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Valuation of Urban Green Open Spaces Using the Life Satisfaction Approach

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Abstract

This study conducts the valuation of the urban Green Open Spaces (GOS) in Jakarta (Indonesia) using the life satisfaction approach (LSA). We integrated the important elements of the LSA, such as housing structure and environmental facilities, into a comprehensive valuation model (using hedonic variables). By explicitly acknowledging the limited application of these methodologies in developing nations, this study endeavors to provide a context-specific understanding of the economic value of GOS in Jakarta. The LSA model, a novel non-market valuation tool, employs community life satisfaction as its primary metric. In this study, we analyzed the satisfaction levels of residents of Jakarta based on a 10-point scale; the responses of a total of 1,592 participants were collected through online questionnaires in 2021 (during the pandemic). We considered various independent variables, including socioeconomic factors, housing attributes, environmental facilities, location amenities, and the presence of GOS. The analysis involved LSA and ordinary least squares (OLS) models in the Statistical Package for the Social Sciences (SPSS). The results indicate that several variables, such as longer residence duration, good employment status, high income "over 20 million Indonesian Rupiah (IDR); approximately USD 1281.56", and access to more shopping centers, positively influenced the life satisfaction of the residents, which is in line with the studies conducted in western countries. Surprisingly, the economic evaluation of urban GOS portrayed a limited impact on the residents' life satisfaction, while negative aspects, e.g., the presence of cemeteries around residential areas (19.1%), impacted the residents significantly. Urban parks did not portray statistical significance in influencing the residents' life satisfaction, despite having a positive impact across all radii of urban regions. Urban forests exhibited a positive impact, mainly within the 100–500-m radius, with a significant impact on resident life satisfaction. Our attempt to assess the values of landscape amenities in Jakarta using LSA marks a pioneering effort in the field of environmental science with respect to community preferences. Consequently, this study contributes significantly to the evolving yet limited literature in this domain. The results differ from those of the Global North research, emphasizing the need for context-specific urban planning strategies. Our study offers valuable insights for urban planners and government entities and can guide GOS development to enhance urban sustainability and community satisfaction. The implications extend to urban centers in Indonesia and other developing countries, emphasizing the importance of optimizing limited urban spaces based on community preferences.

Keywords: Economic Valuation; Green Open Space (GOS); Green Spaces; Life Satisfaction; Life Satisfaction Approach (LSA); Jakarta.

1. Introduction

Urban green open spaces (GOS) play a pivotal role in urban ecosystems; they provide ecological, social, and economic benefits. Additionally, GOS contributes significantly to the resilience of cities to the adverse impacts of climate change and natural disasters [1]. These spaces are essential for mitigating the effects of climate change and fostering sustainable urban development. They offer a range of ecosystem services that address several health-related

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challenges, such as heat waves and air pollution, while enhancing the well-being of residents through physical activities and social interactions [2]. Sustainable urban development focuses on enhancing the overall quality of life for residents. Achieving sustainability and urban regeneration requires a meticulous examination of human-made aspects within urban environments, especially in rapidly urbanizing low- and middle-income countries, thus emphasizing the importance of GOS [3]. This study explores the interplay between the GOS, public perception, and urban sustainability in Jakarta. We aim to understand the public perceptions of GOS with respect to their contribution to the social dimensions of quality of life and as integral components of sustainable development in the region. The study aligns with the United Nations Sustainable Development Goals, ensuring universal access to safe, inclusive, and accessible green spaces by 2030.

Urban planning strategies are critical in achieving environmental aesthetics and fostering socially and economically resilient environments, thereby significantly contributing to sustainable development [4]. In particular, during the COVID-19 pandemic, urban GOS has been vital to the community. These spaces offer diverse environmental and health benefits that become even more critical during such scenarios. Despite the temporary closures of GOS during the pandemic, evidence suggests their ongoing importance for the mental and physical well-being of residents, as they offer recreational activities [5]. However, a noticeable shift toward recreational activities necessitated adjustments to pandemic-related urban policies. Numerous studies have reported the benefits of these spaces [6]. Urban green infrastructure, essentially a landscape element, acts as a conduit that offers various environmental, economic, and social advantages. Understanding the benefits of GOS allows planners to develop evidence-based policies for their effortless integration into urban environments. This maximizes the ecological and socioeconomic advantages of such space while managing costs [7].

In this context, valuation serves as a powerful tool for policymakers and decision-makers, offering significant insights into the crucial role of ecosystems in ecological sustainability and human well-being. This simultaneously guides efforts related to the development and use of the environment. Ambrey & Fleming [8] emphasize the need for policymakers to consider the role of public urban GOS in supporting the well-being of residents and serving their preferences. This has led to the need for economic scrutiny when assessing the community preferences for recreational activities within GOS during urban planning. The application of economic valuation methods serves the specific purpose of bridging the gap between planning, financing, and implementation considerations [9]. It is also perceived as an indispensable element in the decision-making process of the government for urban planning. Policymakers have emphasized calculating the economic value of GOS as a critical component of strategic urban planning for future development [1]. While the multifaceted role of GOS is well established, its valuation is considered a pivotal area of investigation in developed countries.

The lack of studies on the economic valuation of urban GOS in Indonesia can be attributed to the intangible and public nature of these goods, often making them appear insignificant because they cannot be included in market transactions. To address this, monetary valuation methods have been designed to analyze the inherent characteristics of these goods and capture individual preferences [10]. A considerable body of literature focuses on determining the monetary value of GOS, with the most common method being the hedonic price model (HPM), wherein the GOS value is deduced from its discernible impact on the valuation of land or property. Several studies that employed HPM attempted to determine the monetary value of a GOS by assessing its impact on the property value. For example, Tyrväinen [11], Saphores & Li [12], Xu et al. [13], Wu et al. [14], Kolbe & Wüstemann [15], and Setiowati et al. [16] demonstrated the effectiveness of the HPM for the valuation of green spaces, with the GOS value being inferred from its discernible influence on the property value (based on the urban context).

An alternative to traditional methods such as the HPM is the use of non-market environmental valuation methods, e.g., the life satisfaction approach (LSA). Unlike the HPM, which relies on market equilibrium conditions, the LSA eliminates the need for individuals to directly appraise non-market goods. Instead, it measures the value by quantifying the influence of the GOS on the life satisfaction of community/residents [17]. The concept of sustainability extends beyond economic prosperity and serves a broader perspective on human well-being, including aspects such as the quality of life, happiness, equality, justice, and the fulfillment of basic needs. Concurrently, LSA has emerged as an alternative method to gauge the value of GOS by assessing its influence on the life satisfaction of individuals. This study highlights the effectiveness of the LSA model for capturing individual preferences for GOS while considering the subjective well-being and satisfaction of residents. Tsurum & Managi [18] suggested a potential correlation between greenspace quality and the moods of residents, proposing that higher-quality greenspaces may improve the overall well-being of the local residents. This departure from market-based methods is particularly relevant for non-market environmental goods, for which conventional market prices are not applicable.

Environmental quality plays a crucial role in shaping individual well-being and guiding well-informed policy decisions [19]. The LSA model offers a valuation technique for an environment that subjectively calculates individual life satisfaction scores. It operates on the assumption that if a GOS is considered essential, its presence in the city should be maintained while avoiding degradation. Our study assesses the relationship between life satisfaction and the presence of GOS in individual residential areas. A significant lack of studies exists on the valuation of urban public GOS in

Indonesia; our study addresses this gap in the literature. Assigning monetary value to environmental goods and services that are not applicable to conventional market pricing is a broad area of study in environmental economics. This field originated from the need to incorporate the values of environment-centric areas into cost-benefit analyses while considering environmental damage litigation.

In Jakarta (Indonesia), rapid urbanization has led to significant population growth and environmental challenges. The area of particular concern is the noticeable decline in the public GOS in the city. Currently, the GOS area in Jakarta covers only 5.1% of the total area of the city, falling considerably short of the mandated 20% of the 30% GOS coverage outlined in the Central Government Spatial Planning Law. Achieving this ambitious target may be difficult due to the rapidly advancing urbanization trend. The issue of urban GOS is becoming increasingly important because of rapid growth in population and urbanization. According to preliminary studies, the GOS area in Jakarta, which accounted for 5.84% in 2011, declined to 5.31% in 2018. This decline caused the region to rank lowest among the cities with GOS [20]. The decrease in the GOS area in Jakarta, which is categorized under non-market environmental goods or services, reflects a lack of emphasis on the city's development plans. The externalities that arise from environmental factors necessitate the implementation of government policies aimed at preserving and enhancing the environment. Recognizing the unique benefits of these greenspaces in urban life, Indonesia enacted the Ministry of Environment and Forestry Regulation No. 15 of 2012, emphasizing the need for effective planning of these resources. This regulation guides the economic valuation of forest ecosystems by emphasizing careful planning and the adoption of valuation as a tool for implementing strategies that incorporate a precautionary approach. The assessment methods outlined in this ministerial regulation do not explicitly mention LSA. Thus, this study provides valuable insights that can be used by the central government, particularly regarding the incorporation of the LSA approach in determining the economic value of environmental goods and services in Indonesia.

Although the HPM and LSA have been extensively applied for GOS valuation in developed countries, their utilization in developing nations, including Indonesia, is limited. This study addresses this gap by employing a comprehensive valuation model that integrates hedonic price variables and the relevant elements of the LSA. The lack of studies on GOS valuation in Indonesia, combined with its unique socioeconomic and environmental context, highlights the necessity for a nuanced understanding of the economic value of the GOS in Jakarta. This study is a novel attempt to construct an LSA model for evaluating the value of urban public GOS on a provincial-regional scale using an HPM approach. As mentioned previously, this study aims to develop a preference valuation model that is specifically designed for urban GOS in Jakarta. This includes categorizing various GOS types, such as parks, urban forests, and cemeteries, using the LSA method. In line with Law No. 26 of 2007 on spatial planning, cemeteries were officially classified as GOS. To realize this objective, we focused on understanding the local community preferences for GOS.

This study also recognizes the likelihood of conflicting preferences arising from the diverse attitudes and subjective opinions of residents. The importance of integrating environmental amenities into urban planning while considering factors such as proximity to the nearest train station, income level, and population density has been highlighted by Tsurum & Managi [18]. This study explores whether residents, in pursuit of enhanced well-being, prefer to live in areas surrounded by green spaces. The study utilized satisfaction data gathered through online surveys conducted during the pandemic; we surveyed due to the lack of available data. The challenges encountered during the survey process included the potential impacts of the pandemic on Internet access and the unwillingness of the residents to participate in the survey. Notably, public perceptions and attitudes may have been influenced by the pandemic, potentially affecting their responses related to well-being and green spaces. Nonetheless, online surveys offer advantages by enabling real-time data collection and analysis, extending geographical reach, and facilitating diverse respondent participation.

The exploration process included investigating the functional relationships among socioeconomic variables, urban GOS attributes, environmental amenities, residential structures, and the impact of public green spaces on life satisfaction. This comprehensive analysis was crucial for estimating the value of the GOS. Our approach also recognizes the importance of considering community decision-making processes when selecting residential areas. This served as a reference point for identifying the specific environmental amenities that significantly influenced community preferences. Furthermore, this study incorporated community life-satisfaction preferences as the main dependent variable in the LSA model, enabling a comprehensive valuation of GOS in the urban landscape. Gaining absolute knowledge of the dynamics and perceptions associated with these spaces in Jakarta has fundamental significance; it informs the development of effective urban-planning strategies and contributes to enhancing the well-being of the residents.

The structure of this paper is as follows: Section 2 presents a literature review of the studies on greenspaces and the LSA model. Sections 3 and 4 present the study methodology, the results, and the discussion in detail. The research methodology is categorized into survey areas, data and methods, and respondent characteristics. Section 5 presents the conclusions of the study and highlights the political implications of our findings for urban planners. Notably, our study emphasizes the significance of incorporating the perceptions of people into the valuation of urban GOS to ensure the effective utilization of these resources and achieve sustainable development.

2. Literature Review

2.1. Green Open Spaces (GOS) in Jakarta

Frequent visitors to urban green spaces demonstrate elevated levels of well-being [21], e.g., such individuals portrayed improved mental health during the COVID-19 pandemic [5]. Extensive studies highlight the positive effects of urban green spaces on health [22]. Additionally, residents who live in areas with more green spaces consistently reported greater levels of subjective life satisfaction than those who live in areas with fewer green spaces [8, 23]. The positive impact of high biodiversity on the well-being of greenspace visitors highlights the importance of comprehending the determinants of self-reported greenspaces for informed decision-making in green policy initiatives; additionally, it is important to acknowledge the ongoing debate surrounding the disparity between physically measured and self-reported data in environmental assessment [24, 25].

The primary objective of sustainable urban development is to improve the overall quality of life for the residents. To achieve sustainability and urban regeneration, the consideration of human-made elements within urban environments is crucial, while also including the important role of GOS. The United Nations Sustainable Development Goals, specifically Proposed Goal 11 Target 7, state the importance of universal access to safe, inclusive, and accessible green and public spaces by 2030. This target focuses on meeting the needs of various groups, including women, children, older individuals, and those with disabilities. Urban GOS plays a critical role in making cities more livable, enjoyable, and appealing to their inhabitants. Within the community, these spaces serve as platforms for promoting health awareness, specifically in urban settings where GOS are often perceived as recreational areas in a natural and flourishing environment [26]. The enhancement of GOS necessitates the need for child-friendly facilities and activities that support the growth, development, education, and safety of children while encouraging participation and collaboration [27]. Furthermore, the development of sustainable cities extends beyond ecological considerations and the social aspects of urban life, including the satisfaction, experiences, and perceptions of residents with respect to the environmental quality in residential areas. Increasing citizen awareness about the significance of these areas in urban environments is important and can improve the quality of life in cities and the general urban environment [28].

The development in Jakarta and its nearby cities of Bogor, Depok, Tangerang, and Bekasi (collectively known as Jabodetabek) has led to a significant population increase of approximately 14 million residents. This has resulted in rapid urbanization, posing significant challenges related to environmental degradation; this is of particular concern in scenarios of elevated temperatures [29]. As a megapolitan city, Jakarta has experienced substantial development across multiple sectors, including industry, commerce, transportation, and housing, leading to various environmental challenges [28]. One particular urban challenge in the city is the reduction of the GOS area. Between 2011 and 2018, the city witnessed a decrease in the area of these spaces (~342.40 ha), with the most significant reduction occurring in South Jakarta (109.42 ha) [30]. The current area of public GOS in Jakarta accounts for only 5.1% of the total area of the city, which is significantly lower than the mandated threshold of 20% set by the Central Government Spatial Planning Law. The management of a significant portion of these spaces falls under the jurisdiction of the Jakarta City Parks and Forestry Agency [31].

Jakarta has an ambitious objective to increase the area of GOS to 30% by 2030, in line with the requirements of Law No. 26 of 2007 on spatial planning. However, reaching this target poses significant challenges for Indonesian cities that are experiencing rapid urbanization. Despite the government's efforts and policies aimed at enhancing public parks, protecting urban forests, and establishing GOS, these initiatives have struggled to keep pace with rapid population growth. This emphasizes the need for urban planners to prioritize GOS preservation, ensure public access to these spaces, and integrate ecologically driven utilization into inclusive planning. Presidential Regulation No. 60 of 2020 proposes a strategy for the Jabodetabek Metropolitan Area, designating the protected zones with a minimum of 30% of the total region allocated as GOS within this metropolitan area. This provision differs from the policy outlined in Law No. 26 of 2007 and Government Regulation No. 15 of 2021 on spatial planning, which states that 30% of the total area of a city should consist of GOS. The Ministerial Regulation No. 14 of 2022 from the Ministry of Agrarian Affairs and Spatial Planning/National Land Agency also states that urban GOS should constitute a minimum of 30% of the total area.

The ongoing reduction in the GOS area each year can be attributed to the urban planning practices of the Jakarta Provincial Government due to the consistent downsizing of the allocation of these spaces in spatial regulations. Sutapa et al. [32] indicate that, as one of the largest cities in Indonesia, Jakarta tends to experience high-intensity and unsustainable urban development, resulting in landscape degradation. The presence and management of public spaces, particularly the green plan delineated in regional regulations, are closely intertwined with urban spatial planning; this includes the plans enacted by the Jakarta Provincial Government. The history of such plans implemented in the city can be traced to the Jakarta Master Plan 1965–1985, wherein the area designated for GOS was 24,315.04 ha, accounting for 37.2% of the total area of the city. However, in subsequent developments, e.g., in the 1984 General Spatial Plan, this proportion was reduced to 29.92%. Further reductions resulted in the proportion being 13.94%, corresponding to the 1999 amendments to the 2010 Jakarta Spatial Plan. In 2014, the Jakarta Provincial Government enacted Regional Regulation No. 1 of 2014, further reducing the area allocated to GOS and the allocated space to 11.51%, or 7,520.96 ha.

This downward trend continued with a subsequent revision in Governor Regulation No. 31 of 2022 on the Detailed Spatial Plan or the Provincial Planning of Jakarta, further limiting the allocated GOS to 7.56% of the total area of the region [5]. These successive regulatory modifications consistently eroded the allotment of green spaces in Jakarta, posing a substantial challenge to meeting the minimum requirements mandated by national laws. This decline had a significant impact on the quality of life and well-being of the city residents, as these spaces played a critical role in urban sustainability, including the health and happiness of its inhabitants. According to previous studies, community interviews in West Jakarta revealed a substantial demand for cities with environmental parks [33]. This demand highlights the need to facilitate urban activities and enhance the local urban environment to provide better experiences and amenities to communities. The decline in the GOS area can be linked to a consistent reduction in GOS allocation in urban planning regulations. Successive modifications to such regulations resulted in a decrease in greenspace allotment, affecting the quality of life and well-being of city residents. Carrying out an economic valuation of urban GOS through LSA is essential for understanding the monetary value of GOS and its impact on urban sustainability. Aoshima et al. [25] explored the significance of subjective perceptions in the assessment and preservation of urban green spaces. While planners commonly emphasize the importance of the physical attributes of GOS, this study explores the role of public perceptions in GOS allotment [25]. The intersection of urban green spaces and human well-being is a captivating subject, with numerous studies highlighting the multifaceted benefits of such spaces for urban residents.

2.2. Economic Valuation Model Using the Life Satisfaction Approach (LSA)

The exploration of greenspace value has been a central focus of environmental economics. Valuation methodologies, such as contingent valuation, have been extensively used to assess the quality of greenspaces, as highlighted by Tsurum & Managi [18]. However, these methods have limitations, e.g., participants may provide shallow responses, and there may be disparities between the expressed and actual behaviors of the respondents. Additionally, Tsurum & Managi [18] cautioned against biases in the HPM results, especially if environmental changes are not promptly reflected in land value assessments. Notably, the LSA model can address these challenges while offering a distinct perspective on environmental valuation by explicitly capturing individual well-being without relying on market equilibrium. Therefore, several studies employed LSA data for environmental valuation [17, 18, 25, 34–38].

Life satisfaction is influenced by the complex interplay between social and economic factors. These factors included income, marital status, employment, parenthood, health, and educational attainment. In addition to these traditional factors, recent related studies include environmental variables such as air quality, floods, climate conditions, natural landscapes, droughts, and the presence of urban GOS. Public perceptions of equally sized GOS have yielded different outcomes based on specific types [25]. These findings have significant implications for urban planners and experts and highlight the importance of considering both the physical attributes of the GOS and the public perceptions of environmental planning, specifically for areas with limited space. To achieve effective and efficient outcomes, it is crucial to incorporate public preferences quantitatively and qualitatively, particularly when life satisfaction is used as a dependent variable in valuation models. This necessitates the incorporation of socioeconomic factors, residential structures, environmental amenities, and standard GOS variables that are commonly used in HPM construction. Consequently, the economic valuation of these spaces in urban areas extends beyond policy recommendations and requires academic effort.

In public policy decision-making, understanding the value of services provided by GOS is essential, especially when uncertainty is related to the costs associated with their preservation [39]. This comprehension is particularly crucial in urban settings, where policymakers need to make well-informed decisions. This approach can be used to assess whether the economic benefits derived from these open spaces, which are regarded as part of nature, outweigh the costs associated with their development and maintenance [40]. Policymakers often evaluate the monetary valuation of environmental services to address conservation, social, and economic objectives. This approach provides more concrete estimates than qualitative studies, offering a clearer picture of the benefits at stake [11]. However, there is no universally perfect method for valuing urban GOS, with only a limited number of studies being conducted in developing countries [41]. Urban development has societal implications; policymakers must consider how improved facilities affect land prices [42]. These methods and practices can be used to assign monetary value to environmental goods and services when conventional market prices are not applicable [10].

For instance, a study conducted in the United Kingdom (UK) reported that individuals were happier in natural green habitats than in urban settings [43]. Similarly, an investigation in Australia focused on the impact of public GOS on the life satisfaction of residents [8]. A positive correlation was observed between the proportions of these spaces and self-reported life satisfaction. Public GOS, also categorized as environmental goods, often pose challenges in terms of economic measurement/valuation, leading to the undervaluation of such goods and their designation as low-worth assets. The economic value of these spaces plays a significant role in the context of sustainability assessments. This aspect has remained relatively unexplored in Indonesia, contributing to its marginalization in the decision-making process of urban policies. The valuation of such areas forms the basis on which public policies are enacted, offering insights into the extent to which communities value these spaces. Environmental policies and regulations have been implemented to

improve environmental quality for individual well-being [37]. A case study in London revealed that the strength of the association between personality traits and life satisfaction depends on the environmental characteristics of the region [44]. The LSA technique for GOS valuation enables the estimation of different coefficients and individual income, which can then be used to analyze the public perception of and community preferences for GOS.

Valuation determines the precise economic value of goods and services that cannot be traded in traditional markets. Urban GOS plays an important role in enhancing property values, attracting investments, and boosting tourism. As public goods, these spaces should be maximized to generate social benefits for the community. Two analytical approaches are commonly used for assessing urban landscapes. One focuses on the psychological aspects related to human perception [45], while the other involves economic (monetary) evaluation methods. Urban GOS lack price tags; therefore, it is challenging to incorporate them into government policies and decision-making processes that rely on cost-benefit analysis. To address this challenge, scholars have developed valuation models using a preference-based approach that combines the elements of both LSA and HPM. This approach complements the HPM while emphasizing the mutual enhancement of the LSA and HPM theories [36, 46, 47]. Previous studies on the LSA demonstrate numerous personal, demographic, and socioeconomic factors that influence life satisfaction [48, 49]. A study on preference heterogeneity analyzed the impact of GOS on life satisfaction within an Australian urban context [8]. The influence of these spaces depends on different variables, such as the percentage of public areas, population density, and characteristics, with the majority of interactions portraying nonsignificant distinctions, indicating relatively consistent preferences for GOS [8].

For instance, a study conducted on the urban quality of life in the Buenos Aires Metropolitan Area using both HPM and LSA [50] revealed a strong correlation between real estate prices, income levels, environmental characteristics, and subjective life satisfaction. A significant relationship between urban environments and life satisfaction was reported, signifying the importance of considering both methods in the development of urban public policies aimed at enhancing the quality of life of residents. A theoretical and methodological framework for understanding the relationship between HPM and LSA further emphasizes how these approaches complement each other [51]. Van Praag et al. [47] and Brereton et al. [52] identified the similarities between the HPM and LSA methods, proving that both can effectively analyze the effects of location attributes on the quality of life and preferences of individuals. Notably, the majority of studies on LSA have been conducted in developed countries, typically categorized as part of the Global North, with limited application for developing nations. Expanding its use to more diverse regions and contexts could provide a broader understanding of the relationship between urban environments, socioeconomic factors, and resident well-being, thus supporting policymakers in making informed decisions to enhance the quality of life for the local community. The unique capability of LSA is to capture external factors that affect life satisfaction, even when these influences are not consciously acknowledged by individuals [53]. Note that LSA is a versatile method for assessing the positive and negative externalities associated with various public goods [18].

The LSA model uses an econometric function to estimate the environmental value based on individual income [53]. Unlike other approaches, LSA uses surveys similar to those used for HPM construction and provides distinct advantages by uncovering the externalities that influence individual well-being, even when people may not consciously recognize the presence of GOS [53]. Tsurum & Managi [18] used LSA to assess the impact of green spaces on human well-being, community preferences for greenery, and the proximity of GOS to residential areas. The values of GOS around residences were determined using geographic information systems (GIS) at various distance intervals. According to previous studies, residents tend to experience higher levels of satisfaction when residing near GOS [10, 54]. Using self-reported well-being as a proxy for individual utility functions facilitates the direct computation of implicit prices associated with environmental amenities [51]. In microeconomic functions, aspects such as life satisfaction, environmental conditions, and income determine the willingness of individuals to pay for resource preservation [53]. Multiple investigations used the LSA model to assess the economic value of diverse factors, including urban air pollution, air quality [35, 55], airport noise [47], climate [56], scenic amenities [10], and flooding [57].

3. Research Methodology

3.1. Study Area

This study was conducted in Jakarta, the capital city of Indonesia, with respect to Law No. 5 of 1974. The city is known for its high population density and rapid urbanization, which pose significant challenges in terms of environmental sustainability and quality of life. Jakarta is particularly noteworthy for its swift urbanization, elevated levels of air pollution, and limited access to clean water. As one of the megacities of the world, it covers an area of 662.33 km² and an additional sea area of 6,977.5 km². The city has the highest population density in Indonesia, with 20,618 people/km², resulting in a total of 10,679,951; the annual population growth rate of Jakarta is 0.66% [58].

Within the Jakarta Province, central Jakarta has the highest population density (20,618 people/km^2). Geographically, the northern boundary of Jakarta comprises a 32-km coastline, serving as an estuary for 13 rivers, two canals, and multiple floodways. Figure 1 portrays a map of the city; Banten Province borders Jakarta in the west, whereas West Java

Province borders its southern and eastern boundaries. Regarding its administrative structure, Jakarta experienced significant territorial reformation in 2001. This transformation involved the transition from five municipalities to one administrative district and five administrative cities. The expansion also extended to administrative subdivisions, increasing the number from 43 subdistricts and 265 villages to 44 subdistricts and 267 villages. In 2022, the city experienced a wide temperature range, with the minimum and maximum recorded temperature being 23.0 °C and 35.4 °C, respectively, humidity levels varying from 34% to 100%, and the total annual precipitation being 2,136.3 mm [46]. However, during this period, 502,040 people lived below the poverty line, with North Jakarta hosting the largest concentration of impoverished individuals (133,730 people). In 2021, the territory of Jakarta included protected forests and nature reserves that covered an area of 270,889.20 ha. By focusing on Jakarta, this study recognizes and addresses the contextual factors unique to developing nations while providing insights into the valuation of GOS in the context of rapid urbanization, population growth, and distinct urban challenges.

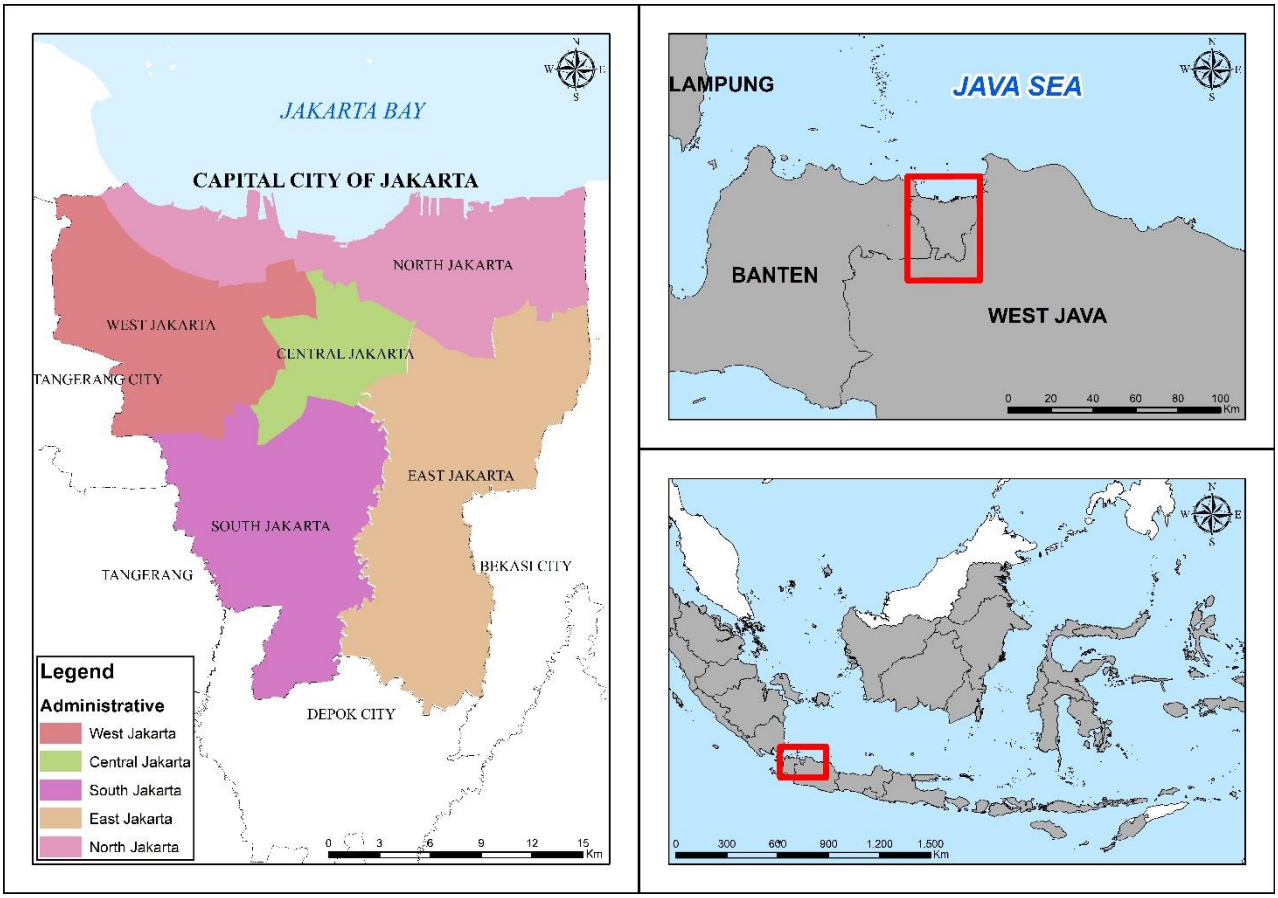

Figure 1. Geographic location of Jakarta, Indonesia

3.2. Data and Method

The data collection process required the distribution of questionnaires to the public through Google Forms. Similar surveys on subjective well-being (in the field of economics) were conducted by Frey & Stutzer [59], Layard [60], Di Tella and MacCulloch [61], and Clark et al. [62]. The online survey, which focused on measuring life satisfaction, was conducted for three months, from March 2021 to May 2021, coinciding with the pandemic. The responses were collected from 1,660 individuals across 244 neighborhoods, representing the residents across all five administrative parts of the city. The distribution of the respondents was as follows: East (26.99%), South (20.48%), West (19.64%), Central (17.23%), and North Jakarta (15.66%). The main survey questions are listed in Table A1. The survey was used to create a comprehensive profile of the respondents and included information on their housing situation, educational background, employment status, income, length of residence, and age. To simplify the data, we conducted a cluster analysis of 1,660 respondents, as shown in Figure 2, by grouping individuals with similar preferences. Figure 2 also illustrates the distribution of GOS in Jakarta, specifically parks, urban forests, and cemeteries, in accordance with the data obtained from the Jakarta City Parks and Urban Forest Agency. Following the cluster analysis, we constructed a valuation model for the GOS in Jakarta using LSA. This process adopted dendrogram hierarchical clustering using the statistical package for the social sciences (SPSS) software while considering various socioeconomic characteristics, such as the age, education level, occupation, and income of the respondents. A dendrogram-hierarchical cluster analysis revealed the formation of two major clusters. Clusters 1 and 2 comprised of 1,592 and 68 respondents, respectively. The GOS valuation model, which was developed based on the preferences of Cluster 1, represented a large subset (of 1,592

respondents). In the subsequent stage, the distances between the residential locations of the respondents and the nearby urban amenities and GOS were computed using GIS. In the final stage, we conducted an ordinary least squares (OLS) analysis using the SPSS software to establish the valuation of GOS through the LSA model. Figure 3 presents the framework used for our analysis.

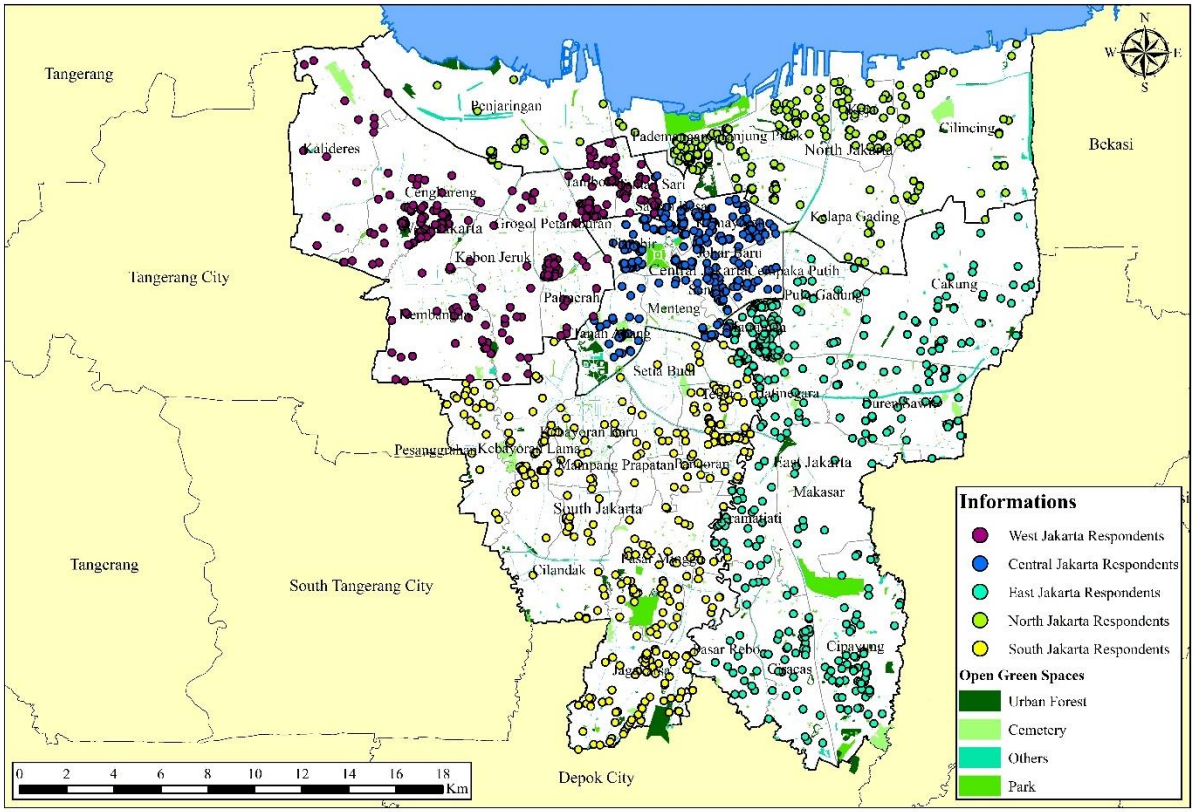

Figure 2. Distribution of respondents and urban green open spaces (GOS) in Jakarta, Indonesia

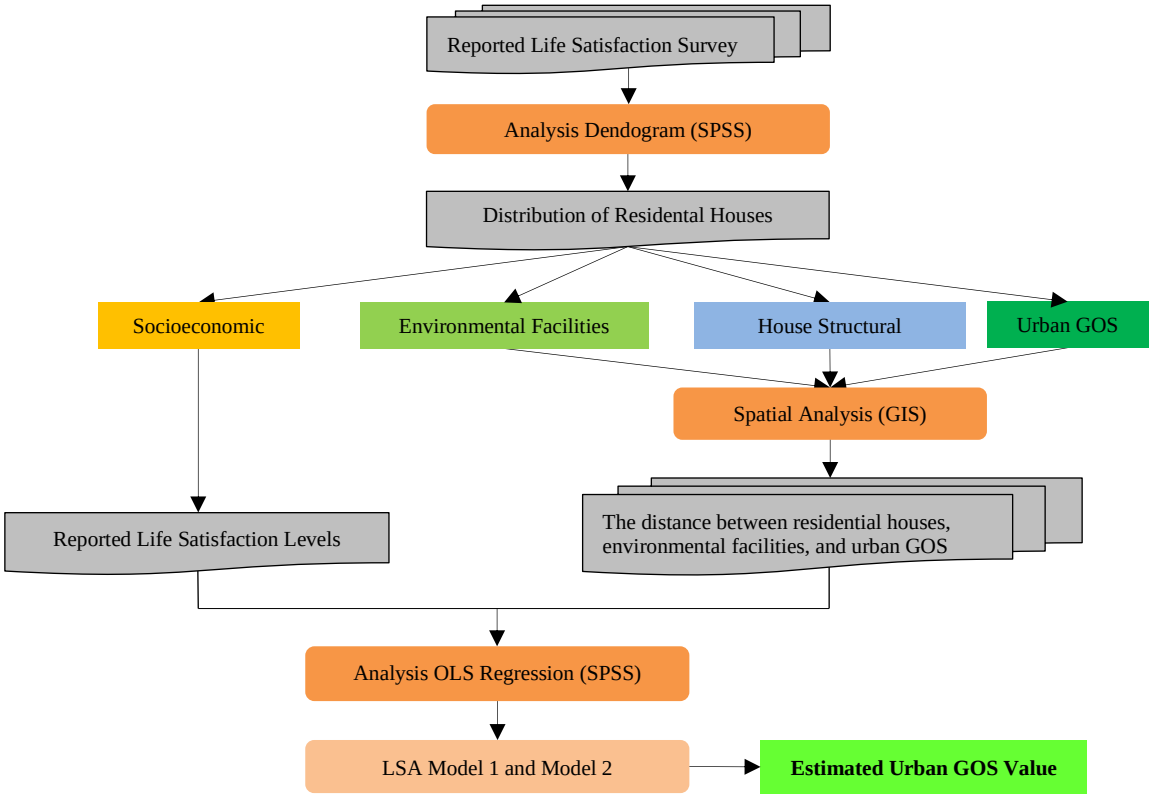

Figure 3. Illustration of the framework used in this study. (SPSS): Statistical Package for the Social Sciences; (OLS): Ordinary Least Squares; (LSA): Life Satisfaction Approach; (GOS): Green Open Space; (GIS): Geographic Information System

3.3. Characteristics of Respondents

A comprehensive description of the demographics of participants, mainly focusing on socioeconomic factors, is presented in Table 1. The data revealed that the majority of the respondents (94.1%) were within the age range of 20–60 years, indicating a predominant proportion of working-age adults. The participants who were under 20 years old and over 60 years old accounted for 2.23% and 3.67% of the total number of participants, respectively. In terms of education, the majority of participants (60.54%) had completed high school, and a significant proportion (38.86%) had college degrees. A small proportion of the study group (0.6%) lacked formal education. Regarding employment, the distribution was diverse, with approximately a quarter (24.82%) being unemployed, 25.42% working in government and private sectors, 9.88% being entrepreneurs, and 5.72% having blue-collar occupations. A substantial proportion (34.16%) was considered in the "Others" category, which comprised various job roles and types, including self-employment.

With respect to income, in 2023, the majority (68.31%) earned below the Jakarta Regional Minimum Wage standard of Indonesian Rupiah (IDR) 4.9 million/month or United States Dollar (USD) 313.98. A smaller group (15.90%) earned IDR 4.5–10 million/month (USD 288.35–640.78) in 2022, while the minority (10.42%) had incomes exceeding IDR 20 million/month (USD 1281.56), which were the higher-income individuals in the study group. Thus, our analysis provides valuable insights into the age distribution, educational background, employment status, and income level of participants, thereby portraying the sociodemographic characteristics of the participants.

Table 1. Characteristics of the participants of this study

Variable	Sub-variable	Frequency	Percentage (%)
Age	<20 years	37	2.23
	20–60 years	1,562	94.1
	>60 years	61	3.67
Education Level	Those without education or formal degrees	10	0.6
	High-school graduates	1,005	60.54
	College graduates	645	38.86
Occupational Status	Unemployed	412	24.82
	Employed in government and private sectors	422	25.42
	Entrepreneurs	164	9.88
	Blue-collar laborers	95	5.72
	Others	567	34.16
Average Monthly Income	< IDR 4.5 million	1,134	68.31
	IDR 4.5–10 million	264	15.9
	IDR 10–20 million	89	5.36
	> IDR 20 million	173	10.42

3.4. Descriptive Statistics

The descriptive statistics for OLS Models I and II are shown in Table 2; the table incorporates the important findings from the questionnaire results. It comprises different variables, including reported life satisfaction levels, socioeconomic factors, housing structure, environmental or location facilities, and GOS characteristics. Notably, the data on reported life-satisfaction levels as gathered through previous surveys, wherein questions like "Overall, how satisfied are you with your life?" were measured using a Likert scale [34]. The descriptive statistics were complemented by the insights gathered from the questionnaire responses, which provided a comprehensive overview of the survey population and their living conditions.

Table 2. Descriptive statistics ordinary least squares (OLS) Models I and II

Variable	Descriptive Statistics					
	Model I			Model II		
	Mean	Standard deviation	N (Number)	Mean	Standard deviation	N (Number)
Reported Life Satisfaction Levels (scale of 1–10)	8.1422	1.60011	640	8.1237	1.58295	1,592
Socioeconomic Variables						
Age (<20 years) (dummy)	0.0016	0.03953	640	0.0013	0.03543	1,592
Age (20–60 years) (dummy)	0.9766	0.15141	640	0.9812	0.13602	1,592
Age (>60 years) (dummy)	-	-	-	-	-	-
Length of residence >10 years (dummy)	0.6422	0.47973	640	0.6476	0.47786	1,592
Not schooled/did not complete elementary school (dummy)	0.0094	0.09645	640	0.0063	00.07903	1,592
College-educated (dummy)	0.4063	0.49152	640	0.4052	0.49108	1,592
Employed (dummy)	0.7500	0.43335	640	0.7601	0.42719	1,592
Income <IDR 4.5 million (dummy)	0.6688	0.47103	640	0.6696	0.47051	1,592
Income IDR 4.5–10 million	-	-	-	-	-	-
Income IDR 10–20 million (dummy)	0.0547	0.22755	640	0.0559	0.22981	1,592
Income >IDR 20 million (dummy)	0.1047	0.30639	640	0.1087	0.31132	1,592
Residential location comfort satisfaction	8.1563	1.74975	640	8.1124	1.73166	1,592
Housing Structure Variables						
Source of clean water (dummy)	0.4469	0.49756	640	0.4912	0.50008	1,592
Environmental / Location Facilities Variables						
Number of shopping centers	17.0156	6.43152	640	16.7714	6.01814	1,592
Population density per neighborhood (people/km²)	23347.4891	16482.78474	640	25605.8304	18607.54882	1,592
Distance to toll road (1000 m) (dummy)	0.4453	0.49739	640	0.4083	0.49167	1,592
Distance to main road (200 m) (dummy)	0.1859	0.38936	640	0.1859	0.38917	1,592
Distance to train station (500 m) (dummy)	0.1000	0.30023	640	0.1043	0.30571	1,592
Distance to Central Business District (9000 m) (dummy)	0.5047	0.50037	640	0.5396	0.49859	1,592
Distance to the river (200 m) (dummy)	0.2875	0.45295	640	0.2808	0.44952	1,592
Location of Respondent (a categorical variable)	2.6063	1.36968	640	2.8536	1.40102	1,592
Public High School	2.7922	1.67152	640	2.6376	1.65805	1,592
Urban Green Open Spaces Variables						
Distance to Urban Forests						
Less than 500 m	78.4547	145.89117	640			
0–500 m, as a dummy variable				0.1118	0.31523	1,592
500–1000 m, as a dummy variable				0.1916	0.39367	1,592
1000–2000 m, as a dummy variable				0.3386	0.47337	1,592
Distance to Parks						
Less than 500 m	182.6344	177.34022	640			
0–500 m, as a dummy variable				0.2494	0.43279	1,592
500–1000 m, as a dummy variable				0.2739	0.44608	1,592
1000–2000 m, as a dummy variable				0.3097	0.46250	1,592
Distance to Cemeteries						
Less than 500 m	101.3172	159.79211	640			
0–500 m as a dummy variable				0.1420	0.34912	1,592
500–1000 m, as a dummy variable				0.3656	0.48174	1,592
1000–2000 m, as a dummy variable				0.3461	0.47588	1,592

4. Results and Discussion

4.1. Life Satisfaction Level of Resident

The assessment of public satisfaction levels required the use of a satisfaction scale [25]; for this study, the scale ranged from 1 (low) to 10 (high). The community satisfaction survey conducted in our study focused on three significant aspects: evaluating the comfort of residential locations, measuring the satisfaction of the respondents with respect to the availability of GOS facilities in residential areas, and assessing their general life satisfaction in the urban context, the last being the dependent variable in the LSA model. To analyze the responses effectively, we aggregated the data based on the administrative city level; for clarity, the resulting average values were converted into percentages, achieved by multiplying the values by 100%. The satisfaction levels were further categorized using the life satisfaction index (LSI) to facilitate the descriptive analysis. The satisfaction level of the respondents with respect to the comfort of residential locations yielded an average LSI score of 81.30% across the five administrative cities, indicating that the residents in Jakarta were "very satisfied," as shown in Figure 4. However, certain variations were evident when examining their satisfaction at the city level. The LSI values were high for the residents of East (83%), South (82.3%), and West (80.9%) Jakarta, while those for the residents of Central and North Jakarta were slightly lower (79.3% and 79.4%, respectively).

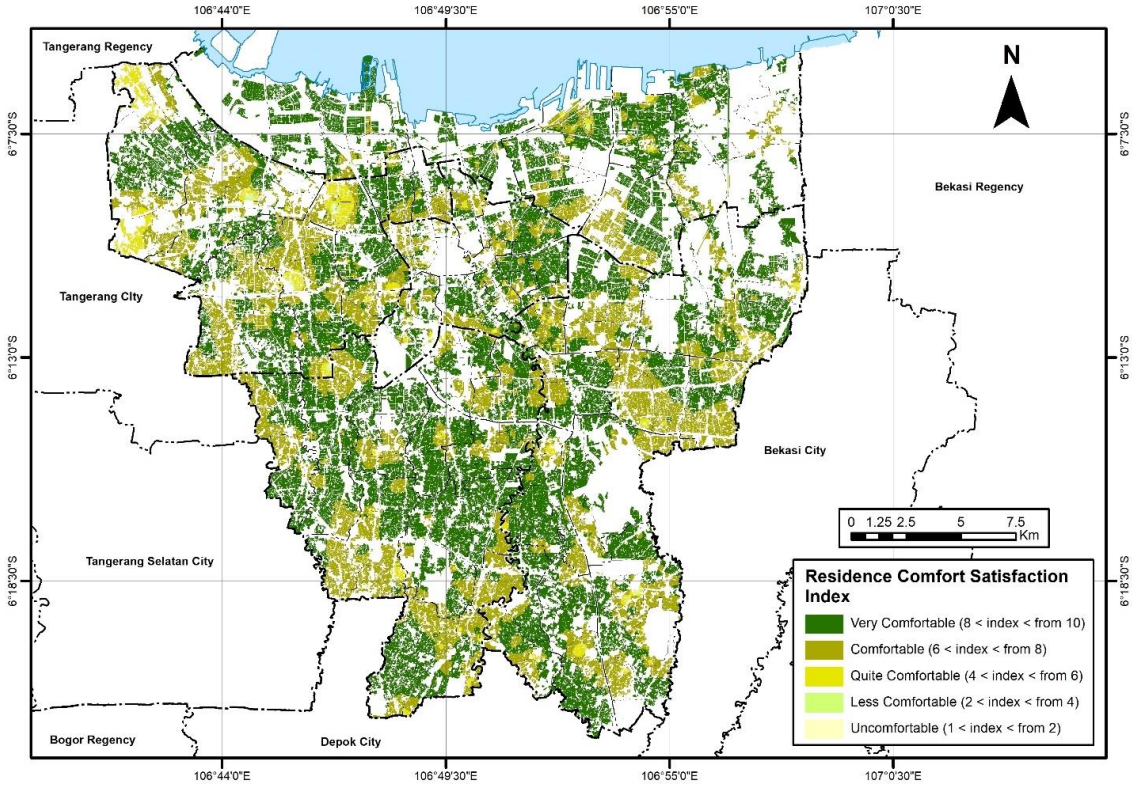

Figure 4. Distribution of self-reported location comfort levels in Jakarta, Indonesia

The satisfaction with the availability of GOS facilities in their residential areas portrayed an average LSI score of 57.60% across the five administrative units of the city (see Figure 5). However, South Jakarta reported a significantly higher LSI result (61.2%) compared to the other administrative units of the city. The LSI percentages for the other areas were as follows: East (59%), West (54%), Central (54.5%), and North (58.2%) Jakarta. The data suggested that even though there was a moderate level of satisfaction with the number of GOS facilities, the residents across all the administrative units of Jakarta generally perceived the availability of these GOS as inadequate. This finding emphasizes the importance of optimizing and increasing the number of GOS facilities across the five administrative units, thus providing valuable feedback and recommendations for the government.

The respondents from the five administrative units reported an impressive average LSI of 81.30%, indicating a high satisfaction rating, as shown in Figure 6. This was in line with the satisfaction typically associated with residential comfort, albeit the variations among individual cities. All five administrative units portrayed high LSI values, with South Jakarta portraying the highest LSI of 82.7%, followed by West (82.1%), North (81.7%), East (80.3%), and Central (80%) Jakarta. Notably, despite the online survey being conducted during the pandemic, the respondents reported remarkably high LSI scores. These scores were used as the LSA dependent variables; the LSA is a valuation technique that considers different factors, such as life satisfaction, environmental conditions, socioeconomic determinants, and income, to determine an individual's willingness to pay for available facilities.

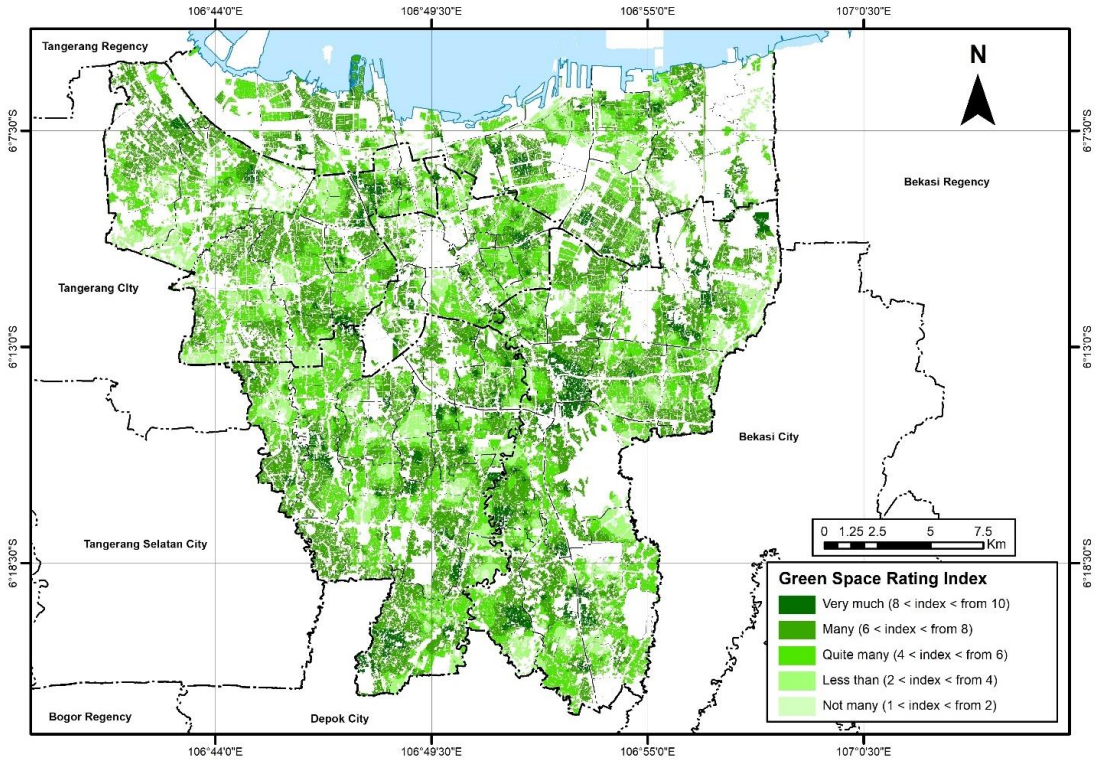

Figure 5. Distribution of self-reported data on green open spaces (GOS) around the residential areas in Jakarta, Indonesia

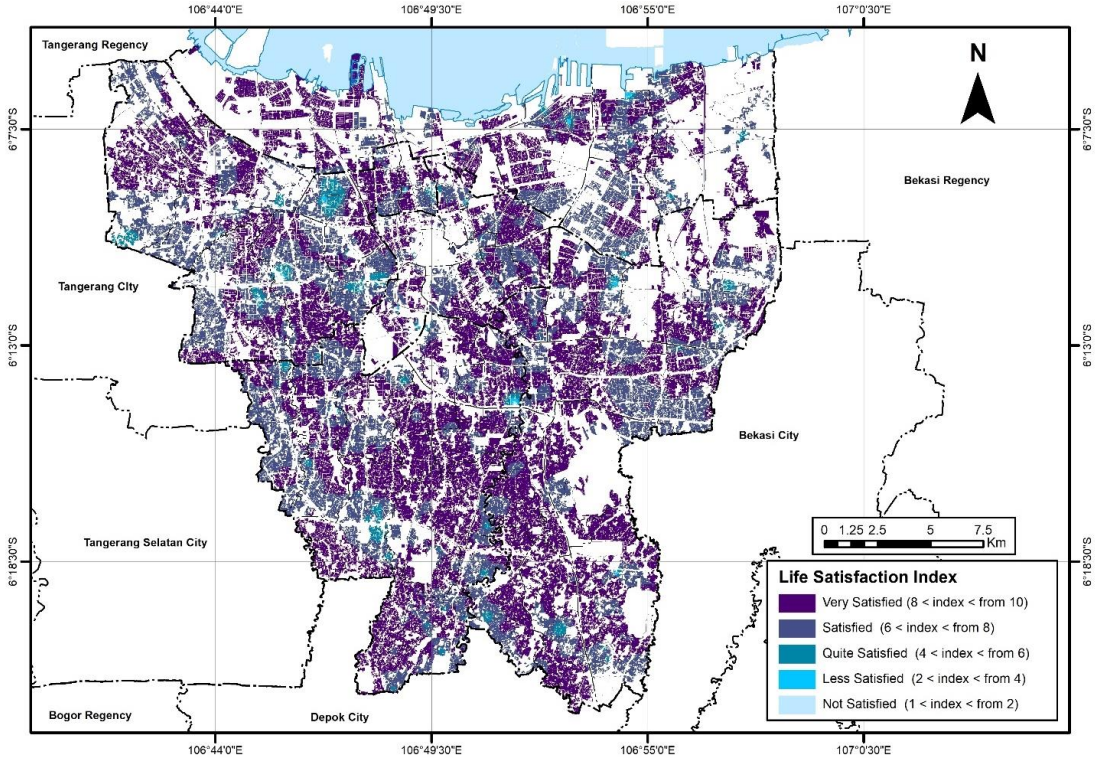

Figure 6. Distribution of self-reported data on the life satisfaction levels of the residents in Jakarta, Indonesia

4.2. Life Satisfaction Approach (LSA) Model Results

In this study, we adopted an innovative approach for the valuation of GOS to explore the correlation between urban GOS and life satisfaction while transcending the traditional approach of considering income as the sole valuation criterion. We attempted to capture the external effects associated with the urban GOS in Jakarta by examining the link between income and life satisfaction. This study aims to comprehensively understand the economic value of the GOS in Jakarta, Indonesia, using a valuation model that integrates LSA and hedonic price variables. Furthermore, we aim to elucidate the socioeconomic and environmental factors that influence the value of GOS in the urban landscape of a developing nation. This exploration is crucial for advancing our understanding of the diverse dimensions that contribute

to the values of GOS; notably, the factors differed significantly from those observed in developed countries. To address this issue, the questionnaire data is used to evaluate the dependent variables (in this case, life satisfaction). The explanatory variables are comprised of a wide range of factors, including household income, sociodemographic characteristics, socioeconomic attributes, social conditions, economic indicators, and institutional determinants [53, 63]. Building on the work of Tsurum & Managi [18], this study investigates the impact of greenspaces on diverse populations based on the distance of such areas from residential areas, specifically for the ranges of 0–500, 500–1000, and 1000–2000 m.

Our investigation incorporates various independent variables, including socioeconomic factors and the HPM variables, e.g., the presence of urban GOS, residential structure, and environmental/location amenities. Additionally, the analytical model used in this study includes various socioeconomic variables to examine their impact on the life satisfaction of residents. These variables focus on specific aspects of the socioeconomic backgrounds of respondents, e.g., their length of residence in the region (for identifying individuals who have lived in the same location for >10 years). The respondents were categorized into two groups: those under 20 years of age and those aged between 20 and 60 years. The aspect of educational attainment was divided into the following two categories: no education, elementary education, and college education. The occupational variable was binary to indicate employment status. The income-related variable was segmented into three categories: >IDR 4.5 million, IDR 10–20 million, and <IDR 20 million. Additionally, the model included an independent variable that reflected the comfort level of respondents with their residence, derived from the questionnaire responses. The analyzed variables comprised socioeconomic attributes and components featured in the HPM, including the structural characteristics of residential properties, environmental amenities, and the presence of urban GOS, which were used to create a comprehensive OLS regression model (Table 3).

Table 3. Coefficients of the ordinary least squares (OLS) regression models with respect to the life satisfaction approach (LSA)

Variable	Coefficients	
	Model I	**Model II**
(Constant)	2.576	3.584
Socioeconomic Variables		
Age (<20 years) (dummy)	1.334	1.153
Age (20–60 years) (dummy)	0.019	-.010
Age (>60 years) (dummy)	-	-
Length of residence >10 years (dummy)	-0.114	**-0.176****
Not schooled/did not complete elementary school (dummy)	-0.108	-0.454
College-educated (dummy)	0.142	-0.005
Employed (dummy)	0.157	**0.156***
Income <IDR 4.5 million (dummy)	0.138	-0.042
Income IDR 4.5–10 million	-	-
Income IDR 10–20 million (dummy)	-0.120	0.020
Income >IDR 20 million (dummy)	0.318	**0.243****
Residential location comfort satisfaction	**0.562*****	**0.523*****
Housing Structure Variables		
Source of clean water (dummy)	**-0.188***	-0.118
Environmental / Location Facilities Variables		
Number of shopping centers	**0.026****	**0.013***
Population density per neighborhood (people/km²)	1.089E-07	-5.167E-7
Distance to toll road (1000 m) (dummy)	0.159	0.110
Distance to main road (200 m) (dummy)	-0.142	-0.135
Distance to train station (500 m) (dummy)	-0.042	-0.083
Distance to Central Business District (9000 m) (dummy)	**-0.244***	-0.046
Distance to the river (200 m) (dummy)	-0.016	-0.094
Respondent's Location (a categorical variable)	**0.147*****	0.054
Public High School	0.036	0.027
Urban Green Open Spaces Variables		
Urban Forest		
Less than 500 m	-0.0001	
0–500 m, as a dummy variable		-0.123
500–1000 m, as a dummy variable		0.096
1000–2000 m, as a dummy variable		-0.049

Park		
Less than 500 m	0.00008	
0–500 m as a dummy variable		0.120
500–1000 m, as a dummy variable		0.123
1000–2000 m, as a dummy variable		0.012
Cemetery		
Less than 500 m	-0.0001	
0–500 m, as a dummy variable		0.068
500–1000 m, as a dummy variable		**-0.191****
1000–2000 m, as a dummy variable		-0.074
Coefficient of determination (R^2)	0.401	0.338
Adjusted R^2	0.378	0.325
Number (N)	640	1.592
Significance levels: ***0.01; **0.05; *0.1		

In Model I, the R-squared (R^2 value was 0.401, or 40.1 %) indicates a relatively robust relationship within the constructed model. However, in the OLS regression analysis, it was evident that the three urban GOS variables were not significant to our analysis (portraying low coefficients). The only variable that portrayed a significant correlation with life satisfaction was the proximity of the residential areas to cemeteries (within a distance or radius of 500–1000 m). The economic valuation of these greenspaces based on the LSA in the context of Jakarta was only able to estimate their value in cemeteries at a distance or radius of 1000–2000 m, which amounted to 0.191 with a negative impact, as determined using GIS. This finding is inconsistent with the results of Bertram & Larondelle [54], who combined survey data with a GIS database of the greenspaces in Germany and reported that quantity and proximity had significant effects on life satisfaction levels.

The R^2 value of OLS Model I (0.338, or 33.8%) was lower than that of OLS Model I. In both models, not all variables portrayed a significant relationship with the life satisfaction level of residents. Variables such as residential location comfort and the number of shopping centers were significant in both models. The LSA models developed for Jakarta yielded R^2 values of 0.401 and 0.338 for Models I and II, respectively, in line with previous LSA studies that reported R^2 values less than 0.40; Cruces et al. [50], Rehdanz & Maddison [64], and Ambrey and Fleming [10] obtained R^2 values of 0.33, 0.3684, and 0.1518, respectively. These results indicated that the models effectively captured a significant portion of the variations in the life satisfaction level. Thus, the model is a valuable tool for gaining insight into the factors that influence community well-being in Jakarta. Interestingly, it appears that in this city, the concept of positive externalities from the urban GOS does not substantially impact the life satisfaction level.

The results from Model II of the LSA valuation present a unique perspective, indicating that only negative externalities—specifically, the presence of cemeteries—have a statistically significant relationship with life satisfaction levels (the closer the cemeteries to residential areas, the lower the satisfaction level). The cemeteries in Jakarta, managed by the City Parks and Urban Forest Agency, are an integral part of the urban GOS. Therefore, local governments should reconsider the cemetery design to alleviate the perceived dissatisfaction among the residents despite the abundance of tree cover. Transforming the perceptions of cemeteries into positive contributors to residents' overall well-being in Jakarta should be a priority in urban planning, emphasizing the importance of considering both positive and negative external factors when assessing the impact of environmental factors on community well-being. This also raises the possibility that cultural or contextual factors specific to Jakarta may have contributed to these outcomes. Notably, the presence of GOS did not yield the same positive impact on life satisfaction as that reported in previous LSA studies conducted in northern global countries.

Our study results differ from those of the Tsurum & Managi [18] regression results, as the residents in this study did not exhibit statistically significant associations with the greenspaces within the specified distance ranges. This suggests a scenario wherein Jakarta residents may prefer alternative land uses or indicate an incomplete acknowledgment of the significance of the GOS. The negative impact of the distance to cemeteries on life satisfaction level aligns with the findings of Dong et al. [34], who stated a significantly negative relationship between air pollution and life satisfaction level in Beijing, China. Notably, the urban green spaces examined by Aoshima et al. [25] and Tsurum & Managi [18] did not include cemeteries. Our study emphasizes that, excluding cemeteries, urban green spaces have a positive influence on life satisfaction.

The results of this study differ from those of previous investigations conducted in the capital city of Australia [8], wherein the residents were willing to allocate an annual household amount of USD 1168 for a 1-% increase in the public GOS, indicating a strong preference. However, the initial assumptions proposed that the individuals in high-density areas may portray homogeneous preferences, even though certain heterogeneity was discovered during the actual

analysis [8]. Single parents, individuals with less than 12 years of education, and those residing in high-rise apartments benefited more from the increased number of greenspaces, and their preferences remained relatively consistent. From a conceptual viewpoint, the HPM and LSA methods complement each other and offer valuable insights into the relationships among socioeconomic factors, environmental characteristics, and individual well-being. These investigations consistently report the existence of a relationship between GOS, the life satisfaction level of residents, and community well-being. This finding does not agree with the results of Ambrey and Fleming [8, 38] and Bertram & Rehdanz [49], who have consistently reported that urban GOS significantly influences life satisfaction and well-being. Furthermore, these findings contradict those of Krekel et al. [23], who stated that the life-satisfaction level was associated with the number of GOS around the residence of an individual.

This method aligns with the approach used by Luechinger & Raschky [36], wherein the life-satisfaction level, assessed on an ordinal scale, was analyzed using the OLS regression technique. The use of OLS regression in the context of LSA was consistent with previous studies conducted by Ambrey & Fleming [8, 10], Brereton et al. [52], Kristoffersen [65], and Stutzer & Frey [66]. Prior investigations report that the determinants of life satisfaction level portray a high level of consistency when both the ordinal and cardinal variables were modeled using OLS regression [67]. However, Dong et al. [34] reported a statistically significant negative association between air pollution and life satisfaction, with variations across different geographical areas. Maddison & Rehdanz [56] analyzed the impact of climate on the average life satisfaction level across 87 countries using OLS regression. By estimating the coefficients and individual income levels, this approach allowed for the calculation of the implicit value attributed to environmental amenities.

The discrepancies in the findings between the current studies and the Western-centric LSA theory, with respect to the significant differences in the models for the Eastern and Western countries, suggest that the relationship between GOS and life satisfaction level may be influenced by regional or cultural factors. This emphasizes the need for tailored investigations into how environmental factors affect community well-being in specific contexts. It is important to stress that the outcomes of this research should not be interpreted as developing countries being inherently less concerned about environmental issues. Instead, the distinctions may reflect variations in the economic circumstances and priorities within these regions. For example, when examining the monetary valuation of air pollution, it was apparent that the residents of Beijing were willing to allocate approximately 2.6% of their annual income to a unit reduction in the average air pollution level [34]. However, Dong et al. [34] stated that the preference of the public for cleaner air in Beijing might not be as strong as that in developed countries, as the residents were reluctant to sacrifice a larger portion of their income to control air pollution. These findings emphasize the complex interplay among economic factors, environmental concerns, and individual preferences across different regions. They shed light on the intricate relationship between economic development and environmental priorities while emphasizing that the willingness to invest in environmental improvements can vary significantly based on contextual factors. Therefore, it is important to consider these nuances when evaluating and addressing environmental challenges in diverse settings.

The results of our study indicate that higher levels of education do not significantly impact the life satisfaction level, which is in line with the findings of Ambrey & Fleming [10]. Ambrey & Fleming [10] also reported a strong positive relationship between income and life satisfaction, consistent with the findings of our study. The variations in the findings emphasize the contextual nature of such investigations in the fields of life satisfaction and community well-being. The impact of individual preferences on life satisfaction differs significantly between regions, populations, and economic contexts, emphasizing the importance of conducting localized and nuanced investigations when examining the link between socioeconomic factors and community well-being. The application of LSA theory to Jakarta does not appear to be a suitable method for the valuation of the GOS in the city, as it failed to reveal significant relationships with the presence of parks and urban forests. However, previous studies failed to state the negative influence of cemeteries on life satisfaction levels. This finding contradicts the results of Mayer et al. [68], who reported that an increase in the connection of community with nature could enhance attention, positive emotions, and the ability to reflect on life issues. Bowler et al. [69], Nisbet et al. [70], and MacKerron & Mourato [43] reported the positive effects of physical activities in natural environments on life satisfaction and happiness levels. Protected areas, ecosystem diversity, and GOS have a positive relationship with life satisfaction, as reported by Ambrey & Fleming [8, 10]. Although using life satisfaction as the basis for evaluating the GOS in Jakarta mainly captures negative externalities, these findings offer an alternative approach for valuing environmental assets in urban settings. Our study results indicate that the preferences of Jakarta residents generally exhibit a degree of homogeneity, consistent with the investigation conducted by Ambrey & Fleming [8]. These findings have significant implications for urban planning and development, suggesting that government initiatives that aim to establish public GOS should consider the preferences of the population and treat such areas as a form of public infrastructure that is capable of enhancing life satisfaction and the general well-being of the community.

The key parameters in the LSA model for valuing the GOS in Jakarta encompass crucial socioeconomic variables: satisfaction of respondents with residential location, employment status, and income. The variable used for gauging satisfaction with their residential location was a significant metric that provided a subjective measure of the comfort of the respondents concerning their living environment. This parameter is crucial for comprehending the broader aspects of community well-being with respect to the residential context. The number of shopping centers may indicate

convenience and the commercial impact on life satisfaction. Standard socioeconomic variables, such as employment status, offer valuable insights into the demographic dimensions of the study area. Moreover, the income variable is pivotal, given its recognized role in shaping quality of life. This study systematically explored the intricate relationship between income and life satisfaction, especially for those whose income exceeds IDR 20 million, thus recognizing the significance of economic factors in influencing the overall well-being of an individual. These parameters contribute to a nuanced understanding of the complex interplay between socioeconomic variables and life satisfaction while offering valuable insights for improving urban planning and development strategies in Jakarta.

Future studies on urban planning and green space design should consider the integration of the variables associated with security and crime rates into the LSA model. Notably, Fleming et al. [71] explored the correlation between accessibility to green spaces and crime rates in New Zealand. Improved access to these spaces is associated with higher levels of life satisfaction. The investigation further proved that the psychological benefits of access could diminish, assuming that the residents perceive the area as unsafe. This study focused on the crucial role of safety considerations in urban planning and green space design [71]. Furthermore, the findings of this investigation indicated that the distribution and presence of GOS did not significantly enhance the life satisfaction level of the residents of Jakarta. Notably, the presence of GOS does not satisfy the concept of human well-being, particularly in terms of sustainability aspects such as quality of life and happiness level. This raises the possibility that, in Jakarta, citizens tend to prioritize meeting their basic needs.

Our research contributes significantly to the literature on spatial planning by offering insights into the challenges associated with the provision and management of urban GOS in a context characterized by limited land availability and high land prices. The LSA technique is an innovative approach to understanding community preferences for public goods. Unlike traditional methods, this technique does not mandate individuals to directly assess public goods but instead evaluates life satisfaction levels, offering a unique perspective on how environmental facilities impact human well-being and the quality of life.

This study contributes to the field of environmental economics by introducing an alternative method for the valuation of GOS in urban areas. The proposed economic valuation process can be used for evaluating urban sustainability, guiding resource allocation decisions, and shaping GOS design choices. In general, our study provides valuable insights into the complexities and significance of considering individual preferences while focusing on improving community well-being during urban planning and development. It evaluates the role of self-reported life satisfaction as a proxy measure of utility in happiness-related studies while offering valuable insight into how individuals perceive and value urban environments. Notably, life satisfaction did not fully capture the value associated with green spaces. The proximity to cemeteries affected the life satisfaction level of the community. The investigation did not effectively capture the value of interactions, knowledge of GOS functions, quality of GOS, or potential preferences for alternative land uses. We noted a statistically nonsignificant relationship between the life-satisfaction level and public GOS for the area radius range of 0–2000 m. Therefore, simply increasing the availability of public GOS, such as urban parks and forests, will not necessarily improve the level of well-being and life satisfaction of residents.

This study offers valuable insights into urban planning and management, particularly regarding the improvement of the environment through the planning and development of GOS. The valuation models adopted in this study focused on optimizing the efficient use of the limited urban space in Jakarta while considering the diverse preferences and well-being of its residents. These findings serve as relevant tools for local governments and city planners, providing them with a clearer understanding of the locals' preferences concerning both the quantity and quality of GOS. Thus, this information can significantly impact the decision-making processes related to the development and maintenance of public GOS. Our study highlights the importance of GOS in urban areas, particularly in densely populated regions with limited green spaces. The main goal of increasing the number of GOS is to ensure a more equitable distribution of greenspaces throughout the city, ensuring that such areas are accessible to a broader and more diverse population.

Enhancing the quality and equitable distribution of GOS in Jakarta is important for the advancement of environmental sustainability. This is crucial given the global trend of urbanization, particularly in developing nations experiencing rapid rural-to-urban migration. Note that a well-functioning GOS network is critical for the establishment of sustainable ecological landscapes, e.g., the creation of green corridors and the selection of cost-effective plant species. City quality is closely linked to the conception, management, and conservation of spaces. Therefore, there is a critical need for thoughtful GOS management, informed planning, effective design, and seamless policy implementation at both the regional and national levels. In this context, local governments play a significant role in maintaining current GOS databases and carrying out rigorous evaluations, particularly concerning landscape and ecological attributes. This approach is crucial in developing countries that are experiencing an expansion in transportation networks and an increase in urban heat levels.

Green open spaces (GOS) offer diverse ecological benefits, including the preservation of biodiversity in urban regions. Therefore, in developing nations that are influenced by complex economic, political, and cultural factors, an integrated approach toward environmental sustainability is not only recommended but also crucial. A comprehensive perspective on GOS development includes the following factors: investment, effective management, meticulous planning, public policy formulation, and resolving the challenges related to political instability. The active participation

of residents in shaping the urban environment is essential, as a sustainable city should cater to the needs of its inhabitants. In this study, we focused on parameters related to the public GOS, using indices to understand the satisfaction level of the community and their perceptions of the living environment. Notably, GOS facilities serve various social functions and fulfill certain psychological needs, thereby contributing to urban sustainability. When designing and managing GOS, it is important to consider the recreational requirements of all the community segments to promote health and stress reduction. Evaluating the intangible benefits of these spaces can support urban sustainability strategies. Public engagement, community participation, and qualitative assessment empower communities to articulate values and can support city planners in conceptualizing sustainable urban strategies. To enhance GOS valuation, this study advocates the application of LSA with more detailed GOS data, including a refined radius, specific categorization of the tree species grown in GOS, and thematic classification of greenspaces. This study also highlights the potential impact of park greenery on community life satisfaction.

This study has some limitations. For instance, the model relies on online survey satisfaction data and introduces biases or constraints associated with self-reported information. The assumption that respondents represented all the households in Jakarta Province does not fully capture regional diversity, and the presumption that users were exclusively residents limits the applicability of the findings. This study focused on understanding the impact of GOS on the well-being of Jakarta residents. By focusing on the households in Jakarta Province, this study seeks to gain nuanced insights into contextual intricacies. The focus on residential areas aligns with our study objective, which is to provide data for customized urban planning for the local populations. The presumption is that the users, exclusively comprised of residents, can portray the influence of GOS on those deeply entrenched in urban environments, ensuring a concentrated analysis of experiences and perceptions. Owing to their continuous presence, residents are likely to foster a deeper connection with the local green spaces than occasional visitors. This exclusivity ensures a concentrated analysis of the experiences and perceptions of those profoundly entrenched in the community fabric.

This study focuses on publicly owned GOS, such as parks, urban forests, and cemeteries, while excluding the valuation of private GOS (due to data unavailability). Notably, the Jakarta Provincial Government lacks comprehensive information on privately owned GOS, justifying this exclusion. Publicly owned GOS managed by local government entities are generally more accessible to diverse populations, significantly contributing to the overall well-being of the local community. Focusing on these spaces prioritizes the evaluation of areas that directly affect public health, recreation, and community engagement. Publicly owned GOS are often considered under urban planning and municipal management; thus, they can be directly influenced through public policies and urban development initiatives. Assessing privately owned GOS poses greater challenges from both regulatory and planning perspectives. The strategic focus on publicly owned GOS ensures a more feasible and impactful analysis that aligns with the objectives of our study and serves the broader context of urban governance.

5. Conclusion

In conclusion, this study utilized LSA and hedonic price variables to thoroughly assess the values of GOS in Jakarta while considering the ecological, economic, and social dimensions of the quality of life. Our study proposes a novel application of the LSA model to evaluate GOS in the Indonesian context. In the analysis, OLS Model II revealed that factors such as the length of residence, employment status, income, and the number of shopping centers affected the subjective life satisfaction levels of the respondents. These results are consistent with previous studies conducted in Western countries. While the economic valuation of urban GOS had a limited impact on the life satisfaction of residents of Jakarta, negative externalities, notably the presence of cemeteries (19.1%) within a 500–1000 m radius, significantly influenced the life-satisfaction coefficients in Model II. The results deviate from those of previous studies conducted in the Global North, emphasizing the significance of formulating urban planning strategies that are tailored to local contexts.

Furthermore, we noted that the LSA theory does not offer a practical alternative valuation method for urban GOS, primarily because of its inability to fully capture and leverage the positive externalities associated with parks and urban forests. The study also indicates a weak correlation between the presence of GOS and life satisfaction levels. Nevertheless, the LSA model pinpoints the negative externalities associated with the presence of cemeteries. This emphasizes the critical need to understand the multifaceted factors that influence people's perceptions and well-being in urban environments. Our study suggests that the residents of Jakarta tend to have relatively consistent preferences for urban GOS. Thus, urban planners and policymakers must design these spaces with a thorough understanding of their contributions to public well-being.

Our study enhances the current understanding of the complex interplay between urban environments, socioeconomic factors, and residents' overall well-being. Our findings highlight the crucial role of GOS in enhancing the quality of life and urge policymakers to consider both the physical attributes of the region and the locals' perceptions during urban planning. The use of LSA to evaluate the economic value of GOS offers a versatile approach to capturing external factors that affect individual well-being, even when these influences may not be consciously recognized. Ultimately, this study aims to inform policymakers about the economic implications of the GOS in Jakarta and suggest the implementation of sustainable practices for the development of the city. It acknowledges the limited studies that apply these valuation methods to developing nations that are experiencing rapid urbanization and facing unique urban challenges.

The LSA method meticulously analyzes the intricate interplay between social, economic, and environmental variables while offering invaluable insights for policymakers. While GOS valuation studies that use LSA are well-established in developed nations, the application of the approach to developing countries, such as Indonesia, is still in its nascent stages. To bridge this gap, our study employs a comprehensive valuation model that integrates the elements from the LSA and HPM (e.g., housing structures and environmental facilities). The economic valuation of the GOS extends beyond mere policy recommendations; it represents an academic endeavor with substantial relevance to the advancement of urban spaces in Indonesia. Understanding the economic values of GOS is crucial for informed decision-making in public policy. This understanding is pivotal in urban settings, wherein policymakers must assess whether preserving these open spaces outweighs the costs associated with their development and maintenance. The ongoing decrease in the GOS emphasizes the urgency for urban planners to prioritize preservation, guarantee public access, and integrate ecologically driven utilization into planning.

Furthermore, our approach contributes to the field of environmental economics by advancing the understanding of life satisfaction in urban populations and elucidating the complexities of the valuation of GOS in diverse urban contexts. Although our investigation did not identify a substantial positive impact of these spaces on life satisfaction, it provides insights into the critical aspects of urban planning and environmental economics in a rapidly growing city. It also emphasizes the importance of recognizing that the relationship between GOS and human well-being could be context-specific, while highlighting the need for a deeper understanding of how different elements of urban environments interact with the perceptions of the residents.

In the broader context of urban sustainability, this research highlights the significant role that public GOS plays in enhancing the quality of life of city residents. Achieving a balance between urban development and the provision of these spaces is considered crucial, particularly in cities with limited land availability and exorbitant property prices. Although the LSA did not significantly identify the positive externalities, it offered essential insights into urban planning and environmental economics while shedding light on the complex relationships between these spaces and community well-being. The insights derived from these findings can help policymakers and city planners design more livable and sustainable environments, while ensuring that the distribution and quality of greenspaces cater to the well-being of all residents.

Future studies should explore additional factors that influence community preferences for GOS by incorporating a wider array of variables and considering the distinct attributes of public GOS, including their size, purpose, and ecosystem services. This approach can enable urban planners and policymakers to better correlate GOS development to population preferences and human well-being. Future investigations could leverage these findings to enhance the development of these spaces and ensure their alignment with the preferences and well-being of the local population. The insights from this study are significant for policymakers, urban planners, and stakeholders in shaping the urban landscape of Jakarta. Understanding the economic value of the GOS can support policymakers in making informed decisions on the sustainability of city planning and the well-being of residents.

6. Declarations

6.1. Author Contributions

Conceptualization, R.S.; methodology, R.S.; software, R.S.; validation, R.S. and R.H.K.; formal analysis, R.S.; investigation, R.S.; resources, R.S.; data curation, R.S.; writing—original draft preparation, R.S.; writing—review and editing, R.S.; visualization, R.S.; supervision, R.H.K.; project administration, R.S.; funding acquisition, R.H.K. All authors have read and agreed to the published version of the manuscript.

6.2. Data Availability Statement

The data presented in this study are available on request from the corresponding author.

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6.5. Conflicts of Interest

The authors declare no conflict of interest.

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Appendix I

Variable	Content of Question / Parameters / Values
Socioeconomic	
1. Name (not mandatory)	-
2. Handphone number (not mandatory)	-
3. Home address	Street Name/Housing Complex/Alley Number of neighborhood Subdistrict District Administrative City
4. Age	Less than 20 years old Aged between 20 and 60 years old Over 60 years old
5. Education level	Those without education or formal degrees High school graduates College graduates
6. Occupational status	Unemployed Employed in government/private sectors Entrepreneurs Blue-collar labourers Others
7. Average monthly income	IDR < 4.5 million IDR 4.5 – 10 million IDR 10 – 20 million IDR > 20 million
Structural Housing	
1. Type of residence	Landed house Apartment
2. Resident status	Ownership Rent/Lease If the house is rented/leased, what is the monthly rental payment amount (in IDR)? If the house is owned, what is the estimated rental/lease amount per month (in IDR) based on market price estimates? (Fill in 0 if the house is rented/leased)
3. Length of residence	< 5 years 5-10 years > 10 years
4. Source of clean water	Piped water Others
5. Bathroom	Inside the house Outside the house
6. Size of the residential building in m²	< 100 ≥ 100
7. Number of bedrooms	1 2 3 4 ≥ 5
Satisfaction and Comfort Level	
1. To what extent are you satisfied with the level of comfort in the location of your residence?	Very dissatisfied (1) ─ Very satisfied (10)
2. According to you, how much green open space (park/urban forest/cemetery) is there in the location of your residence?	Very few (1) ─ Very much (10)
3. Overall, what level of satisfaction do you feel in life?	Very dissatisfied (1) ─ Very satisfied (10)