned causing the growth of physical development in the city is done by converting such green open space, agricultural land, forest and other open space for urban development. Green infrastructure was one of city development concept to control development as a strategy for land conservation by establishment of hubs and links as boundary of development. A research to implement green infrastructure concept was carried out in Malang City. This research was aimed to identify hubs and links in Malang city as green infrastructure network and found an implementation strategy. Methods used are: Gap analysis; GIS analysis and; English Natural Greenspaces criteria. The results show that Malang city has landscape typology that can enhance to become hubs and links in green infrastructure concept, like: town parks, urban forest, and riparian river, street corridor, and also area along high electrical network, train trail, lakes, and specific location. The green infrastructure network in Malang city is about 23% (agricultural area =2420.9 ha; open space =439.9 ha; bush/schrubs =110 ha; tree canopy =440 ha; and water bodies =110 ha). Establishment of the green infrastructure network as conservation area is the strategy for implementation of the green city concept.

*Keywords: greeninfrastructure, network, hub, links*

### Introduction

The intensive physical development in Malang city can degrade the quality of the environment such as air, water and other natural resources, which can affect the quality of the people's life in Malang city. Therefore we need a clear foundation plan to set the location of green infrastructure in the form of natural resource conservation areas and agricultural lands and other open areas connected by a natural network in an inseparable unity.

Nowadays, the concepts of development considering more on the environmental aspects have colored the urban and regional

planning. One of the basic concepts that evolved since the 1980s is the eco-city that shows the relationship of a series of issues of urban planning and economic development through social justice by promoting local democracy in the context of sustainability.

Dimension of sustainable development is one of the basic objectives of the eco-city concept. In this context, there should be a balance of economic development, social and environmental, and does not exceed the carrying capacity and land suitability of an area. Determination of the structure of space and proper spatial pattern becomes absolutely necessary for the development of urban areas.

From the outset, the 'back to nature' concept is needed to solve environment problem in Malang city. During 2000 – 2011, landcovers that have been changed from vegetated area into residential areas in Malang city was 10,31%. In line with the growth of population, landcover change from naturally vegetated area to build-up areas also increased rapidly and several types of landcover changes tending to increase temperature significantly are : residential, industry, and bare land This fact impact environment problems in urban area. Facing this problem, green infrastructure was introduced to minimize environment problems because of negative effect of urban activities. Yet, several constraints were also faced, for instance limitation of available land for urban green infrastructure and conversion of greenspace.

Based on sustainable spatial planning, it can be made of a solid infrastructure (grey infrastructure and green infrastructure) planning to support the economic life, social and environmental problems in urban areas. Grey infrastructure and green infrastructure should be developed and planned by the aspect of sustainability to achieve progress for a smart regional growth (Davies, C, MacFarlane, R, McGloin, C, Roe, M.2004).

This study is based on the reduction of natural lands in Malang city which have turned into a build-up/developed area. The tendency of population growth in the city to meet the requirements of built-up area has increased. This condition is expected to see the trend of the growing population and build up area in the future. This sets the minimum area requirements of green infrastructure that must exist. On the other hand, there is an open space that has the potential to be upgraded as green infrastructure.

Subsequently, the making of green infrastructure network will be based on the current conditions and needs in the future. The green infrastructure plan is expected to be the basis for development of the city to support economic activity in a more efficient society (smart growth). The concept refers to the principles of urban development in a balanced

consideration of environmental aspects in addition to the economic and social aspects (eco -city) to achieve sustainable urban development.

### **Green City and Green infrastructure**

Green city is known as ecological city. Ecological city can also be regarded as a healthy city, meaning that there is a balance between development and progression of cities under environmental sustainability. Under the terms of the Department of Public Works, Republic of Indonesia (2011), the city can also be called a sustainable green city (city sustained) or eco - city (city -based ecology), the city in carrying out the development is designed by considering the environmental aspects and benefits so that the function can be sustained. Green city can be realized if the people living in them to make savings (minimization) energy and water utilization. It also did cause hot exhaust minimization, as well as to prevent water and air pollution.

There are some legal aspects regarding the development of green cities in Indonesia such as stamped on the UU. No. 26 of 2007 on Spatial Planning, Article 29 stated that the green open space that must exist in urban areas is at least 30 % of the area of the city, with a proportion of 20 % and 10 % of public green space private green space. In addition there is the UU No. 32 of 2009 on the Protection and Management of the Environment, UU No. 24 Year 2007 on Disaster Management, UU No. 7 of 2004 concerning the Management of Water Resources and UU No. 28of 2002 on Building Code.

According to the Department of Public Works, Republic of Indonesia (2001), to create a green city, every city can apply the eight indicators (attributes) green city in stages which include : (1) improving the quality of spatial planning and urban design that is sensitive to the green agenda (green planning and design), (2) an increase of amount and quality of green space ( green open space), (3) the application of green

building (green building), (4) waste reduction and management of waste (green waste), (5) the development of the sustainable transport system (green transportation), (6) the efficiency of resource utilization and zero water run-off (green water), (7) the use of energy efficient and environmentally friendly (green energy), and (8) a network of cooperation between government and society (green community).

Eco-city is the rationale that refers to the principles of urban development that is balanced and sustained. The concept has a mission to build towns and in ecological balance with nature. This concept requires appropriate spatial management plans and infrastructure development planning that supports the natural balance in the principle of sustainable development (Comhar, 2007).

The basic principle is the concept of green infrastructure connecting natural areas that have ecological system in the area with sufficient and uninterrupted (hubs) using natural corridors that have intertwined relationship between landscape of natural land (Weber, 2003). The relationship can help reduce the loss of open space due to fragmented functions.

Green infrastructure connects a variety of natural landscape resources as reserves of natural ecosystems which have the characteristics that made the system hubs and links (Benedict & McMahon, 2006). John Olmsted and Frederick Law Olmsted Jr. said that the connected system of parks and gardens in the form of lines will provide much better usability and completeness compared to a number of isolated / separated gardens.

Green infrastructure is an important solution to solving the issue of sustainable growth. Green infrastructure consists of three main systems namely hubs, links and sites (Larcombe, G. et al. 2003). Hubs are anchors of a network of green infrastructure and provide a natural ecosystem component. Hubs can be composed of various shapes and sizes such as protected areas, protected areas, and national parks and so on. Links on the other

hand is the component that connects the links between hubs, maybe by the way of water, river, green belt and the road network. Green infrastructure is also equipped with smaller sites of hubs and may or not be connected with the hubs. Site in fact can be a park or green space located in residential communities and recreational areas, natural attractions. According to (Weber, T, 2003; Davies, R.G. Barbosa, 2008), a fragmented area is the beginning of the loss of the components of the environment and land matters. Green infrastructure and physical infrastructure (green/grey infrastructure) is actually difficult to be separated. Both have the necessary elements to support human life and complementary.

#### Methods

This research was conducted from January until June 2014 in Malang city. The study area is located in Malang city – East Java – Indonesia, approximately between  $112.06^{\circ}$  -  $112.07^{\circ}$  East Longitude  $7.06^{\circ}$  -  $8.02^{\circ}$  South Latitude. In Malang city, number of population tends to increase every year. Malang population reached 820,243 at the end of 2010, and it increased almost 1.1 times higher than 2005.

The types of data that was used for this research are: primary data (ikonos 2010), secondary data used to accomplish this research is Malang city administrative map was used for geometric correction as referencing. A polynomial rectification with linear order was selected and applied using ground control points.

This research used Gap Analysis, GIS analysis, and English Nature Greenspaces criteria to find out the actual condition of Malang city and evaluate the role of green infrastructure and compare it with the ideal condition of green city concept and evaluate the implementation with scoring method.



Figure 1. The research area

## Results and Discussion

### a. Ecosystem and Biophysical Condition

Malang city is one of the tourism destinations in East Java because of the natural potential and climatic owned. Astronomically Malang is located at position  $112.06^{\circ}$  -  $112.07^{\circ}$  East Longitude  $7.06^{\circ}$  -  $8.02^{\circ}$  South Latitude with the following boundaries:

1. North : Singosari district and Karangploso district, Malang Regency
2. East : Pakis district and Tumpang district, Malang Regency
3. South : Tajinan district and Pakisaji district, Malang Regency
4. West : Wagir district. Dau district Malang Regency.

The total area is 110.06 km<sup>2</sup> and Malang city is divided into five districts. The districts are Kedungkandang, Sukun, Klojen, Blimbing and Lowokwaru. Malang has a elevation of between 440-667 meters above sea level. Malang is flanked by several mountain ranges, rows of Kawi Mountain and Panderman Mountain, Arjuno Mountain, and Semeru Mountain. Flowing river in Malang city are the Brantas River, Amprong and Bango.

Based on the extent of the percentage area of the city, Kedungkandang region is the largest district of Malang city. The area of the Kedungkandang District is 39.9 km<sup>2</sup> or 36.2 % of the total area of Malang city. Lowokwaru District is the second largest region with an area of 22.6 km<sup>2</sup> or 20.5 % of total Malang city.

Land use in Malang city is dominated by build-up area with a total area of 6902.7 hectares, while total area of an build up area is 4102.9 hectares. Land use data showed that inequality of land use is likely to continue to grow for settlement construction and other economic facilities. Policies that are not oriented to the alleged environmental impact on the reduction of the allotment of land for open space and green area of trees which led to a decrease in the quality and comfort of urban life. Uncontrolled land conversion caused reduction in ecological growing space. From the data it is known that the proportion of build up areas is 62.4 % of the total area and un-build up area is 37.3 %.

Malang city ecosystem consists of residential, office area and trade, industry, urban forest, green open spaces, gardens, fields, lake, and river. Total area is 110.1 km<sup>2</sup> Malang city. Malang city ecosystem, based on the results of the statistical analysis related green city (site statistics), it is known that the area of land use percentage area of 5609.9 hectares or 51 % of the total area of the city; agricultural area 22 % or 2420.9 hectares; open space 4 % or 439.9 hectares; bush 1 % or 110 hectares; tree canopy 4 % or 440 hectares; and water bodies 1 % or 110 hectares.

The area of canopy cover of trees in Malang city based on GIS analysis, covering 440 hectares or 4 % of the total area as a whole. The area of green open space Malang city based on the results of the analysis are composed of 23 % of productive open space (fields, moor, shrubs) and a body of water such as riparian areas.

#### **b. Conditions of Urban Green Infrastructure (UGI) Malang**

Urban green infrastructure in Malang city is divided into three categories based on function and form. These types, are among others urban green infrastructure with ecological, economic social and architectural functions. Urban green infrastructures with useful ecological functions such as water and soil conservation areas, wildlife habitat networks, as well as lower levels of air pollution and prevent flooding.

Forms of UGI with ecological function is the city, garden city, the region and the green line, demarcation own ends, and the railway track under high voltage. UGI with socio-economic functions of forest in the form of Malang city, city parks, sports fields, parks and recreation parks and residential housing environment. The UGI is useful as environmental education, recreation and social interaction space city. UGI with architectural function of Malang city is useful for neatness and regularity of the town, comfort and beauty of the city. The UGI region can be green lane, street corridor landscape, squares and city monuments, neighborhood parks and commercial buildings as well as roads and median lane road safety (Williamson, 2003; Davies, R.G, 2008).

To develop a plan of urban green infrastructure, it must first be noted that the condition of the existing land use. Of the land use map can be seen where the needs of urban green infrastructure in each zoning district that urban green infrastructure development plan is expected to come as needed (Davies, C, Mac Farlane, R., Mc Gloin, C, Roe, M. 2004).

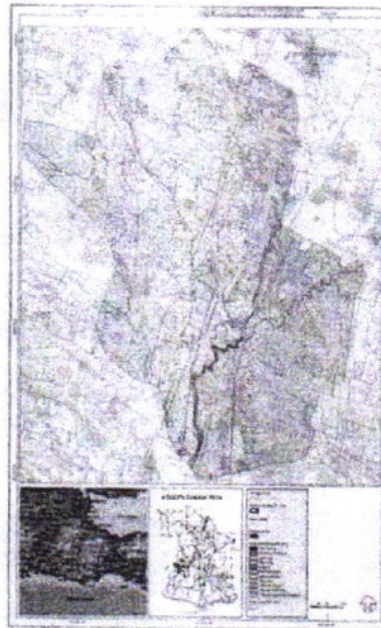


Figure 2 Landcover of Malang city (Nugroho, 2011, processed)

Identify the types of urban green infrastructure already available in an area to be considered in determining the type of urban green infrastructure to be built. This means that the spread of urban green infrastructure can be more varied and complementary. For example, if the area has a lot of built urban green infrastructure for social functions such as community gardens, it can be considered to build the urban green infrastructure to function as an urban forest ecology (Regulation of the Minister of Public Works, Republic of Indonesia No.5/PRT/M/2008).

Both public and private urban green infrastructures have several major functions such as ecological functions and additional functions, namely socio-cultural, economic, aesthetic/ architectural. Especially for urban green infrastructure with a social function as a place of rest, and exercise facilities or play areas, should have good accessibility for all people, including accessibility for persons with disabilities (Pham, 2007; Davies, R.G, 2008).



Figure 3 Characteristic of UGI and Spatial Ecosystem Malang City (Nugroho, 2011, processed)

To facilitate discussion of the image of the urban green infrastructure, Malang city is divided into two, namely in the form of urban green infrastructure hub (area) and link (line) which is divided into each section of the City (BWK).



Figure 4. Distribution Map of UGI at Malang BWK West, Central and East

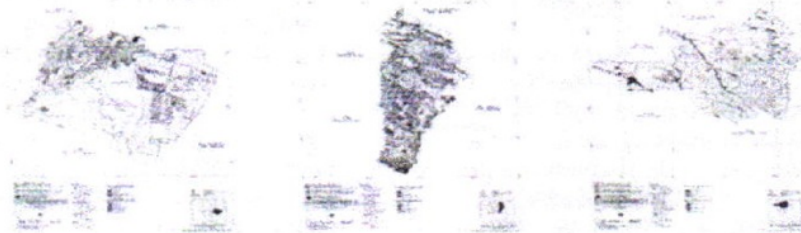


Figure 5. Distribution Map of UGI at Malang BWK East, Northeast and North



### c. Green Infrastructure Development in Malang City

According to geographical conditions, Malang city had been planned for infrastructure development that blends with the natural green mountains surrounding the city. Green infrastructure planning is supported by a variety of plants that grow fast under cool weather all year round. One characteristic spatial arrangement Malang is the presence of open spaces / parks, starting from planning Thomas Karsten (1933); landscaping/open space in Trunojoyostreet representative; Kertanegarastreet; Gajah Madastreet, Merbabustreet, Ijenstreet, and Suropatistreet. In addition to the open space to support the existence of government buildings, parks cater for the interests of the Dutch people who live in the elite residential area on Ijen Street and surrounding areas. Civic center and the residential areas, hitherto retained as the area can be preserved as a historical monument inception Malang.

Calculation of green infrastructure in Malang city conducted in accordance with the approach in the development of technical guidelines for housing and environment, where the calculation is done based on the number of people served and calculated projections forecast a population of 20 (twenty) years, until the year 2030.

The plan of the functions and benefits of green infrastructure in Malang city is as follows:

- Ensuring the availability of oxygen in sufficient quantity and at all times;
- To create a healthy climate, clean air free of pollution;
- To create calm, comfortable, clean and beautiful atmosphere;
- To control water system (hydrology) and allows for optimal byproduct derived from productive plants deliberately planted in a secure location on the medium of pollution of soil, water and air;

- As a backup location for the purposes of the city's sanitation and urban sprawl;
- As a recreation area where residents can carry the form of recreational activities, active recreational activities such as sports fields and passive recreation such as parks.
- As a place to work, where the population livelihood from the land use sector directly as agri-food, flowergarden and ornamental plants business.
- As a maintenance space, a space that allows the government to perform maintenance urban elements such as track maintenance and gutter along the river as a city corridor.
- As a safety chamber, which is vital to protect an object or to secure a man from such elements that can harm the green belt along the high voltage power lines, lines around military installations or power plants or buffer areas?
- As the space to support the preservation and protection of natural environment, namely the conservation or preservation of natural areas to secure the possibility of erosion and landslide, riverbank protection, preservation of water catchment areas.
- As the alternative build up area development in the future.

The plans for the provision and utilization of green infrastructure planning in Malang city are as follows:

- Maintenance and preservation of green areas remaining infrastructure, as specified in the layout plan of the city.
- Development of Orchid Garden in Kedungkandang equipped with facilities and infrastructure.
- Develop Smart Park Housing Dieng region, Araya, and PermataJingga.
- Development of Technology Parks directed at the town square, square monument, Velodrome which is equipped with a

- gazebo and shelter. Also each housing area is geared to provide technology park.
- Development of the Rampal field as Technology Park, Field Performance, and Exhibition.
  - Improved GOR as Ken Arok Sports Park in Malang city
  - Complete and maintain city parks that already exist, as well as possible and based on the fundamental principles of green infrastructure functions (identification and beauty) of each location.
  - Development of green infrastructure and public buildings home page, as well as a rooftop (rooftop garden), with aerofonic or hydroponics plants, and the like by building owners
  - Development of green infrastructure as a safety zone on the railway track; river banks; main channel high voltage border, an industrial areas.
  - Recreating and securing natural green pathways, such as along the edges of roads, highways, fly-over, general cemetery, and sports fields, from occupational settlements.
  - Provision of green belt and parks in the city and directed the District Kedungkandang, other than that in any ring road.
  - Provide specific characteristics in strategic places, such as the boundaries of the city and town square.
  - Rejuvenation and improvement of the quality of the plants on the main roads of the city, the appropriate classification.
  - Development of urban forest and nurseries on the East Malang region (District of Kedungkandang) relatively still a lot of undeveloped land.
  - Development of parks in each neighborhood unit.
    - Green Infrastructure Park Neighborhood Unit , with the following criteria:

This area of the park is at least 1 m<sup>2</sup> per resident neighborhood unit, with a minimum area of 250 m<sup>2</sup>. The location of the park is at a radius of less than 300 m of homes served. The area planted with crops (green space) a minimum of 70 % - 80 % of the area of the park. In addition to the park is planted with a variety of plants, there are also at least three shade trees of small trees or

- Green Infrastructure Pillars Park Residents, with the following criteria:

Garden area of at least 0.5 m<sup>2</sup> per resident RW, with an area of at least 1,250 m<sup>2</sup>. The location of the park is at a radius of less than 1000 m from the houses it serves. The area planted with crops (green space) a minimum of 70 % - 80 % of the area of the park, the rest can be paved courtyard as a place to perform various activities. In addition to the park is planted with various plants as needed, there is also a minimum of 10 of the protective tree species of small or medium.

- Infrastructure Green Park Village, with the following criteria:

The vast park of at least 0.30 m<sup>2</sup> per inhabitant village, with a garden area of at least 9,000 m<sup>2</sup> the location is at the village park in question. The area planted with crops (green space) covering at least 80 % - 90 % of the area of the park, the rest can be paved courtyard as a place to perform various activities. In addition to the park is planted with various plants as needed , there is also a minimum of 25 of the protective tree species of small or medium for the active type of garden and at least 50 of protective tree species of small or medium for this type of passive park.

- Park District of green infrastructure Minimum area of the park is 24,000 m<sup>2</sup>. The location of the park is at the respective districts. The area planted with crops (green space) covering at least 80 % - 90 % of the area of the park, the rest

can be paved courtyard as a place to perform various activities. In addition to the park is planted with various plants as needed, there is also a minimum of 50 of protective tree species small or medium for the active park and a minimum of 100 of annual tree species of small or medium for this type of passive park.

- Rehabilitation park area as a supporter of city monuments.
- Improved function of open land into a city of green infrastructure.
- Development of green infrastructure in the border areas of the city region.
- Establishment of protected areas according to the characteristics of the area as an icon of support.
- Increased funding from government, private, and non-government adequate for urban green infrastructure program.
- Revitalization Malabar Urban Forest
- Increased community participation in the management of green infrastructure
- Implementation of the incentives and disincentives preservation of green infrastructure.

Model development policies in an integrated green infrastructure in Malang city formulated to sustainable urban development that begins with the desire of the public to obtain urban services (urban services) in order to better the quality of life increases. In addition, the government of Malang city there is a need to develop strategies and policies for urban development of environmentally sound and sustainable. The needs come from the pressure in Malang, and the demands of the citizens who expect that their quality of life has not decreased and from the other side of Malang city's government still can serve and maintain urban services properly in order to be a livable city (liveable) and corresponding the human habitat (habitable)

Phenomena that occur in Malang city in urban dynamic is the urbanization process that

quite rapid due to economic growth and urban concentration thus causing the gap with regions surrounding area (Malang, Pasuruan and Blitar). This resulted in the need for space and land in Malang city is increasing and occurring utilization of natural resources and the environment is more intensive. This situation raises conflict utilization of space, natural resources, and the environment because of the limitations of the supply side. In addition, the growing population of Malang city has led to increased production of solid waste both solid and liquid waste significantly. Increased concentration of waste and utilization of space is increasingly congested and not managed properly pollution impact on the environment as well as disruption of the balance and the carrying capacity of the environment.

Infrastructure in Malang city that support economic, social and environmental carrying capacity needs to be managed in an integrated manner in order to bridge the problems between needs and available capacity efficiently and effectively in order to realize the development of urban areas environmentally sustainable by identifying influential indicator based DPISR (Driver, Pressure, Impact, State, Response). By identifying indicators or variables that affect it can be seen that the problems faced in relation to the performance of infrastructure services in Malang city.

The development model of integrated green infrastructure policy in the early stages of the city is to develop strategies and policies for environmentally sound development. In the model development policy in Malang city needs to be seen and the system functions related components between the interests of stakeholders from the economic, social and ecological. Factors necessary to find a lever (leverage factors) of green infrastructure can promote the establishment of improved efficiency and effectiveness to achieve sustainable development in Malang city.

To realize the Malang city as a sustainable green city (livable, equitable social, cultural, productive, and balanced), it

is necessary to have sufficient economic growth, full employment, good environmental carrying capacity, adequate green infrastructure and regional capacity enough.

### Conclusions

From the foregoing discussion, the following are some conclusion derived:

1. Based on the gap analysis can be seen that the application of green infrastructure as one of the eight indicators of green city's concept in Malang city reached scoring 57 %. This is because the development of green city's concept in Malang city has been running for over one and a half years so it still needs to be improved in terms of both quantity and quality. The scoring value of the role of green infrastructure is relatively quite high due to the existing condition of Malang city that from the beginning designed as a garden city and still have a green open space adequate public.
2. The availability of green infrastructure in Malang city in 2014 was 130.3 hectares was not sufficient for total population of Malang city. Malang has had a city development plan towards sustainability city, but the implementation still have not been maximized. The implementations not been spread through the region.
3. A dynamic life in Malang city, and has undergone ecological deficit requires city planning and design approach on an on going basis and should be based on the recognition of diversity and the interconnectedness of all sectors and locations. Approach to design plans to Malang green city becomes essential that occurred sustainability.
4. Dispersed from with structure of green infrastructure (hubs and links) have equal role and effectiveness toward green city development.
5. In developing the concept of green cities, the future of Malang city's government should immediately implement the eight

indicators of green city's concept (green planning and design, green open space, green building, green water, green transportation, green waste, green energy, green community) and not only focused on green infrastructure (green open space) indicator.

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