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To cite this article: A Safrilia and D Poerwoningsih 2021 *IOP Conf. Ser.: Earth Environ. Sci.* **780** 012032

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Green space as potential for forming a sustainable city

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Abstract. The growing of development in Malang City, Indonesia has unwittingly brought an impact on changes in land use and exploitation of natural resources. With this development, it also affects the amount of Green Open Space. This study aims to determine how much benefit is obtained in increasing the area of green open space in Malang, given the importance of green space in improving the quality of the urban environment, as well as how architects implement components to support the creation of green open spaces that are safe, inclusive, and accessible. The method used is descriptive qualitative. The expected result is to be able to find out how much influence the amount of Green Open Space in Malang City and what components are needed in order to create a Green Open Space that is safe, inclusive, and accessible.

1. Introduction

To achieve a sustainable environment, one of the government programs is to implement the Green City Development Program by developing the development of Green Open Space in Urban Areas. This development is in the form of urban forests, urban green lines, city parks, tourist parks, burial sites, yards, agriculture and plantations. A good composition of regional green open spaces is 30% of the area, 20% is public green open space and 10% is private green open space. Public Green Open Space is that which is owned and managed by the city / district government which is used for the benefit of the community in general.

Green space in Malang City, Indonesia in 2019 is still an area of 1,045 Ha or equivalent to 9.5% of the total area of Malang City, namely 11,006 Ha, which must reserve 30% of RTH or 3,301 Ha. As a result of the reduced green open space in Malang City which has been converted into concrete buildings, it has resulted in environmental damage, namely air pollution with an uncontrolled increase in the number of vehicles. The lack of water catchment areas has resulted in the city of Malang, which is located in a highland area, experiencing flooding during heavy rains. Therefore, it is natural that Malang City is often hit by floods with the weather getting hotter.

Green space in urban areas is needed because of its function and role as a place for people to socialize and have recreation as well as an alternative place to rest for fresh air at a very low cost. The existence of urban green open spaces is one of the solutions in improving the quality of the urban environment, where the impact that we feel most easily is the effect on health, comfort, aesthetics and environmental preservation [1]. The social benefits of urban green space include integration within and between different ethnic groups [2].

The concept of sustainability put forward by environmentalists started out of concerns about the long-term consequences of stressing natural support systems. The purpose of development is to support increased economic activities that ensure the sustainability of natural resources and the environment [3]. To realize a sustainable city, there are several indicators that can be used, namely ecological, economic,



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and social [4]. Sustainable development is a goal motivated by a vision of balance in the relationship between economic, social, and environmental (ecological) in order to build a stable, prosperous and quality society [5]. Green and public spaces must be safe, inclusive, and accessible to all people. However, in Malang City, most women and children do not feel safe in public spaces, feeling worried about the occurrence of criminal acts such as abuse, mugging or kidnapping children, especially after dark or when walking alone. Each city must develop with its own character, and more importantly, how the city is able to accommodate its future development while maintaining an area that functions to protect the life of the city and its people is one of the main targets of the Sustainable Development Goals. This research on green space aims to determine how much benefit is obtained in increasing the size of the green open space in Malang, as well as how to implement components to support the creation of safe, inclusive and accessible Green Open Spaces, as a strategy for providing Public Open Space that refers to the concept of Sustainable Development.

2. Methodology

Using a rationalistic approach which is a method by gaining a deep understanding of the dimensions and interactive relationships between the instrument and the research objectives which will then be abstracted into a conceptual model related to the relationship between the two.

The data collection process was carried out by means of a survey which consisted of primary data surveys (field) conducted by conducting field observations and interviews with resource persons. Meanwhile, secondary data survey (institutional), in order to obtain data on the elements that form green cities and data on the area of green open spaces in urban areas in Malang, it is carried out by accessing data from related technical agencies and conducting development policy studies on green open spaces. been done.

This interview also uses a questionnaire as a tool for researchers in writing a list of questions. The questionnaire used in the activity was semi-structured question and answer. In this study, interviews were conducted to explore government and user preferences for the needs of green space and public development, where the indicators are abstract or cannot be observed by the five senses simultaneously. Observations include:

1. Knowing about the existing buildings around the park
2. Activities and rides or games in the park
3. Pedestrian around the park both inside and outside the park.
4. Elements in the garden such as fences, seats, trash cans, toilets, ventilation and lighting.
5. Vegetation and trees and plants around the park

Qualitative descriptive analysis is carried out to describe systematically the facts and characteristics factually and accurately. This analysis is to analyze what factors influence people's choice of green open spaces that have a level of comfort, which means safe, inclusive, and accessible to all levels of society. The results obtained are then compared with the criteria for green open space that supports sustainable city programs and their relation to safe, inclusive, and accessible green open spaces.

3. Results and discussion

3.1. *The existence of green open space*

Analysis of the Availability of the Amount and Distribution of Green Open Space in Malang city, Indonesia.

3.1.1. *Analysis of the amount of green open space in Malang.*

- a. Calculation of the area of green open space in Malang City is calculated based on the provisions of the Law on Spatial Planning Number 26 of 2007, then the area of public green open space is at least 30% of the total area of the urban area = 3,301 Ha.
- b. Based on Existing RTH Calculations in Malang City of = 1,045 Ha

3.1.2. Analysis of the distribution of RTH Malang City. From the analysis, from 5 sub-districts in Malang City, all regions have a percentage of green open space less than 30%.

Table 1. Formatting sections, subsections and subsubsections.

No	District	Area (ha)	Area Of Green and Public Space (ha)	Area Of Green and Public Space (%)	30% requirement of the area
1	Blimbing	1.777	227,56	12,8	not eligible
2	Kedungkandang	3.989	285,25	7,1	not eligible
3	Klojen	883	125,36	14,1	not eligible
4	Lowokwaru	2.260	280,53	12,4	not eligible
5	Sukun	2.097	126,61	6	not eligible
	Total	11.006	1.045,31		

The results of the calculation show that the need for green open space in the city of Malang to meet the government requirements is 2,256 or 20.4% of the total area of Malang City. The district with the largest area, namely Kedungkandang and Sukun, has a small area of green open space, so the government has a program for making city parks in the two districts.

The results of data analysis obtained from questionnaires and interviews with the government, found what factors affect the availability of green open space in the city of Malang, namely:

- Population density factor
- The factor of immigrants and migrants
- Land limitation factor
- Community participation factors
- The factor of private involvement
- The factor of limited funds
- Government commitment factor

3.2. Safe, inclusive and accessible green open space analysis

In the Habitat III conference held in Quito, Ecuador in October 2016, there was a follow-up to the city development program in Kuala Lumpur, Malaysia, how to create an inclusive public space. Produced several criteria, namely:

- The public sphere should not support certain groups.
- Inclusive public spaces work in ways that make people of all ages and cultures feel safe and comfortable in them.
- Inclusive space can only flourish if it is open, free and accessible at any time.
- Inclusive space must respect and recognize the needs of all genders and recognize children as active users of space.
- Public spaces can be accessed if they are well integrated and connected to surrounding land use and transportation options.
- Inclusion depends on real participation.

3.3. Green open space infrastructure at a regional scale

From the results of surveys, interviews and questionnaires dominated by young women and mothers, they told them what they wanted for a green open space. Comfort and safety are ranked first in the design of a green open space. Because women want comfort and safety for them when they are alone or a mother who wants her children to be safe while playing. While for men want a special smoking area and wifi area. Some people agreed that they wanted a large parking area, and the location of a green open space that was easily accessible by various means of transportation.

Data on the distribution of green space in the city of Malang becomes a reference for researchers to take samples of green open space in Malang, to be compared with the criteria for safe, inclusive, and accessible green open space. For more details, here are the green open spaces that the researchers reviewed:

3.3.1. Singha Merjosari Park. Singha Merjosari Park is located on Jalan Mertojoyo Selatan, precisely in front of Dinoyo Baru Market, Merjosari Village, Lowokwaru District. This park has made an achievement as a city park with the best design in Indonesia. The detail can be seen on table 2, table 3 and figure 1.

Table 2. Singha Merjosari Park.

No	Characteristic	Information
1	Area (m2)	10.766 m2
2	Time Inauguration	February, 2013
3	Vegetation	Green condition is good and well maintained. However there are still many spots with lots of weeds.
4	Facility	<ul style="list-style-type: none"> • There is circulation for pedestrians however there are no facilities for disabilities • Socio-cultural facilities, there are benches garden as well as several gazebos that can be used for gathering or doing assignments for students. • Besides there is a children's play area however conditions such as poorly maintained and area sports contained in the Taman Bugar Merjosari • Cleanliness facilities in the form of toilets and trash can. • There is a vehicle parking area.
5	Visitors	Kids College Student

Table 3. Strengths and weaknesses of Singha Merjosari Park.

No	Advantages	Deficiency
1	There is a Children's Playground	There are still many areas of weeds that detract from the aesthetics of the garden
2	Outdoor Gym	No CCTV
3	Sky Bike	No Wifi
4	Gazebo	Inadequate night lighting
5	Beach sand area	Lack of trees, so it will be very hot during the day
6	Jogging track	There is no security centre
7	Educational Park (traffic signs)	No smoking area
8	Open theater	
9	Parking area	
10	Toilet	
11	Garden seating	



Figure 1. Gym area and children's play area, lack of trees makes this park feel hot during the day.

3.3.2. *Trunojoyo Smart Park.*

The detail about Trunojoyo Smart Park can be seen on table 4, table 5, and figure 2.

Table 4. Trunojoyo Smart Park.

No	Characteristic	Information
1	Area (m2)	5.840 m2
2	Time Inauguration	April, 2014
3	Vegetation	There is a tamarind tree and it is supported with vegetation in the form of mini green elephant grass and ornamental plants in good condition..
4	Facility	There are other facilities in the form of toilets, children's playgrounds, a library room, a bicycle park, a fountain, an outdoor gym and vehicle parking area. In addition, there is culinary center located on the outer edge of the park..
5	Visitors	Family Teenager

Table 5. Strengths and weaknesses of Trunojoyo Smart Park.

No	Advantages	Deficiency
1	Many shady trees	Lack of lighting at night
2	Mini library	There is no security centre
3	Bicycle area	No wifi
4	Parking	No CCTV
5	Gym area	There is no open theater
6	Garden seating	There is no designated smoking area
7	Toilet	
8	Culinary	

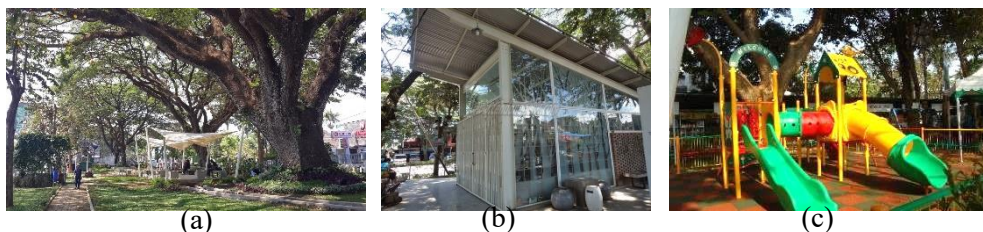


Figure 2. (a) Park Area, (b) Mini Library (c) Playgorund.

Green spaces exist to support physical activity [6], human psychological well-being [7], and general public health [8]. City green open space has a very strategic function in an effort to create a conducive urban environment to place the order of interaction between human life [9] and the natural environment in harmony.

4. Conclusion and discussion

- 1) In terms of quantity and quality, distribution and size of green open spaces in Malang City area still needs to be improved, especially in Sukun and Kedungkandang Districts.
- 2) Providing green open space with the concept of Sustainable Development, green attributes should also be applied such as :
 - increasing the role of the community as a green community
 - selection of endemic vegetation, shade vegetation, vegetation forming microclimate, oxygen producing vegetation, vegetation attracting wildlife.
 - energy efficiency like using solar panels
 - effective water management
 - waste management with the principle of green waste.
- 3) There is still need for socialization and assistance at the community level to take part in maintaining and being responsible for the sustainability of the park that has been built, so that the supporting elements of the park are well maintained, not easily damaged and not quickly lost, and so that the plants planted in the garden can thrive.
- 4) From a study of 2 parks in Malang City, the deficiencies in the park can be used as a design reference for the next green open space development. There is a need to add elements that support safe, inclusive and accessible green open spaces, as:
 - Additional lighting at night, because the 2 parks are areas that are prone to crime. This can be done by adding CCTV and security posts.
 - To respect users of green open spaces, especially children, you should add a special smoking area so that children and other users are not disturbed by cigarette smoke.
 - In order to become a public space that can be accessed properly, you should look for land that is easily accessible by public transportation, to make it easier for people who do not have private vehicles, and can reduce pollution around the park.

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