Space Utilization in Vertical Residential Complex (Rusunawa) in Jakarta, Indonesia

Abstract. The rapid growth of cities, including Jakarta, encourages the conversion of non-built-up areas into built-up ones. It can threaten their sustainability. To overcome a decreasing trend of green open spaces, the Government of Jakarta (GoJ) has established a policy stipulating that urban areas must have at least 30% green open spaces. Therefore, the vertical residential complex can be a solution to reach it, especially in Simple and Low-Cost Apartment Buildings (Rusunawa). Based on previous issues, this paper analyses their surface and whether it reaches the regulation. Moreover, this paper identifies factors influencing the surface. We study 30 of 32 Rusunawa in Jakarta. Then, we conducted descriptive spatial analysis by interpreting high-resolution satellite imagery to find space utilization patterns in the Rusunawa. The findings are that: only 20% of Rusunawa (6 of 30 Rusunawa) have reached a minimum of 30% green open space of the total area, indicating challenges to meeting the regulation. Based on in-depth interviews with the management of Rusunawa, the findings are that: the land availability of Rusunawa's complex is limited, green open space competes with anthropogenic-living space use, and the initial site plan is not designed to meet the regulation. Moreover, in the case of Rusunawa located near the coastal area, water, and land salinity are obstacles.

1 Introduction

The population living in cities has increased significantly. More than half of the world's population lives in urban settlements [1,2], and 60% of the latter are expected to live in urban settlements by 2030 [2]. Cities consume lands for human settlements and other built infrastructures, such as industrial estates, center commercial, etc., to support urban lifestyles. It leads to the rapid growth of cities, encouraging the conversion of non-built-up areas into built-up ones. Therefore, the cities experience a lack of green open space. This condition, in the long term, threatens urban livability and sustainability. The green infrastructure concept has been introduced as one solution to the problem previously mentioned because it can be the direction of planning for sustainable land use [3,4]. The definition of green infrastructure is a network of green space planned and managed for the benefit of nature and the human population through multifunctionality [5,6]. However, previous studies on mainstreaming it into (public) policy have been conducted primarily in western countries, but it remains blurred in Asia and Africa [7].
DKI Jakarta, the capital of Indonesia with its surrounding areas called Bodetabek (Bogor, Depok Tangerang, and Bekasi), is a major metropolitan city in Southeast Asia, inhabited by almost 18 million people in its urban area. Since Indonesia's independence, DKI Jakarta has rapidly grown from almost 2,000,000 people in 1950 to almost 10 million people in 2010 [8,9]. This rapid growth has encouraged the conversion of non-built-up areas into built-up ones. Jakarta Metropolitan Area (JMA) has faced a significant land cover change from 35% built-up area in 1989 to 70.5% built-up area in 2013 [10]. In order to overcome a decreasing trend of green open space, The Central Government of Indonesia (GoI) has promulgated Law No. 26 the Year 2007/Undang-Undang No. 26 Tahun 2007, which stipulates that urban areas must have at least 30% of green open spaces. Moreover, the Government of Jakarta (GoJ) has promulgated Local Regulation No 1 the Year 2012/Peraturan Daerah Provinsi DKI Jakarta No.1 Tahun 2012 stipulates the latter. Besides, the GoJ has promulgated Governor Regulation No. 38 the Year 2012/Peraturan Gubernur No. 38 Tahun 2012 about stipulating green building in Jakarta. Hypothetically, these regulations emerge as mainstreaming green infrastructure planning into (public) policy.

Therefore, this research analyzes space utilization in Simple and Low-Cost Apartment Buildings (Rumah Susun Sederhana Sewa/ Rusunawa), a vertical public housing managed by the GoJ. How many percentages of the surface of green open space of Rusunawa in DKI Jakarta? What challenges are Rusunawa's Management Unit (Unit Pengelola Rumah Susun/ UPRS), here in after abbreviated UPRS, to provide a minimum of 30% green open space? Identifying land cover in Rusunawa is the first step in sustainable land use planning and management in Jakarta. Besides, it can provide information for the government to create green infrastructure. Moreover, previous studies on identifying green open space in Jakarta have focused more on the analysis with a broader scale of the region, such as at the city, provincial, and metropolitan levels [11-13]. Meanwhile, the parcel lot level analysis, such as in the Rusunawa, has not been done. Besides, space utilization for green open space competes with space utilization, resulting in higher rents for commercial spaces (industrial estates, superblocks, center commercial, business districts, etc.) and human settlements (apartments, gated communities, new towns, etc.). Consequently, acquiring new land for green open space becomes more complex, so a more micro-level analysis is needed. Moreover, following the objective of green infrastructure to develop networks of green space through multifunctionality, especially in an urbanized environment [14] so that it is necessary to develop a multifunctional network on a different scale of spatial level from parcel lot, neighborhood, and city, regional and national level [15].

2 Method

The space utilization can be seen through land cover in each Rusunawa. It can be identified using remote sensing through Google Earth's high-resolution satellite imagery data processing based on seven key interpretations: size, texture, color, hue, shape, pattern, height, shadow, and association. Subsequently, the verification of image interpretation is done through direct observation during field surveys.
We have conducted field surveys. The latter consists of field observations and in-depth interviews. The field observations were conducted to verify detailed land cover maps in the Rusunawas previously identified. Based on the detailed land cover maps produced after remote sensing interpretation of space, we verify the accuracy of these maps through direct observation in each Rusunawas. Then, in-depth interviews were conducted with the Rusunawa's Management Unit (Unit Pengelola Rumah Susun/UPRS). These interviews aim to discover the problems and challenges faced by UPRS in managing space utilization, especially in reaching 30% of green open space.

3 Results and Discussion

Figure 2 shows that in East Jakarta Municipality, 29% (4 of 14 Rusunawas locations) have reached a minimum of 30% green open spaces of its total area. Moreover, Figure 3 shows that in North Jakarta Municipality (eight Rusunawas locations) and Central Jakarta Municipality (only one Rusunawa location), none of these Rusunawas locations has reached a minimum of 30% green open spaces of its total area. Furthermore, in West Jakarta Municipality, 33% (2 of 6 Rusunawas locations) have reached a minimum of 30% green open spaces of its total area. Meanwhile, in South Jakarta Municipality, the only Rusunawa located in this Municipality has almost reached a minimum of 30% green open spaces of its total area, which is 29.19% (Figure 4).
Fig. 2. Land Cover of Rusunawas located in East Jakarta Municipality

Fig. 3. Land Cover of Rusunawas located in North Jakarta and Central Jakarta Municipalities
Fig. 4. Land Cover of Rusunawas located in North Jakarta and Central Jakarta Municipalities
Moreover, UPRS Jatinegara Kaum and UPRS Muara Baru stated that there is land competition between green open space and anthropogenic living space use. If there is vacant land, it will be built for other use, such as parking space and road access. Besides, land availability is mostly prioritized for building a new tower with 16 floors consisting of apartment units.

Besides, in Rusunawa Marunda (UPRS Marunda), vacant land is quite large, but the green open space will not be optimal due to the physical conditions where this Rusunawa is in a coastal area:

“Our area is quite large; in fact, but most of the vacant land has not been utilized. So far, it has not been maximized for the green open space because considering its coastal location.”

4 Conclusions

Urban green infrastructure is a promising idea for sustainable land use, including in the capital of developing countries such as Jakarta. It has been mainstreamed into public policy from the national level (Law No. 26 the Year 2007 / Undang-Undang No. 26 Tahun 2007) to city-level regulation (Local Regulation No 1 the Year 2012/Peraturan Daerah Provinsi DKI Jakarta No. 1 Tahun 2012).

However, implementing green infrastructure planning in Rusunawas, owned by the GoJ, has faced some challenges. Only 20% (6 of 30 Rusunawas locations) have reached a minimum of 30% green open space of the total area. The challenges are that: the land availability of Rusunawas' complex is limited, green open space competes with anthropogenic living space use; the initial site plan of Rusunawas did not design for a minimum of 30% green open space, and in the case of Rusunawa located on the coastal area (very near to the sea); the salinity of water and land is an obstacle. Future research is needed to find innovative and appropriate technologies (teknologi tepat guna) to increase green open spaces horizontally and vertically to solve these problems. Moreover, we suggest multiple uses of urban spaces for broader stakeholders, such as urban planners and the government, from the national to the city level. This multiple-use combines various functions to provide benefits and well-being for urban inhabitants, e.g., housing, food production, social interaction, air coolness, and neighborhood beautification to attract people (Rusunawa's inhabitants) actively. This research limits the area study about the implementation of green building policy only in Rusunawa; meanwhile, in order to create a multifunctional network of green open space, it is necessary to investigate other types of parcel lots in Jakarta. Besides, future research on the government's perspective on green infrastructure in a multi-scale hierarchy is essential for more comprehensive green infrastructure planning.

We received the financial support for this article from a PUTI Prosiding Grant Year 2020 (Number: NKB-941/UN2.RST/HKP.05.00/2020) of the University of Indonesia.

References

4. L. Mazza, Green Infrastructure Implementation and Efficiency (Brussels and London: Institute for European Environmental Policy, 2011)


