

Green Open Space Provision in Surakarta: A Community Character Perspective for Sustainable Urban Development

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ABSTRACT

The city of Surakarta, Indonesia, is characterized by the significant influence of traditional Javanese culture on the lifestyles of its inhabitants. Concurrently, modern cultural practices are emerging within the city. Consequently, the development of an integrated urban environment necessitates the incorporation of both traditional and contemporary cultural elements. The realization of such an integrated city is anticipated to promote sustainability. This research examines the presence of green open spaces in Surakarta, which are historically associated with traditional urban life, as exemplified by Sriwedari Park, Balekambang Park, Tirtonadi Park, and several other parks. The study aims to understand how the community currently utilizes these parks in relation to their lifestyles. A qualitative, descriptive, and exploratory analysis method was employed, with data collected through observations of various existing green open spaces, supplemented by secondary data from previous studies on the lifestyles of residents in Surakarta. The analysis focuses on the norms, functions, and physical forms associated with green open spaces. Findings indicate that several of these spaces hold cultural and traditional significance for the community. Additionally, there has been a noticeable increase in the intensity and diversity of activities, accompanied by modernization and commercialization, as well as transformations of green open spaces. The arrangement of these spaces is intended to be pragmatically implemented. Therefore, it is essential that future management of green open spaces considers both traditional and modern cultural aspects to create an environment conducive to all.

KEYWORDS: Green Open Space, Culture, Surakarta.

INTRODUCTION

Surakarta is a city in Central Java Province, Indonesia. Internationally, Surakarta or Solo is known as a cultural city; the center of Javanese culture. Currently, Surakarta continues to develop alongside its civilization. The population in urban areas is increasing, activities are becoming more diverse, and built-up areas are becoming denser (Hamidah, 2019). As a result, the city ecosystem is also changing. At a certain level, the quality of the city can reach its optimum point: efficient and effective in the use of materials, energy, space, and time. However, without control, environmental degradation may occur (environmental principle 1), especially if the rate of urban growth surpasses the environment's ability to sustain it. The existence of green open space (GOS) is recognized as crucial in the development of a city (Yang, 2017). Therefore, to compensate for the increasingly crowded built environment and the saturation of activities, GOS has the capacity to perform a variety of beneficial roles for the city (Schuch, 2017). One of these functions is preventing urban environmental degradation. The significance of GOSs cannot be overlooked (Singh, 2006). GOS plays a significant role when it is integrated into the life cycle of city processes. GOS enables more efficient use of materials, energy, space, and time while simultaneously fostering diversity. Urban environmental degradation is associated with the expansion of a city's economic, cognitive, communicative, and visual functions, which are shaped by the demands and interests of multiple stakeholders (Astriani, 2015). In the life of a city, numerous supply and demand networks emerge. The city government should address deficiencies and basic issues while directing the strengths and development of existing potential to ensure the city evolves in a more advanced, characterful, and economical manner, while also considering the carrying capacity of its environment (Evans, 2002). Public and private GOS should be a primary element of urban spatial planning (Purnomohadi, 2006). GOS is an essential requirement for a city to be livable, authentic, productive, and sustainable (Lestari, 2014). GOS is an urban space that is more openly utilized, where both naturally growing plants and deliberately planted vegetation thrive. Well-planned GOS in urban areas can enhance the utilization of materials, energy, space, and time, making them more beneficial (environmental principle 5) for the urban area. The dynamics of the city are increasingly influenced by climate change phenomena (Lejano, 2019), which should be mitigated to avoid further diminishing the city's quality. The need for GOS can vary from city to city. In providing GOS, the approach should consider ecological patterns, planological patterns, and basic human needs (Maslow et al, 1987). Therefore, the significance of abiotic factors, biotic factors, and cultural factors must be acknowledged and conceptualized. This research specifically focuses on cultural factors. Consequently, the research aims to discover how the parks in the city of Surakarta are utilized by the community in line with their way of life. The goal is to identify the types of parks that align with the community's culture, ensuring that the provision of open space is sustainable. It is hoped that the findings will serve as new models and guidelines for creating GOS in urban areas, particularly in Surakarta. Academically, the research results can contribute new insights regarding the need to consider cultural factors in the provision of GOS.

Literature Review

The understanding of GOS is fundamentally linked to environmental science, which encompasses 14 key environmental principles that should be considered when evaluating these spaces (Watt, 1973). GOS is a vital component of urban environments, offering substantial benefits when available in adequate quality and quantity. Indonesian legislation mandates that green spaces constitute a minimum of 30% of a city's total area. Additionally, these spaces serve a range of functions, including ecological, socio-cultural, aesthetic, and economic roles.

Urban development has frequently impeded the adequacy and expansion of GOS. Nonetheless, the presence of these areas is crucial for the health of urban ecosystems. The pertinent questions extend beyond the area required; they also encompass strategies for fulfilling the demand for GOS within urban settings, viewed through the lens of the city as an ecosystem comprising abiotic, biotic, and cultural elements (Singh, 2006). Consequently, it is imperative to investigate the specific requirements for GOS in relation to each of these elements and to ascertain the overall needs (Lizya et al., 2017). Therefore, urban development must not only avoid diminishing GOS (Fitriananda, 2015) but also strive to enhance their quality in alignment with the cultural characteristics of the community.

The escalating intensity of urban activities yields both positive and negative implications across social, cultural, economic, and physical dimensions of the environment. GOS can facilitate urban planning by harmonizing the natural and built environments, thereby benefiting society through the enhancement of urban aesthetics and the creation of comfortable, attractive, fresh, safe, and clean urban spaces, while also preserving land designated for water catchment areas (Hamidah, 2019). Normatively, it is essential to maintain GOS in optimal condition concerning both quality and quantity. Well-maintained GOS in urban areas are capable of fulfilling their primary (intrinsic) functions, such as acting as the lungs of the city, regulating the microclimate, providing shade, generating oxygen, absorbing rainwater, offering habitats for wildlife, and filtering pollutants, as well as their additional (extrinsic) functions that encompass socio-cultural, economic, and aesthetic contributions essential for urban development.

Theoretical Proposal and Research Questions

Recent literature on the relationship between urban public green spaces and social cohesion underscores the significance of physical characteristics, public perceptions, and usage patterns in shaping social dynamics (Wan, 2021). Attributes such as design, accessibility, and ecological quality not only impact individual perceptions of comfort and safety but also influence how diverse social groups utilize these spaces. The interaction among physical elements, perceptions, and usage patterns creates a complex interdependent relationship, complicating the understanding of how green spaces can either strengthen or weaken social cohesion. To address this complexity, a conceptual model is proposed to map the multidimensional relationship between green spaces and social cohesion, thereby fostering more inclusive and evidence-based planning approaches.

The provision of GOS in urban areas must be informed by the character and culture of the local community, as cultural backgrounds significantly affect how individuals perceive, use, and engage with these spaces. Each cultural group possesses distinct value systems and relationships with nature, leading to varying roles of GOS in enhancing local quality, identity, and character. Understanding how cultural groups and subcultures interact with GOS is essential for effective management that meets the needs of the local community (James et al., 2009; Tyrväinen, Mäkinen & Schipperijn, 2007; Aslanoglu et al., 2025).

This study is imperative as it investigates the critical role of community characteristics in shaping the effectiveness of GOS provision, particularly within the context of Surakarta's urban development, where such spaces are essential for environmental sustainability and mitigating global warming (Rahbiah et al., 2019). Public GOS are vital for a sustainable urban environment; however, many Indonesian cities encounter challenges in providing adequate and equitable green spaces, often failing to meet the mandated 30% target of total land area (Sihombing & Hutapea, 2022; Sulistyarningsih et al., 2024). This shortfall is frequently exacerbated by rapid population growth and uncontrolled land-use changes that prioritize development over green infrastructure (Yulianti & Hadi, 2018; Widiyastuti et al., 2020). This gap highlights the necessity for specific spatial planning policies, including zoning regulations, to ensure the provision of public GOS even in densely populated urban areas (Priyanta & Zulkarnain, 2024). The research question posed is: How does the concept of providing GOS in Surakarta City take into account the character of its citizens in the pursuit of creating a sustainable city?

METHOD

GOS must be provided in adequate quality and quantity (Stähle, 2010), as this is fundamental for urban management in shaping cities that are livable, imageable, resilient, and sustainable (Lynch, 1960). Additionally, a good city must meet the economic, social, cultural, communicative, cognitive, and aesthetic needs of its stakeholders. Abraham Maslow stated that human motivation is primarily driven by the fulfillment of physiological needs, safety and security, belongingness, esteem, and self-actualization. Subsequent interpretations also emphasize the importance of cognitive and aesthetic needs (Lang, 1994). Meeting these fundamental human motivations requires effective urban governance, including the strategic provision of GOS, to enhance citizens' well-being (Fitriananda, 2015). From a macro perspective, GOS creates a harmonious and balanced atmosphere between built and unbuilt areas. This research is grounded in the understanding that GOS is an integral part of a good city, an ideal city where the life cycle of the city's dynamic system and GOS are related. This relationship is explored by explaining the nature of its existence, the methods by which it occurs, and its implementation. The role assessment is conducted using a Life Cycle Assessment that includes goal setting, analysis, impact assessment, and interpretation, concluding with suggestions for use (Govindarajan, 2017).

The research approach underscores that GOS is a fundamental element of a well-functioning city, an ideal city characterized by the interplay between GOS and the life cycle of the city's dynamic system. This relationship is

examined through an in-depth exploration of its nature, occurrence methods, and implementation strategies. Role assessment is conducted via a Life Cycle Assessment, which comprises goal setting, analysis, impact assessment, and interpretation, ultimately culminating in recommendations for effective utilization.



Figure 1. Surakarta Indonesia

Sources: <https://www.britannica.com/place/Surakarta>; https://id.wikipedia.org/wiki/Berkas:Peta_Solo.jpg

This study adopts an exploratory qualitative approach supported by mixed methods to explore how community character relates to the provision of GOS in the pursuit of sustainable development in Surakarta City (Figure 1). The research encompasses various areas within Surakarta, specifically those with varying distributions of GOS, including Banjarsari, Serengan, and Jebres. Participants in the study include local residents, community leaders, city planners, and local government officials—all of whom are stakeholders in GOS management.

Spatial data were employed to evaluate the distribution and extent of GOS, supplemented by land use data, demographic information, and socioeconomic indices collected from field observations, relevant agencies, and pertinent documents. Additional data were gathered to capture community perceptions, preferences, and cultural practices through surveys, augmented by secondary data. In-depth insights were obtained, when necessary, through interviews or focus group discussions. Documentation related to city planning, GOS policies, and relevant local cultural archives was also compiled.

Spatial analysis was performed to identify gaps in GOS distribution and correlate them with community characteristics. Qualitative thematic analysis was conducted using either manual coding or appropriate software to extract key themes pertinent to the research objectives. Subsequently, descriptive statistical analysis was utilized to explore simple correlations between community perceptions and characteristics based on secondary data. Triangulation analysis was employed to integrate findings from mapping, surveys, interviews, and documentation, thereby enhancing the validity and depth of the analysis. Ethical protocols involved informed consent procedures, protection of participants' anonymity and data confidentiality, and sensitivity to local cultural values and practices.

RESULT AND DISCUSSION

1. Community in the Context of Providing Green Open Space in Surakarta

The population of Surakarta City in 2021, based on data from the Directorate General of Population and Civil Registration (Dukcapil) of the Ministry of Home Affairs, is 588,419 people. The area of Surakarta City is 4,672 ha, resulting in a population density of approximately 125 people/ha. The sub-district with the largest area is Banjarsari District, while the smallest is Serengan District, which has an area of 308 ha. As an urban area, Surakarta is equipped with GOS, which can generally be divided into public and private categories. According to the Surakarta City GOS Master Plan, there are currently 325 ha of public GOS. This includes 49 ha of urban forest, 364 ha of city parks, 105 ha along river borders, and 63 ha of cemeteries. Private GOS covers an area of 317 ha. These figures represent 6.94% and 6.79% of the city's total area, respectively. Providing GOS contributes to environmental balance and serves complex functions within residential areas. The denser the population and the built-up area, the more extensive the GOS is needed, with specific characteristics tailored to the city.

1.1 Identify the Conditions of Provision Factors from the Community Aspect

Before identifying the conditions of the factors providing GOS in Surakarta, it is important to understand that the Surakarta area is a cultural region characterized by many distinctive local traditions. Various cultural attractions occur daily, and many residents still adhere to Javanese customs that have been passed down through generations. There is a local wisdom embedded in the community, emphasizing harmonious togetherness. However, Surakarta also demonstrates the dynamics of development supported by various contemporary city facilities and infrastructure, evolving into a modern city.

Surakarta is rich in diverse urban heritage, which can be categorized as either non-physical or physical. Non-physical urban heritage includes religious activities, traditions, and cultural practices, while physical heritage encompasses the environment, buildings, road infrastructure, urban spatial patterns, and GOS and parks. The existence of GOS or parks is closely tied to the city's history. While the area exhibits dynamism, there are challenges in providing sufficient GOS, which remains limited. This limitation is partly due to land conversion and the failure to develop GOS in accordance with the demands of urban life, where some residents still value the cultural significance of certain green areas or parks.

To effectively integrate the provision of GOS, it must be created with the city's needs in mind beyond contemporary considerations, while also addressing the community's spiritual need for such spaces (Breuste, 2020). The requirements of the urban area will be identified through the analysis of the integration factors in the central city

area of Surakarta. However, this research will focus specifically on the cultural factors of the community in relation to GOS.

1.2 Condition of Community Cultural Norms Factors

Norm factors relate to patterns or standards of community behavior in settlements, encompassing components of cultural values, regulations, and institutions (Larson et al., 2020). The purpose of identifying norm factors is to determine the conditions and needs of these factors in the central area of Surakarta city in providing GOS. Identifying the conditions of norm factors involves comparing the situation in Surakarta with the requirements for the area based on theoretical frameworks. Essentially, an integrated area is grounded in contextual norms and local cultural practices.

1.3 Components of Cultural Values

With regard to the cultural value component, the truth is that Surakarta's cultural values have shifted from mystical and idealistic to practical and realistic. The idea that Surakarta has metaphysical significance, particularly for the palace environment as a sacred center, might be a manifestation of mystical and utopian cultural ideas. In the past, the Palace established several GOS in the city of Surakarta, such as Sriwedari Park, Balekambang Park, and Tirtanadi. Beyond these metaphysical beliefs, mystical and utopian cultural values can also be expressed through religious activities conducted for spiritual purposes. The use of the north and south squares is related to this. The feelings, creativity, and mystical intentions present in society are now showing a decline.

In the cultural value component, integrated GOS, according to theoretical concepts, should still reflect local cultural values in terms of taste, creativity, and initiative. When there is a change in values, efforts must be made to maintain continuity. In Surakarta, there are indications that GOS are being transformed into functional areas, prioritizing material aspects over spiritual ones. These indications reveal that regional conditions have shifted away from the roots of local cultural values. The roots of local culture, which have been shaped by the senses and minds of the community over a long process, have been diminished by the encroachment of habitation and regional artifacts.



Figure 2. Javanese dancing in green open spaces, Surakarta, Indonesia

Source: <https://www.voaindonesia.com/a/perayaan-hari-tari-sedunia-di-surakarta>

Manifestations in socio-cultural life include shifts in cultural values, such as the changing appreciation of heritage following the emergence of commercial activities within the palace environment, with some stakeholders even proposing the development of hotels in areas considered sacred. The palace environment, once a source of Javanese culture, is now perceived as less sacred than before. This perspective indicates that some individuals see an economic function in the palace environment, contrasting with cultural roots that regard the palace as possessing greater mystical value.

Another indication is a societal transformation in which spiritual values are increasingly emphasized over material concerns. However, religious and spiritually oriented cultural activities, such as traditional arts that address spiritual needs, are experiencing decline due to inadequate facilities and the growing influence of external cultural values, particularly in relation to wayang, pedalangan, musical performances, and traditional rituals. This reflects a tension between the normative ideal of prioritizing spirituality and the practical reality that material needs are often more immediate. Consequently, the meaning of cultural values changes as economic activities prioritize material needs through commercialization in the urban environment.

The condition of integration in Surakarta is thus identified as a shift in cultural focus, leading to a decline in cultural values rooted in the local area. In fact, society depends on a stable system of values to support its social development, way of life, and cultural continuity (Trancik, 1986: 113). To ensure that the cultural value component continues to embody local values in terms of taste, creativity, and initiative, the region must integrate these elements and strengthen cultural values that remain deeply embedded in community perceptions.

1.4 Regulatory Components

The regulatory dimension in Surakarta reflects an interplay between statutory regulations and traditional norms, which operate as unwritten rules shaping meaning, function, location, and spatial characteristics. Yet, some of these traditions are weakening due to evolving cultural values and the dominance of formal regulation.

In the regulatory component, the provision of GOS should be integrated according to theoretical concepts and comply with environmental regulations and social realities. In Surakarta, there are signs of neglecting tradition, indicating that the meaning of existing regulations differs from the cultural significance once held by the community. Cities that were originally based on sacred traditions have now transformed into strategic areas for economic activities. Consequently, regulations often overlook the spiritual aspect of society, as seen in the establishment of trade centers and the desire to commercialize historical heritage with Javanese cultural significance.

These patterns signal a shift in customary approaches to facility placement and area allocation. In its original conception, Surakarta represented a mandala microcosm organized along the north–south and east–west axes, with the palace at the center, symbolizing sacredness that gradually diminished with increasing distance from the core (Sajid, 1983). This principle was reflected in the function and placement of facilities. Currently, commercial activities of a profane nature are concentrated around the center, such as buying and selling in the square and surrounding areas like Klewer Market, Galabo, and Benteng Plaza Shopping Center. The cultural tradition that attributes sacred or symbolic value to regional centers is being marginalized by a growing focus on their strategic and economic significance.

Another sign is that traditions believed to have been abandoned are often attributed to regulations. In this context, the government regulates spatial areas based on wider collective interests, particularly those related to the city’s carrying capacity and environmental hygiene. Consequently, the provision of GOS in Surakarta reflects a shift from traditional meanings to formal rules. For regulatory components to align with environmental and social realities, regions need regulations that ensure continuity of perception.

1.5 Institutional Component

From an institutional perspective, the people of Surakarta traditionally perceived the palace as the principal source of culture and relied heavily on populist cultural practices, as noted by historian Sartono Kartodirdjo (1997). This populist culture emerged from everyday community life and emphasized harmony with both social and natural environments. In recent years, however, institutional orientations have increasingly shifted toward more formal governmental structures.

Theoretically, the institutional dimension of an integrated area should accommodate diverse social communities and their organizational forms. In the context of Surakarta, there are indications that urban development does not always adhere to regulations grounded in social realities and has yet to fully accommodate the interests of all existing social groups, including the continuity of populist culture. This culture is closely associated with the extensive use of public spaces, particularly GOS.

Existing indications show that the government has taken over many interests in the form of public policy. Under government control, the area is being developed primarily for economic growth, even though the community has long-established socio-cultural and economic patterns, such as conducting traditional ceremonies and arts, as well as trading agricultural and industrial products. Actions rooted in an aristocratic institutional framework, which carry socio-cultural implications, have become part of the public sphere. This contrasts with the fact that the people still view Surakarta as Kutaneegara or the Great State, a center for the community (civic center).

The integration condition in Surakarta is thus identified as a shift in regional control from informal traditions to formal government. The government is developing the area for economic purposes, even though the community still regards it as the center of Javanese society. Cities require development processes that are embraced by all segments of society. Surakarta, by nature, cannot avoid growth and development, as these are essential to progress. The provision of GOS in Surakarta needs to harmonize existing local norms with new norms that emerge in a balanced manner. Regional needs include sustainable development that considers the tastes, creativity, and initiatives of local communities, aligning with local requirements while accommodating the interests of all parties. Implementing a contextual integration approach involves preserving existing components, adjusting and reshaping them, and developing new components to facilitate change.

2. Context of Providing Green Open Space in Surakarta

Functioning GOS in Surakarta could have an ecological function as the city's lungs, microclimate regulator, and animal habitat. However, in Surakarta, GOS has evolved into multifunctional spaces that serve as venues for recreation, social interaction, and communal gathering among urban residents, reflecting local cultural values of togetherness and harmony as well as functioning as a medium of communication. GOS also performs economic roles, such as providing space for the cultivation of marketable plants, including flowers, fruits, leaves, and vegetables. At certain scales, therefore, GOS contributes to agricultural, plantation, and even forestry-related activities. From an aesthetic perspective, GOS enhances urban comfort and quality of life, improves the visual character of the city at both micro and macro levels, and fosters harmony and balance between built and open spaces. Such an ecological balance can only be achieved when GOS is provided in adequate quality and quantity within urban areas.



Figure 2. Green Open Space in Surakarta

Source: <https://rth.surakarta.go.id>, Observation, mettanews.id

2.1 Conditions of Open Space in Surakarta

In Surakarta, GOS comprises various forms, including urban forests, pedestrian corridors, cemeteries, traffic islands and road medians, railway buffer zones, riverbanks, sub-district parks, city parks, as well as neighborhood-level parks (RW and RT parks). In 2016, the total area of public GOS reached 428.73 hectares, representing

approximately 9.72% of Surakarta's total land area. Public GOS includes urban forests, parks, green belts, and locally protected areas such as river borders and water catchment zones. However, this proportion remains below the regulatory requirement mandating a minimum of 20% public GOS coverage within the city, while private GOS is targeted to account for an additional 10%. In the context of Surakarta, expanding public GOS through the conversion of private open spaces is considered challenging; consequently, policy efforts have focused on optimizing the functions of existing GOS. The primary challenge for GOS development in Surakarta, therefore, lies in enhancing its functional performance. Beyond serving as a key representation of biotic components, GOS plays critical ecological, social, economic, and educational roles. Given its limited availability, GOS in Surakarta has also assumed an increasingly important recreational function.

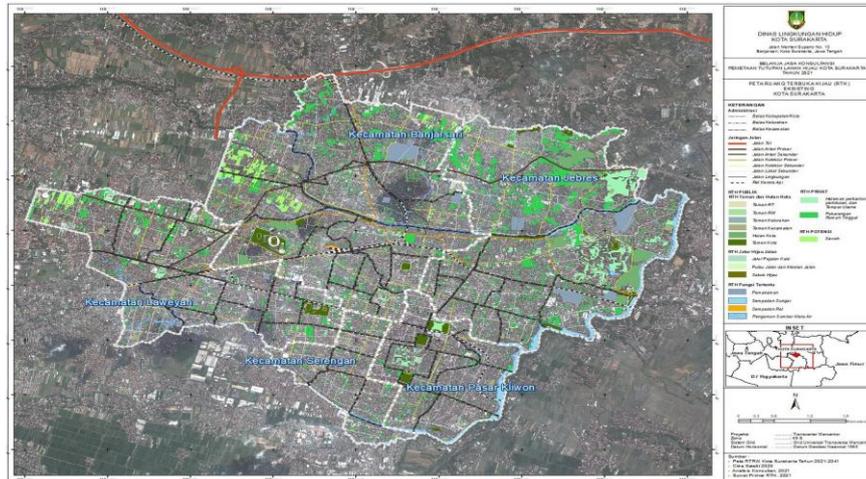


Figure 2. Map of Existing Green Open Space in Surakarta

Source: Dinas Lingkungan Hidup Surakarta (City Environmental Service)

The distribution of GOS in Surakarta is characterized by significant inequality, primarily due to urban growth concentrated in the southern region. Not all areas have met the target for green space provision. Certain sub-districts, such as Banjarsari and Laweyan, have relatively better access to green space, while southern areas like Serengan and Pasar Kliwon show notable disparities. Although many GOS are well-maintained and serve important functions as recreational areas and ecological buffers, numerous vacant lots remain underutilized, representing potential opportunities for green space development. The Surakarta City Government, through its Environmental Agency, is actively identifying vacant land for the creation of public GOS in alignment with the Sustainable Development Goals. Key challenges in enhancing green space provision include the conversion of these areas for alternative purposes, insufficient community engagement in their preservation, and budget constraints.

Expanding public GOS by utilizing private open spaces is widely regarded as difficult; therefore, efforts are generally directed toward improving the quality and functionality of existing GOS. In Surakarta, the primary challenge lies in enhancing the roles and functions of GOS areas, particularly their ecological function. As a crucial representation of biotic components, GOS serves important environmental roles, including ecological, social, economic, and educational functions. Despite its limited extent, GOS in Surakarta also plays a significant role in sustaining local cultural life.

2.2 The Provision of Green Open Space Takes into Account Demand and Supply

There is an urgency to ensure that the provision of GOS takes into account the condition of the ecosystem in the city of Surakarta, as studied from both the demand and supply sides. Additionally, there is another consideration: the phenomenon of global climate change. GOS is one solution for climate change mitigation (Downton, 2009; Dewi, 2017). Research from Germany indicates that demand-side analysis of ecosystem services is useful for capturing stakeholder interests in GOS provision (Kiese & Mager, 2018), while supply-side analysis, especially of GOS, supports the identification of climate-relevant potential and the planning of GOS development (Jacobsen & Firor, 2019).

Using Surakarta City as a case study, this research provides a foundation for identifying and modeling GOS provision by accounting for stakeholder demand for and supply of GOS. The analytical framework applied in previous studies on the demand and supply of GOS ecosystem services for sustainable urban planning (Kiese & Mager, 2018) is considered relevant to the local context based on empirical observations. Accordingly, this study emphasizes the importance of identifying the ecological and socio-cultural potential of urban green and open spaces through an ecosystem services supply–demand approach.

2.3 Problems of Providing Green Open Space in Surakarta from the Community Aspect

At present, a number of public GOS, such as urban forests, parks, public cemeteries, and green belts, have been developed and managed in accordance with regional regulations. Nevertheless, post-development management in several areas remains suboptimal. When provided in adequate quality and quantity, GOS generates substantial benefits. Moreover, Indonesian laws and regulations require that at least 30% of urban land be allocated to GOS, which plays a crucial role in maintaining balance in the use of various natural resources. GOS serves a multidimensional function for urban areas, delivering both direct (tangible) and indirect (intangible) benefits.

In the context of Surakarta, the intangible benefits of GOS for the community include fostering regional identity; supporting education, outreach, and research activities; providing spaces for both active and passive recreation as well as social interaction; enhancing urban land value; cultivating residents' sense of pride and

strengthening regional dignity; facilitating social activities for various age groups, including children, adolescents, adults, and the elderly; serving as emergency evacuation areas; and regulating as well as improving the urban microclimate (Cheshmehzangi & Dawodu, 2018). Collectively, these roles reflect a combination of physical-ecological, socio-cultural, aesthetic, and economic functions, which may be categorized into intrinsic and extrinsic dimensions. However, these functional aspects require further examination and refinement through future research.

Utilization of GOS in Surakarta: The study of the availability of GOS in the City of Surakarta reveals several general functions that align with the guidelines for providing GOS set by the government.

- a. Ecological function. GOS serves as a habitat for various flora and fauna. Despite the environmental pressures in urban Surakarta, the diversity value is low. GOS also functions as an effective water catchment area, capable of absorbing carbon dioxide and reducing particulate emissions.
- b. Economic function. GOS that host a variety of flora and fauna offer economic benefits to society and can be utilized sustainably. Several types of flora, such as herbal plants, vegetables, and fruits, have economic value and can be found in open spaces managed by the neighborhood (RT or RW).
- c. Recreational function. The City of Surakarta, characterized by limited GOS and dense anthropogenic activity, makes GOS an oasis for local residents seeking a break from their work routines. The recreational function serves as a primary environmental service of GOS in urban areas, and with proper management, it can become a significant tourist attraction. This is exemplified by the developments in Balekambang Park and Jurug Park, which have now transformed into Safari Parks.

Currently, there is no clearly defined function of local community culture emerging from these spaces, nor is there a pronounced educational function. The diversity of flora and fauna presents an ideal opportunity for academic activities, particularly as a focus for related scientific study. However, the significance of a garden is paramount, as it can also serve as a venue for technological and scientific development.

2.4 Proportion of Green Open Space Provision

“GOS represents a vital component of urban environments, including Surakarta, as its presence influences urban livability, authenticity, productivity, and sustainability. Nevertheless, the abiotic, biotic, and cultural characteristics of cities vary due to the complex interconnections among environmental elements, resulting in unique local conditions (Özyavuz, 2013). Consequently, the stipulation of allocating a minimum of 30% of urban land to GOS cannot be uniformly applied across all cities. Previous studies (Lizya et al., 2017) emphasize that the provision of public GOS should be aligned with the needs of urban residents, with availability shaped by factors such as the range of activities supported by facilities and the accessibility of existing green spaces. Accordingly, public GOS development is recommended to adopt vertical approaches, ensure equitable distribution in both number and area, and be strategically located. Furthermore, other research demonstrates that fragmentation levels, shape complexity, green belt orientation, and vegetation types significantly affect the cooling performance of green areas (Soudoudi, 2018). These findings suggest that the effectiveness of GOS is determined not only by its extent but also by its spatial configuration and vegetative characteristics, which together influence cooling efficiency.

CONCLUSION

GOS constitutes a key element of urban environments, including Surakarta, as it shapes multiple dimensions of urban life by enhancing livability, attractiveness, productivity, and sustainability. In Indonesia, the allocation of GOS is legally required to account for a minimum of 30% of total urban land, as stipulated in Law No. 26 of 2007 on Spatial Planning and further regulated by the Minister of Agrarian Affairs and Spatial Planning under Regulations No. 11 of 2021 and No. 14 of 2022. However, the abiotic, biotic, and cultural conditions of each city vary due to the unique interplay of environmental elements. Therefore, the requirement for a uniform minimum of 30% GOS across all cities may not be applicable. Surakarta accommodates various urban activities, as delineated in its regional spatial plan, which earmarks areas for offices, government, trade, housing, culture, and tourism. The agricultural function has nearly vanished. This shift is closely tied to the cultural values and socio-economic backgrounds of the community. Surakarta's development has been shaped by local religiosity, with Kutanegara serving as a central hub for social interaction, trade, and entertainment. The role of GOS encompasses abiotic, biotic, and cultural dimensions, including community perspectives. This research indicates that the factors influencing the provision of public GOS include changes in social norms, functions, and physical conditions. The approach to understanding GOS should consider its historical significance, location, form, and function, which is essential for exploring the concept of integration. The suitability of GOS for the community is assessed in terms of the supply-demand relationship. Findings reveal that several GOS hold cultural importance for the community. However, Surakarta faces challenges in providing adequate GOS. The increasing intensity and diversity of activities, along with modernization, privatization, and commercialization of areas, have led to land conversion that disrupts traditional Javanese lifestyles. The region exhibits a dualism of traditional-informal and modern-formal values, while the existing GOS often serve pragmatic functions. Future GOS must bridge traditional and modern cultural lifestyles to foster an environment that accommodates all.

It is recommended that the provision of public GOS not only aims for equitable distribution in terms of number and area but also considers the cultural context of the community. Previous research indicates that the provision of GOS is influenced by factors such as fragmentation, shape complexity (measured by the land form index), green belt orientation, and vegetation type. Nevertheless, this study emphasizes that the focus for Surakarta should be on achieving a balanced distribution and functionality that aligns with the city's cultural needs. The provision of GOS with specific types and characteristics should also be grounded in an understanding of its cultural function in relation to land use in Surakarta's urban area.

Credit authorship contribution statement

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