Urban greenspace for resilient city in the future: Case study of Yogyakarta City

N M Ni'mah, S Lenonb
Departement of Urban and Regional Planning, Sekolah Tinggi Teknologi Nasional (STTNAS) Yogyakarta, Jl. Babarsari, Catur Tunggal, Depok, Sleman, 55281, Indonesia

novimaulida@sttnas.ac.id

Abstract. The capacity of adaptation is essential elements towards urban resilience. One adaptation that can be done is to consider the provision of open space and public space in the city. Yogyakarta City development which focused on the built area and negates the open space has blurred the characteristics of the city. Efforts in increasing the availability of public space is one of the seven priorities of the programs included in the environmental and the utilization of space in Yogyakarta City. An understanding of the provision of public green open spaces in Yogyakarta is important because the products and processes that take place in a development will determine the successful implementation of the development plan. The objectives of this study are as follows: (1) to identify the provision green space in Yogyakarta City from the aspects of product and procedure; and (2) to identify the role of green space to build resilient city. This study is used descriptive qualitative approach with in-depth interview, literature review, and triangulation as the method for data collection. Yogyakarta has had instruments for public green open spaces provision called Masterplan Ruang Terbuka Hijau (RTH) Up-Scaling Yogyakarta 2013-2032 which govern the typologies and criteria for green open space development in the city. Public green open spaces development mechanism can be grouped into the planning phase, the utilization phase, and the control phase of each consisting of legal and regulatory aspects, institutional aspects, financial aspects, and technical aspects. The mechanism of green open space provision should regard the need of advocacy for “urban green commons” (UGCs) development as a systematic approach of collective-participatory for urban land management.

1. Introduction
The capacities of adaptation are essential elements towards urban resilience. The provision of open space and public space as a public asset that can minimize negative impacts of climate change in urban areas has to be considered as one of the adaptation [1]. In a resilience framework, one of the criteria for urban resilience is when the city providing green open space as a property of space to maintain the sustainability of socio-cultural, economic, and ecosystem [2]. Investment in urban areas through the provision of diversity biodiversity is believed to be a form of mitigation of natural space to anticipate environmental change phenomenon.

The rapid economic growth in Yogyakarta City, especially in the manufacturing sector, accommodation and restaurants, as well as information and communication led to the city underwent a spatial transformation quite rapidly [3]. The phenomena of the development of hotels, restaurants and cafes, as well as shopping center have ignored the existence of urban public space. The availability of
public green open space still very poor with only fulfilled 17% of the 20% minimum requirement of spatial policy [4]. This condition is quite worrying for the fulfillment of public open space, especially public green open space is important to improve the resilience of an urban area through the development of nature-based solutions [5].

Yogyakarta City has made efforts to increase the availability of public space with provision program of green open spaces to support the activities of urban life. The program is one of the seven priorities of the programs included in the environmental and spatial utilization aspect. In 2016, Yogyakarta City should have developed some locations as a green open space [6], [7]. Nonetheless, the challenges for the program implementation is inevitable. The government's action to increase the number of public green open spaces is the right step to improve the quality of life and environment of Yogyakarta. The process of providing public green open spaces are complex activities in which the mechanism is governed by specific policies, involving the various interested parties, and other activities that mutually influence each other. An understanding of the processes in the supply public green open spaces in Yogyakarta City is important to do because the process takes place in the development activity will determine the successful implementation of the development plan. Therefore, efforts to understanding the patterns of integrated and comprehensive in the provision of public green open spaces in Yogyakarta City is performed in this study.

1.1 Objectives
The purpose of this study is to identify the provision of green space in the city of Yogyakarta which plays a role in the realization of the resilience of the city. The objectives are as follows: (1) to identify the provision green space in Yogyakarta City from the aspects of product and procedure; and (2) to identify the role of green space to build resilient city.

1.2 Methods
This study utilized descriptive exploratory qualitative approach to collect the required data and analysis. By using this approach, the researchers had the opportunity to explore and gather information using combined techniques. The methods used to collect data are in-depth interview, literature review, and triangulation. The results will be discussed through description and explanation in accordance with the aims.

2. Result and Discussion

2.1 Plan for City’s Green Open Space
Yogyakarta City with an area of 3250.01 Ha has existing green space area of 1028.79 Ha (31.65%) (Fig. 1) with details of public green space covering an area of 399.81 ha (12.30%) and private green space covering an area of 628.98 Ha (19.35%). The overall area of green space and in particular private green space has exceeded the standard that has regulated by the Law No. 26/2007 on Spatial Planning and the Regulation of the Minister of Public Works No. 05/PRT/M/2008 on Guidelines for the Provision and Use of Green Open Space in Urban Area with minimum 30% of provision for green open space with proportion of public green open space is 20% whereas private green open space is 10%. Therefore, in the case study of Yogyakarta City, the provision of public green open space is still lacking to the contribution of green open space availability in Yogyakarta City. Among 14 districts in the city of Yogyakarta, there are six districts that the existing of green open space has an area of more than 30% of the area of these districts. The sixth districts are District of Gondokusuman, Kotagede, Mantrijeron, Tegalrejo, Umbulharjo and District Wirobrajan. Moreover, District Gondokusuman apart from the compliance with the minimum size of the existing green open space it also has been meeting the public green space area that has more than 20% of the total area. As for the private green open space almost all districts have fulfilled the area of more than 10%, except for three districts that are District Gondokusuman, Kraton and Ngampilan. [8]
Yogyakarta City Government's efforts in improving the quantity and quality of green open space particularly for public green open space has started since 2005 through land acquisition in each district in the city. Until 2012 this program has acquired land 29 units open space with total area of 1.4 Ha which aim for various community activities in the future. To support the process of urban green open space provision the Masterplan Ruang Terbuka Hijau (RTH) Up-Scaling Yogyakarta 2013-2023 which contains the provision and utilization of green open space plan has been approved. The plan consists of the stipulation and the plan of green space development in each district. From the document, green open space in Yogyakarta will be developed into some typologies as follows (Fig. 1): (1) Residential Building; (2) Settlement Area; (3) Special Areas; (4) City’s Gate Area; and (5) Public Green Open Space in the District. Each typology has criteria of vegetation selection, standard area, and functions for the development of green open space. [8]

![Figure 1. Map of: (a) The Existing Condition of Green Open Space and (b) Plan for Green Open Space in Yogyakarta City](image)

| Typology                  | Details                      | Vegetation                      | Area                                      | Functions          |
|---------------------------|------------------------------|---------------------------------|-------------------------------------------|--------------------|
| Residential Building      | Courtyard                    | Tree with wide canopy           | Depend on Building Coverage Ratio (BCR)   | Private            |
|                           | Offices, shops, and place of business | Shrub Aesthetic vegetation     | Public and/or private                     |                    |
|                           | Roof garden                  | Shrub Ground cover              | Depend on the availability of the roof, terrace, balcony or building canopies | Private            |

Table 1. Typologies Green Open Space Place in Yogyakarta City
Typology | Details | Vegetation | Area | Functions |
--- | --- | --- | --- | --- |
Settlement Area | Park/Garden | Tree with wide canopy | Depend on the level of neighborhood | Public |
| | | Fruit Plants | | |
| | | Flowering Plants | | |
| Lane road | Indigenous tree | Depend on characteristic of the road and pedestrian | Public |
| | Vines | The availability space under overpass | |
| | Potted plants | | |
| Certain Function (riverside, rail line, cemetery) | Tree which suitable for birds ecosystem | In accordance with the regulation of the function | Public |
| | Productive plants/crops | | |
| Special Areas | Green space for Kraton area | Vegetation that has philosophy and historical feature | Depend on the space that need to be conserve | Public and Private |
| | | Kepel (*Stelechocarpus burahol*) (Decree of the Governor of Yogyakarta Special Region No. 385 / KPTS / 1992 on Establishment of Identity Flora And Fauna Region of Yogyakarta Special Province) | | |
| City’s Gate Area | Areas of city’s border | The planned area | Public | |
| Public Green Open Space in the District | Open space in each of district | Depend on the utilization | In accordance with the target of fulfillment of green open space in each district | Public and Private |

2.2 The Mechanism of Public Green Open Space Provision

To achieve the ideal conditions based on the spatial aspects of the plan for green open space development, the main mechanism for masterplan implementation, particularly for public green open space provision, tend to emphasize and can be grouped into stages of Planning Phase, Utilization Phase, and Control Phase (Fig. 2). Within the whole process in the mechanisms of green open spaces development, the elements contained in each phase can be distinguished into several aspects include the legal and regulatory aspects, institutional aspects, financial aspects, and technical aspects of operational utilization. The authorized public institutions in the city that run the mechanism namely Regional Planning and Development Agency (Bappeda), Section for Governance and Social Welfare of Regional Secretariat (Sekda), and the Environmental Agency of Yogyakarta (BLH). Bappeda mainly responsible for the planning and control phase whereas Sekda and BLH mainly responsible for the utilization phase, including land acquisition for Sekda and design, development, and maintenance for BLH. [8]
Figure 2. The Mechanism of Green Open Space Development in Yogyakarta City (Adapted) [8]

Table 2. Mechanism Aspect of Green Open Space Provision in Yogyakarta City

| Mechanism Aspects | Planning Phase | Utilization Phase | Control Phase |
|-------------------|----------------|-------------------|---------------|
| **Legal and Regulatory** | • Yogyakarta City Regulation No. 2/2010 on Spatial Planning of Yogyakarta  
• The Minister of Public Works Regulation No. 05 / PRT / M / 2008 on Guidelines for the Provision and Use of Green Open Space In Urban Area | • Yogyakarta Mayor Regulation No. 64/2013 on Request, Procurement and Land Utilization for Public Green Open Space as Supporting Facilities for Community Events (Reference for land acquisition)  
• The Minister of Public Works Regulation No. 05 / PRT / M / 2008 on Guidelines for the Provision and Use of Green Open Space In Urban Area (Reference for design) | • Yogyakarta Mayor Regulation No. 64/2013 on Request, Procurement and Land Utilization for Public Green Open Space as Supporting Facilities for Community Events  
• The Minister of Public Works Regulation No. 05 / PRT / M / 2008 on Guidelines for the Provision and Use of Green Open Space In Urban Area  
• Utilization Permit |
| **Institutional** | • Government (Bappeda and other sectoral agency);  
• Community; and  
• Private Sector (Planning Consultant) | • Government (Bappeda, BLH, and other sectoral agency);  
• Community; and  
• Private Sector (Contractor) | • Government (Bappeda, BLH, and Sekda);  
• Community; and  
• Private Sector (Supervisor) |
| **Financial** | • Indicative budget plan from the regional level (APBD) | • Indicative budget plan (APBD) from the regional level for the construction and stimulant fund for the management | • Indicative budget plan from the regional level (APBD) |
| **Technical** | • Masterplan development conducted by planning consultant under contracts with Bappeda. | • The land acquisition process  
• Technical design process  
• The development process The utilization and maintenance process | • Monitoring and evaluation for the whole process |
2.3 Green Open Space for Resilient City in Yogyakarta

Urban green space is part of sustainable urban form typologies which knowns for its aims to bring “nature into the city” [10] and offers a unique landscape that supports biodiversity [5] which will give benefits for urban citizens. From the Green Urbanism perspective, new approaches to urbanism should more incorporate the ecological design to shape the urban form with some of principle among others ecological limits, design for nature, circular metabolism, self-sufficiency, sustainable lifestyles, and neighborhood and community life [11]. Natural ecosystems in the green open space have an important role and benefits such as provide clean air, increase water availability, regulate the urban climate, and create place making in the city [5]. Maintaining the connection of nature with urban environment is a fundamental, therefore understanding of the benefits would be significant to develop sustainable urban development.

As part of major criteria for urban resilience, green open space become one of urban components that have to develop to increase the capacity of urban environment in order to deal with the risk of climate change and disaster. Green open space as the form of ecological diversity in the city is part of strategies of resilience through “nurturing conditions for recovery and renewal after disturbance” [12]. Related to the transition toward resilient city, Yogyakarta City has been in the process of increasing its adaptation capacity with the planning and development of green open space. Particularly in the sense of product development, Yogyakarta City with its master plan of green open space has established its foundation for urban green infrastructure development whereas the implementation of policy still has challenges from the mechanism of the provision.

Nonetheless, the provision of green open space still has not developed within the frameworks of urban resilience both for product and the process. The success of green open space provision still only seen by the target of area availability with percentage of 30% of total city’s area without considering the need to analyze the environment dynamics which could increase the risk of a city to climate change and disaster impacts, to create green open space that can modify for use in a different purposes, and to build management tools of green open space that contribute to the disaster readiness in the future. Therefore, the future green open space development should considering the potential action to build resilience including the planning, the design, and the managment action with principle of flexibility, adaptability, and agility particularly with the global climate change and disaster issues [12].

The insight of common property system within urban management which dealt with what so-called as Urban Green Commons (UGCs) and the potential of the system to build urban resilience is also discussed [13]. The potential of UGCs to manage and to integrate the cultural and biological diversity in the city would be beneficial to develop particularly public green open space. With distinguished institutional characteristic and community participation, UGCs propose a systematic approach of collective-participatory for urban land management that could contribute to the public green open space provision. The UGCs itself rely on the background of how diversity has role to resilience management. Diversity in the urban setting will contribute to the adaptive capacity with its functions to spread the risk, creates buffers, and allow multiple strategies to repurposed and reorganize complex urban system in order to deal with the urban environment changes. Thus, with its fundamental background UGCs could be used as an approach as well as tool to develop product of green open space and to manage the proces of the development with accentuation in the integration of socio-economic function in the context urban resilience. The examples of UGCs, i.e. collectively managed parks, community gardens, and allotment areas, describe how UGCs focus on to build institutional capacity and socio-ecological as well as cultural insight and memory for urban citizens so that there would be massive civic participatory on the public green open space which not only support the ecological system but also socio-cultural and economic system in urban area.

In particular, the finding of this study related to the role of community participation for green open space provision. From the institutional perspective, the Regulation of the Minister of Public Works No. 05/PRT/M/2008 on Guidelines for the Provision and Use of Green Open Space in Urban Area regulate the need of participation of each urban stakeholder. One of which is legal institution as a non-governmental organization that play a major role for connecting between the community, government, and private sector in overcoming the communication gap and information as well as improving people’s access to resources [8]. The procedure of green open space
development in Yogyakarta has not been involving and optimizing the advocacy aspect that could contribute to the development of green open space. The concept of urban commons property system would be an alternative to bridge the complexity of green open space provision with more collective-participatory of urban land management. With the role of the legal institution which has concerns with the environmental issues there should be more systematic procedure to mediate and to facilitate between relevant stakeholder in terms of communication, conflicts resolution, learning process, space utilization, and law enforcement.

3. Conclusions
Yogyakarta has had instruments for public green open spaces provision called Masterplan Ruang Terbuka Hijau (RTH) Up-Scalling Yogyakarta 2013-2032 which govern the typologies and criteria for green open space development in the city. Public green open spaces development mechanism can be grouped into the planning phase, the utilization phase, and the control phase of each consisting of legal and regulatory aspects, institutional aspects, financial aspects, and technical aspects. Nonetheless, the provision of public green open space still has not appropriately involving the needs of adaptation aspects for the city related to the potential risk of environmental changes in the future. Therefore, urban greenspace development in Yogyakarta City in the future should have more robust framework which include the risk management issues. Moreover, ss some insights have conducted, the mechanism of green open space provision should regard the need of advocacy for “urban green commons” (UGCs) development as a systematic approach of collective-participatory for urban land management.

4. Acknowledgement
Part of this paper is derived from the research of Lenon (2015) while completing bachelor degree in Sekolah Tinggi Teknologi Nasional Yogyakarta. The author express gratitudes to Sekolah Tinggi Teknologi Nasional Yogyakarta for all the support while finishing this paper.

References
[1] C. M. Pickering and W. Hill, “Impacts of recreation and tourism on plant biodiversity and vegetation in protected areas in Australia,” J. Environ. Manage., vol. 85, pp. 791–800, 2007.
[1] Vargas-Moreno, J.C.; Meece, B.; Emperador, S. 2014. “A framework for using open green spaces for climate change adaptation and resilience in Barranquilla, Colombia”, Proceedings of the Resilient Cities 2014 Congress, 5th Global Forum on Urban Resilience and Adaptation, Bonn, Germany.
[2] Syarifi, Ayyoob and Yamagata, Yoshiki. 2014. “Resilient urban planning: Major principles and criteria”, Energy Procedia, 61, 1491 – 1495.
[3] Badan Pusat Statistik (BPS). 2015. Statistik Daerah Kota Yogyakarta 2015, Badan Pusat Statistik Kota Yogyakarta.
[4] http://berita.suaramerdeka.com/ruang-terbuka-hijau-kota-jogja-masih-di-bawah-standar/, accessed 16 Maret 2016.
[5] Van Ham, Chantal. 2014. “Urban green infrastructure: making visible what is valuable”, Proceedings of the Resilient Cities 2014 Congress, 5th Global Forum on Urban Resilience and Adaptation, Bonn, Germany.
[6] http://www.antaranews.com/berita/528936/yogyakarta-bangun-12-ruang-terbuka-hijau-tahun-depan, accessed 16 Maret 2016.
[7] Jabareen, Y. (2012). “Planning the resilient city: concepts and strategies for coping with climate
change and environmental risk”, Cities, 31: p.220-229.

[11] Beatley, Timothy. 2000. “Green urbanism: Learning from European cities,” in Jabareen, YR. 2006. “Sustainable urban form: Their Typologies, Models, and Concept’, Journal of Planning and Education and Research, 26, 38-52.

[12] Desouza, K.C., and Flanery, T.H. (2013). “Designing, planning, and managing resilient cities: A conceptual framework”, Cities, 35, 89-99.

[13] Colding, Johan & Barthel, Stephan. 2013. “The potential of ‘Urban Green Commons’ in the resilience building of cities”, Ecological Economics, 86, 156–166.