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Implementation of Ecological Function Regulations for Green Open Space at Alun-Alun Bung Karno as a Public Green Open Space in Semarang Regency

Nabila Nur Safitri

Universitas Negeri Semarang, Semarang, Indonesia
nabilanursafitri77@students.unnes.ac.id.
https://orcid.org/0009-0004-8684-5027

 Corresponding email:
nabilanursafitri77@students.unnes.ac.id

Abstract

The provision of Green Open Space (RTH) is a legal obligation in urban spatial planning based on Undang-Undang Nomor 26 Tahun 2007, which requires a minimum allocation of 30% of the total urban area for RTH, with at least 20% designated as public RTH. Alun-alun Bung Karno in Kabupaten Semarang, as a form of public RTH in the shape of an intensive urban park. Its physical implementation shows inconsistencies with the ecological function provisions as regulated in Peraturan Menteri ATR/BPN Nomor 14 Tahun 2022 and Peraturan Daerah Kabupaten Semarang Nomor 6 Tahun 2023. This study aims to analyze the gap in the implementation of ecological functions of RTH at alun-alun Bung Karno through

a normative–empirical juridical approach, using data collection methods such as regulatory document studies, field observations, and interviews with policy stakeholders. The findings reveal, the dominance of impermeable asphalt surfaces in non-green coverage areas exceeds the permitted limit of 15%, thereby hindering rainwater infiltration and reducing the role of RTH as a water absorption zone and microclimate regulator. These findings indicate a tension between the fulfillment of extrinsic functions (social-economic purposes) and the legal obligation to maintain intrinsic functions (ecological purposes). The contribution of this research lies in identifying gaps in spatial planning law enforcement in the management of public RTH, as well as recommending strengthened monitoring mechanisms based on community participation and the implementation of administrative sanctions to achieve harmonization of RTH functions in line with sustainable development principles and the commitments of SDGs 11 and 13.

Keywords

Green Open Space; Ecological Function; Spatial Planning Law; Impermeable Materials; Alun-Alun Bung Karno

A. Introduction

Law of the Republic of Indonesia Number 26 of 2007 on Spatial Planning explicitly stipulates that every urban area is required to provide Green Open Space (RTH) covering at least 30% of its total area, consisting of 20% public RTH and 10% private RTH as part of a sustainable spatial planning system. This provision aims to ensure ecological balance and urban environmental quality through ecological functions (such as microclimate regulation and carbon absorption), social functions (as spaces for public interaction), and the aesthetic value of urban spaces, while also serving as an instrument for climate change mitigation within national and regional spatial planning policies. When these functional components are fulfilled, the objectives of RTH provision can be achieved in

accordance with the original planning goals. The provision of RTH is therefore no longer merely a planning option, but a juridical obligation that must be incorporated into spatial planning documents (RTRW/Rencana Tata Ruang Wilayah) by provincial as well as regency/city governments.

Within the framework of agrarian law and spatial planning in Indonesia, Green Open Space (RTH) has transformed from merely a supporting element of urban design into a systemic component that must be integrated into regional strategic planning, particularly in the Regional Spatial Plan (RTRW), which serves as the basis for regulating land use at the provincial and regency/city levels. This obligation not only reflects a commitment to the principles of sustainable development and environmental well-being, but also functions as a tool for local governments to prevent land -use conversion that may worsen urban environmental quality. Regardless of any challenges encountered, efforts should continuously be made to achieve ecological balance, as this fundamentally carries long-term impacts on the future sustainability of the region itself.

In the context of agrarian law and spatial planning in Indonesia, the intrinsic function of Green Open Space (RTH) refers to the ecological roles inherently attached to and inseparable from the existence of such spaces, including their capacity to serve as water infiltration areas, regulate the urban microclimate, absorb air pollutants, and provide oxygen for living systems. This concept is regulated in Article 2 of Ministerial Regulation of ATR/BPN Number 14 of 2022 on the Provision and Utilization of Green Open Space (RTH), which explicitly emphasizes the importance of considering ecological functions in the planning and utilization of every RTH typology. The technical provisions contained in the annex of this regulation indicate that ecological functions are inherent in every RTH area, such as maintaining vegetation to ensure rainwater infiltration and to provide natural green spaces within built environments. Conceptually, the ecological role of green open spaces is also supported by environmental science and urban planning literature through studies on urban ecosystem services. Green spaces in urban areas play an important role as part of the city's ecosystem

network by providing various environmental services (ecosystem services), including microclimate regulation, air pollutant absorption, and the interception and infiltration of rainwater runoff, which in turn enhance urban ecological resilience while contributing to public health and overall quality of life.

In the context of urban Green Open Space (RTH) in Indonesia, extrinsic functions refer to the benefits that arise from community interaction with the space itself, including social, cultural, economic, and aesthetic aspects. RTH does not merely function as a physical element within urban areas but also serves as a space for recreation, public interaction, and a locus for socio-cultural activities that strengthen community bonds and improve residents' quality of life. Empirical studies show that the presence of RTH provides space for various daily community activities, such as family recreation, light exercise, and social gatherings, while also becoming a venue for local cultural expression and broader social events. In addition, economic aspects are reflected through informal activities around RTH areas, including small businesses that develop around urban parks and contribute to local economic dynamics. From an aesthetic perspective, RTH also enhances the visual quality and spatial comfort of urban environments, creating added value for surrounding areas. Such findings reinforce the idea that RTH plays a strategic role as a multifunctional public space, not merely an ecological green area, and becomes a major attraction for communities within the context of inclusive and sustainable urban space utilization.[1]

The tension between intrinsic ecological functions and extrinsic socio-physical benefits in the management of Green Open Space (RTH) often becomes a fundamental issue in urban spatial planning practices. Normatively, RTH is designed to perform ecological functions such as water infiltration, microclimate regulation, and environmental quality protection, while simultaneously providing social benefits in

[1] Nila Rosawatiningsih, "KEBIJAKAN PENGELOLAAN RUANG TERBUKA HIJAU (RTH) TAMAN FLORA SURABAYA," *The Journal of Society and Media* 3, no. 1 (2024).

the form of recreational spaces, aesthetic value, and public interaction. However, in practice, several cases indicate that RTH management tends to prioritize physical utilization and social functions, such as the development of supporting facilities and public activities, while ecological requirements receive less adequate attention. Empirical studies in the context of Indonesian urban areas reveal that the design and management of urban parks often reduce ecological carrying capacity, for example through limited natural vegetation and low water infiltration capacity resulting from the dominance of visual considerations and intensive public use of space. This condition demonstrates that an imbalance between the intrinsic and extrinsic functions of RTH has the potential to degrade urban environmental quality in the long term, thereby emphasizing the importance of an integrated and sustainability-oriented approach to RTH management. [2]

Alun-Alun Bung Karno in Kalirejo Village, Ungaran Timur District, Kabupaten Semarang, is one of the public Green Open Spaces (RTH) in the form of an urban park that is popular and intensively utilized by the local community. This area not only provides green space as a place for relaxation but also serves as a gathering point for residents to engage in various social and cultural activities. In daily practice, the square functions as a recreational and sports area, such as for jogging and family gatherings, making it one of the community's favorite public spaces for spending leisure time. In addition, the site frequently hosts community events, including gatherings to celebrate New Year festivities, demonstrating that Alun-Alun Bung Karno plays a significant role as a center of social interaction and public activities in Kabupaten Semarang. Local media reports also document various activities held in this area, ranging from Car Free Day events to the destruction of illegal cigarettes involving local authorities as part of community-based activities. These conditions reinforce the understanding that Alun-Alun Bung Karno performs a dual role for the community, functioning

[2] June Ekawati et al., "Penerapan Fungsi Pada Desain Ruang Terbuka Hijau Untuk Kota Berkelanjutan," *Jurnal Pemukiman* 20, no. 2 (2025).

both as an ecological green space and as a socio-cultural public space that is intensively used by residents.[3]

Administratively, Alun-Alun Bung Karno is categorized as a public Green Open Space (RTH) within the spatial planning system of Kabupaten Semarang. The status of this public RTH is in line with Regional Regulation of Kabupaten Semarang Number 6 of 2023 on the Regional Spatial Plan (RTRW) of Kabupaten Semarang for 2023–2043, which stipulates that RTH forms part of the regional spatial structure and functions as an essential element in maintaining environmental balance. In the Regional Spatial Plan (RTRW), public RTH is positioned as part of spatial planning policy that must be implemented by the local government to support ecological sustainability, urban environmental quality, and the provision of public spaces for the community. Therefore, from a juridical perspective, Alun-Alun Bung Karno holds the legal status of a public RTH whose management cannot be separated from the provisions of the regional RTRW.

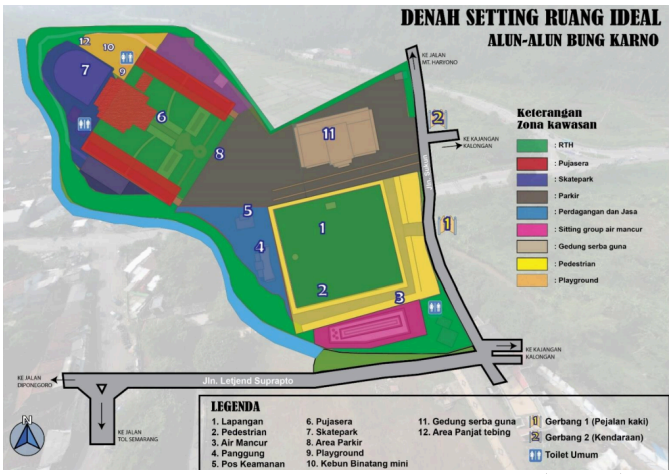
In addition to its designation as a public Green Open Space (RTH), Regional Regulation of Kabupaten Semarang Number 6 of 2023 also stipulates that spatial utilization, including RTH, must take into account environmental ecological functions as reflected in the provisions governing spatial policies and regional spatial patterns. The articles regulating spatial patterns and protected areas emphasize that RTH must support water infiltration functions, microclimate control, and urban environmental quality as part of sustainable spatial planning principles. Therefore, Alun-Alun Bung Karno should not only be viewed as a space for social and recreational activities but also carries a legal obligation to fulfill ecological function standards in accordance with the policy direction of the Regional Spatial Plan (RTRW) of Kabupaten Semarang 2023–2043, meaning that its management must maintain a balance between

[3] Tasir SM Wongapak, "Pesona Alun Alun Bung Karno, Tempat Favorit Warga Ungaran," Suara Merdeka Wongapak, 2024, https://wongapak.suaramerdeka.com/budaya/103413698877/pesona-alun-alun-bung-karno-tempat-favorit-warga-ungaran.

physical utilization and environmental protection.

Alun-Alun Bung Karno itself consists of several designated areas representing different forms of RTH utilization, including parking areas, an UMKM (pujasera) zone, an open field, a multipurpose building, a mini zoo, a skatepark, and a fountain area.

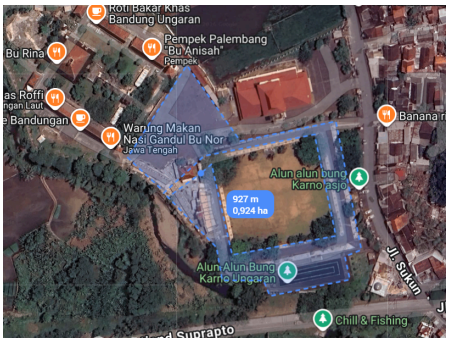
Picture 1. Ideal Spatial Layout Plan of Alun-Alun Bung Karno



Source: Muhammad Zaenal Abidin (2021)

Across the overall area of Alun-Alun Bung Karno, it can be observed that several pedestrian zones use non-green surface coverage. Nearly all pedestrian walkways are covered with conventional asphalt. This condition does not comply with the provisions set out in Ministerial Regulation of ATR/BPN Number 14 of 2022, which recommends the use of materials capable of optimally absorbing water. In fact, the implementation of this regulation is intended to support long-term environmental sustainability and maintenance. The total area of non-green surface coverage at Alun-Alun Bung Karno is recorded at 0.924 hectares

Picture 2. Non-Green Surface Coverage Area of Alun-Alun Bung Karno



Source: Author's Research (2026)

The use of impermeable surfaces such as asphalt and concrete within public Green Open Space (RTH) areas like Alun-Alun Bung Karno has significant ecological impacts on the micro-hydrological cycle. Impermeable surfaces hinder the ability of rainwater to infiltrate the soil, an essential process for maintaining water infiltration zones and groundwater recharge, causing most rainwater to remain on the surface and transform into surface runoff. This increase in surface runoff reduces the area's natural capacity to absorb and store water, thereby weakening the core ecological function of RTH as an urban hydrological mediator and local flood control mechanism. Studies on infiltration and runoff dynamics demonstrate that the conversion of vegetated land into hardened surfaces without adequate infiltration mechanisms empirically decreases infiltration rates, increases runoff volume, and accelerates water flow into drainage systems, ultimately contributing to changes in urban hydrological patterns and degrading the ecosystem services expected from RTH.

The weakness of supervisory mechanisms in overseeing the implementation of physical design in Green Open Space (RTH) represents a juridical issue evident in the management of Alun-Alun Bung Karno. Normatively, technical standards for RTH have been formulated within spatial planning documents and sectoral technical regulations; however, in practice,

control over the conformity of physical design with these standards has not been carried out optimally. This condition is reflected in the continued use of land-cover materials that are not fully aligned with RTH technical provisions, without adequate correction or adjustment. The lack of effective implementation control indicates a gap between planning norms and physical realization in the field, suggesting that spatial planning supervision has not functioned effectively in ensuring that the utilization and development of public RTH remain within established technical standards. This situation emphasizes that supervision is not merely a matter of regulatory availability, but also of consistent enforcement in the management of green open spaces at the local level.

Based on the factual conditions and normative framework previously described, this study is formulated to examine the extent to which the implementation of ecological functions, or intrinsic functions, of Alun-Alun Bung Karno as a public Green Open Space (RTH) has fulfilled the provisions stipulated in Ministerial Regulation of ATR/BPN Number 14 of 2022 and Regional Regulation of Kabupaten Semarang Number 6 of 2023 on the Regional Spatial Plan (RTRW). In addition, this research aims to analyze the juridical implications of the use of impermeable materials within the Alun-Alun Bung Karno area in relation to the fulfillment of legal obligations for sustainable RTH provision, particularly concerning the protection of ecological functions and the regulation of spatial utilization at the regional level.

Studies on Green Open Space (RTH) have been conducted in various previous research. Sari (2022), published in Jurnal Arsitektur ZONASI, demonstrates that the existence of RTH plays an important role in increasing rainwater infiltration capacity and maintaining urban environmental quality; however, the study primarily focuses on ecological design aspects without linking them to compliance with spatial planning regulations.[4] Meanwhile,

[4] Dharwati P. Sari, "KAJIAN FUNGSI EKOLOGIS DAN ESTETIS RUANG TERBUKA HIJAU DI KAWASAN RAWAN BANJIR : Studi Kasus RTH Kawasan Pasar Segiri, Sub DAS Karang Mumus, Kota Samarinda," *Jurnal Arsitektur Zonasi* 5, no. 2 (2022).

Valones and Junaedi (2023), in the Journal of Law and Legal Reform, highlight issues related to the implementation of RTH policies in Indonesia that have not yet optimally fulfilled the provisions of Law of the Republic of Indonesia Number 26 of 2007 on Spatial Planning, although their analysis remains at a macro policy level and does not evaluate the physical condition of RTH at a specific location. In contrast to these previous studies, this research examines the relationship between spatial planning legal norms and the actual physical condition of RTH through an analysis of impermeable material usage at Alun-Alun Bung Karno, Kabupaten Semarang, as well as its juridical implications for the fulfillment of ecological functions based on Ministerial Regulation of ATR/BPN Number 14 of 2022 and Regional Regulation of Kabupaten Semarang Number 6 of 2023.[5]

This study holds academic significance in addressing gaps within agrarian law and spatial planning literature, which has thus far remained limited in examining the tension between social dimensions and ecological dimensions in the implementation of public Green Open Space (RTH). Legal studies have generally positioned RTH as a supporting element of urban planning or as a facility for social utilization, while the fulfillment of its ecological functions has rarely been critically analyzed from both normative and implementation perspectives. Therefore, this research is expected to enrich the body of knowledge in agrarian law by presenting an analysis that positions RTH as a legal instrument containing ecological obligations that must be fulfilled in balance with the social interests of the community.

This study also carries practical significance by providing law-based policy recommendations to strengthen accountability in the management of public Green Open Space (RTH). These recommendations are intended to promote consistency between planning, implementation, and supervision of RTH management so that they align with technical standards and environmental sustainability

[5] Atty Genald Malvas Valones and Ulil Albab Junaedi, "Urban Green Space Policy Reform in Indonesia: Breathing in the Middle of Development," *Journal of Law and Legal Reform* 4, no. 2 (2023).

objectives. Furthermore, this research is relevant in supporting Indonesia's commitment to achieving the Sustainable Development Goals, particularly SDGs 11 on inclusive and sustainable cities and communities and SDGs 13 on climate action, through strengthening the role of RTH as an instrument for environmental adaptation and mitigation in urban areas.[6]

This study employs an empirical juridical approach that combines analysis of statutory regulations with the collection of factual field data to examine the implementation of ecological functions of Green Open Space (RTH) at Alun-Alun Bung Karno in Kabupaten Semarang. This approach was selected because it enables the researcher not only to analyze legal norms theoretically but also to assess their conformity in social reality through observation and direct interaction with research subjects. Primary data were collected through in-depth interviews with key informants who possess authority and substantive knowledge related to RTH management, namely: (1) the Head of the Waste and Waste Management Division of the Environmental Agency of Kabupaten Semarang as the technical authority responsible for public RTH management; and (2) the local neighborhood head (RW leader) who understands community utilization dynamics of Alun-Alun Bung Karno as well as the environmental impacts experienced directly by residents. In addition to interviews, participatory observation was conducted at Alun-Alun Bung Karno to document the physical characteristics of the area, the proportion of green and non-green coverage, types of surface materials (green cover, permeable paving blocks, and impermeable asphalt), and patterns of community space utilization across different times and days. Secondary data sources were collected through document studies consisting of: (a) primary legal materials, including Law of the Republic of Indonesia Number 26 of 2007 on Spatial Planning, Ministerial Regulation of ATR/BPN Number 14 of 2022 on the Provision and Utilization of Green Open Space, and Regional Regulation of Kabupaten Semarang Number 6 of 2023 on the Regional Spatial Plan

[6] "THE 17 GOALS," United Nations, 2015, https://sdgs.un.org/goals.

(RTRW) of Kabupaten Semarang for 2023–2043; (b) secondary legal materials in the form of scientific journal articles related to agrarian law and spatial planning, as well as environmental law and spatial planning textbooks; and (c) annual reports of the Environmental Agency of Kabupaten Semarang concerning RTH provision achievements. All collected data were analyzed qualitatively using content analysis methods with a statute approach to assess the conformity of physical implementation with legal provisions, as well as a conceptual approach to examine the tension between extrinsic and intrinsic functions of RTH. Data validity was ensured through source triangulation by comparing findings from interviews, observations, and documents, and the analytical results were synthesized to address the research problem concerning gaps in the implementation of ecological functions of RTH and their implications from the perspective of sustainable spatial planning law enforcement.

B. Analysis of the Conformity of Ecological Function Implementation of RTH with Statutory Regulations

1. Technical Standards for the Ecological Functions of RTH in Ministerial Regulation of ATR/BPN Number 14 of 2022

Article 2 paragraph (2) of Ministerial Regulation of ATR/BPN Number 14 of 2022 affirms that the ecological functions of Green Open Space (RTH) encompass a broad role in maintaining urban environmental balance. These functions include the role of RTH as an oxygen producer and as part of the “lungs of the city” supporting air quality, a microclimate regulator and shading element that helps create thermal comfort, as well as a rainwater absorber contributing to runoff control and the sustainability of the hydrological cycle. In addition, RTH functions as a habitat provider for vegetation and wildlife, an absorber and filter of air, water, and soil pollution, a wind barrier, and a noise buffer.

Collectively, these functions demonstrate that RTH is positioned as a strategic ecological element within spatial planning, serving not only environmental purposes but also supporting the overall quality of life of the community.

The technical standards of the ecological functions of Green Open Space (RTH) fundamentally emphasize RTH as part of ecological infrastructure that provides essential ecosystem services, namely enhancing water infiltration, regulating microclimates, and absorbing air pollutants and climate-related impacts, rather than merely serving as aesthetic elements or ordinary public spaces. Numerous modern studies demonstrate that green open spaces and other green structures can significantly reduce rainwater runoff volumes by increasing infiltration and water storage within soil substrates and vegetation, which in turn helps mitigate flooding and supports a sustainable urban hydrological cycle. In addition, green vegetation contributes substantially to local temperature reduction through evapotranspiration processes and vegetative shading effects, helping to reduce the Urban Heat Island effect in densely built areas. Initiatives such as green infrastructure, which integrate vegetation components and permeable surfaces as elements of urban design, are supported by scientific studies showing the significant role of green spaces in lowering surface temperatures and improving thermal comfort in urban environments.[7]

In the context of runoff management and pollution control, the use of permeable materials (such as porous paving, pervious concrete, or semi-permeable surfaces) combined with vegetation has been scientifically proven to increase water infiltration and contribute to mitigating runoff that

[7] Ekawati et al., "Penerapan Fungsi Pada Desain Ruang Terbuka Hijau Untuk Kota Berkelanjutan."

carries surface pollutants. This concept forms part of green stormwater infrastructure practices or Nature-Based Solutions, which focus on managing rainwater at its source with the objective not only of reducing flood risk but also improving water quality and absorbing urban contaminants. Permeable paving systems not only reduce runoff volume but are also capable of capturing micro-pollutants such as microplastics, highlighting the extended ecological role of such materials in urban environments.[8]

This is precisely what Ministerial Regulation of ATR/BPN Number 14 of 2022 seeks to regulate in order to achieve ecological functions within spatial planning in a given region. The regulation emphasizes that the provision and utilization of Green Open Space (RTH) must be designed in a measurable manner to simultaneously perform hydrological, climatological, and ecological functions. Through provisions concerning vegetation coverage proportions, limitations on impermeable surfaces, and the obligation to use permeable materials in non-green areas, this policy aims to ensure that RTH genuinely contributes to increasing soil infiltration capacity, controlling rainwater runoff, reducing environmental temperatures, and improving air quality. Furthermore, these regulations reflect a sustainable development approach in spatial planning, where environmental aspects are not positioned merely as complementary elements but as foundational components of regional planning. Accordingly, the technical standards for ecological functions contained in Ministerial Regulation of ATR/BPN Number 14 of 2022 serve as a normative instrument to integrate sustainability principles into spatial planning practices, while also providing a basis for evaluating the conformity of RTH implementation

[8] Eric Franco and Enedir Ghisi, "Permeable Pavements : An Integrative Review of Technical and Environmental Contributions to Sustainable Cities," 2025.

at the regional level.

In Semarang Regency, the regulatory framework is stipulated under Regional Regulation (Perda) Number 6 of 2023, the provisions of which are aligned with those outlined in the Ministerial Regulation of ATR/BPN Number 22 of 2014. The existence of this regional regulation indicates that all green open space (RTH) development is required to comply with the established technical standards in fulfilling ecological functions, as mandated by ATR/BPN Regulation Number 22 of 2014.

2. Incompatibility of Land Cover Materials at Alun-Alun Bung Karno

Bung Karno Square, located in Kalirejo Village, Ungaran Timur District, Semarang Regency, serves as a replacement for the previous town square and was inaugurated in 2014 by the Regent of Semarang at the time, dr. Mundjirin, SpOG. The area is designed as an open field surrounded by a circular pathway functioning as a jogging track and features a landmark sign that was previously written as “UNGARAN,” commonly used as a photo backdrop, and has now been replaced with the “Alun-Alun BUNG KARNO” sign. The square provides various recreational facilities, including roller skates, scooters, decorative pedicabs, and mini motorcycles that can be enjoyed by both children and adults. On Sundays, the area is typically crowded with temporary vendors selling daily necessities, food, and clothing. In addition, certain sections of the square are utilized by communities for activities such as rock climbing and skateboarding, while a fountain element located near the landmark signage forms part of the spatial arrangement. The square can be accessed via the Semarang–Ungaran Toll Road, located not far from the Ungaran toll gate, or through the main Semarang–Solo road

by following the traffic light intersection after the Ungaran gas station, where the site is situated on the left side of the road.[9]

The utilization of facilities at Bung Karno Square is highly diverse. According to information from Mr. Affandi, the Head of Neighborhood Association (RW) 01 in Kalirejo Village, the square is widely used not only by local residents of Kalirejo but predominantly by visitors from other areas. The busiest periods at Bung Karno Square occur during weekends (Saturday and Sunday), particularly at hours when many people engage in various activities such as jogging, martial arts practice, roller skating, and other recreational activities.

Picture 3. The square area is utilized for sports activities

Source: Author's Research (2026)

In addition, the field area is commonly used for organizing various events held by both private parties and government institutions. The outer area of the field serves as a parking space, which is often converted into temporary stalls for small vendors during weekends. Behind the vendor area, there is a food court (pujasera) offering various culinary options, as well as a mini zoo. Public Green Open Space (RTH) is therefore utilized not only as an ecological space but also as a venue for recreation, sports, social interaction, and informal economic activities such as small-scale trading. Furthermore, the use of urban green open spaces for events,

[9] Kelurahan Kalirejo, "Alun-Alun Bung Karno," 2018, https://kknkalirejo2018.wixsite.com/kalirejoungarantimur/alun-alun-bung-karno.

culinary facilities, and MSME activities can increase visitor intensity and strengthen the social and economic functions of the area, provided that the proportion and ecological functions of the green open space are not diminished.[10]

According to the annual report of the Environmental Agency of Semarang Regency (DLH Kabupaten Semarang), the Ungaran urban area already has a considerable number of Green Open Spaces (RTH). This indicates that the region has demonstrated awareness of the importance of Green Open Space in supporting spatial planning and environmental balance within a particular territorial area.

Table 1. RTH Data Report for Urban Parks in Ungaran

NO	GREEN OPEN SPACE	LOCATION	LARGE (ha)
1	Taman Jalan Protokol	Ungaran City	0,468
2	Kawasan Alun-Alun Kalirejo	Ungaran City	1,29
3	Taman Serasi	Ungaran City	0,519
4	Taman Jalan Lingkar Ungaran (JLU)	Ungaran City	0,3
5	Taman Jalan MT. Haryono	Ungaran City	0,038
6	Jl. Ki Sarino (In front of Kantor KP)	Ungaran City	0,015
7	Taman Rusunawa	Ungaran City	0,335
8	Taman Wujil	Ungaran City	0,288
9	Taman Kutilang Susukan	Ungaran City	0,075

[10] Zefri and Muhammad Farid Firdaus, "Analisis Pemanfaatan Ruang Terbuka Hijau Publik Yang Terintegrasi Dengan Ruang Terpadu Ramah Anak Di Kecamatan Jatinegara Kota Adminstrasi Jakarta Timur," *Jurnal Ilmiah Plano Krisna* 17, no. 1 (2021): 97–106.

Source: DLH Kab. Semarang (2026)

According to Article 5 paragraph (3) of Ministerial Regulation of ATR/BPN Number 14 of 2022, an urban park must meet several specific criteria. An urban park is an open area that serves ecological, social, cultural, and aesthetic functions, and is utilized as a space for recreation, education, or other activities serving the population within a city or urban area. Additionally, urban parks function as sites for diverse vegetation and biodiversity, water absorption zones, and microclimate regulation. They also serve as spaces for community social activities, with a service radius of at least 5,000 meters and a minimum area of 50,000 square meters. In terms of composition, the green open space of an urban park must have at least 85% green coverage, while the remaining portion may consist of non-green surfaces that remain environmentally friendly.

In terms of ecological functions, Alun-Alun Bung Karno is managed to consistently comply with applicable regulations. When analyzed against the criteria for RTH fulfilling ecological functions as stated in Article 2 paragraph (2) of Ministerial Regulation of ATR/BPN Number 14 of 2022, Alun-Alun Bung Karno meets several key standards. For example, the square maintains vegetation throughout its area. Certain zones are planted with greenery, which helps keep the atmosphere and temperature comfortable even though the square is close to major roads and the tollway. Additionally, some of the vegetation provides shaded areas for visitors during sunny periods. The size of the trees and plants is generally substantial, contributing effectively to cooling and shade.

Picture 4. Provision of Vegetation and Wildlife Habitats at Alun-Alun Bung Karno

Source: Author's Resource (2026)

In terms of rainwater absorption, ground cover and vegetation play an active role in soaking up rainfall and preventing waterlogging. Vegetation in green open spaces helps reduce surface runoff through direct interception by plant canopies, where a portion of the rainwater is temporarily retained on leaves and branches before reaching the soil. Additionally, plant roots enhance water infiltration into the ground and improve soil structure, which in turn maximizes the RTH's capacity to absorb rainwater and reduce the risk of puddles or flooding during the rainy season. The selection of vegetation types and urban plant cover significantly contributes to retaining and absorbing rainwater, effectively helping to regulate urban hydrology by decreasing surface runoff.[11]

Land cover consists of green cover and non-green cover. Ministerial Regulation of ATR/BPN Number 14 of 2022 recommends the use of environmentally friendly materials by incorporating permeable surfaces. The regulation sets the maximum non-green cover at 15% of the total area of the RTH. According to the Kamus Besar Bahasa Indonesia, "permeable" means allowing particles to pass through.[12] In this context,

[11] Siti Nur et al., "Functional Urban Ground-Cover Plants : Identifying Traits That Promote Rainwater Retention and Dissipation," 2023, 1709–24.

[12] Departemen Pendidikan Nasional, *Kamus Besar Bahasa*

non-green cover can use materials that allow particles—especially rainwater—to pass through, preventing waterlogging. Permeable materials can include paving blocks or porous asphalt. Most urban parks designated as RTH already use permeable surfaces to support optimal water absorption. For example, Amongrogo Park in Gunungpati, Semarang City, has implemented non-green cover using permeable materials.

Picture 5. Example of Permeable Material Use (Paving Blocks) in RTH

Source: Author's Research (2026)

Empirical data indicate that Alun-Alun Bung Karno still features areas of non-green cover dominated by impermeable materials. Impermeable surfaces are water-resistant, preventing rainwater from infiltrating the soil and thereby increasing surface runoff. Materials such as concrete, asphalt, and compacted pavement reduce soil infiltration capacity and raise the potential for waterlogging in urban areas. Converting land cover to impermeable surfaces decreases infiltration while increasing rainwater runoff, contributing to flooding, particularly in developed urban zones.[13]

Each type of material, whether permeable or impermeable, has its own implications for the environment. The analysis is

Indonesia, *Pusat Bahasa* (Jakarta: Pusat Bahasa, 2008).

[13] Anditya Ika Widyaningrum, Donny Harisuseno, and Sri Wahyuni, "Analisa Karakteristik Genangan Berdasarkan Kejadian Hujan Dan Laju Infiltrasi," *Jurnal Teknologi Dan Rekayasa Sumber Daya Air* 2, no. 1 (2022).

presented in the following table:

Table 2. Analysis of the Impact of Using Impermeable Materials on Hydrological Functions

Type of Material	Area (Estimated)	Surface Flow Coefficient	Impact on Infiltration	Ecological Implications
Conventional asphalt	~1,1 Ha	0,90–0,95	Very low	Increased surface runoff, risk of flooding
Permeable paving blocks	~0,2 Ha	0,40–0,60	Medium–High	Allows limited infiltration
Vegetation cover	~0,9 Ha	0,10–0,30	High	Optimal for infiltration and evapotranspiration
Concrete/building	~0,1 Ha	0,95	Very Low	Inhibits the groundwater cycle

Source: Author's Reasearch (2026)

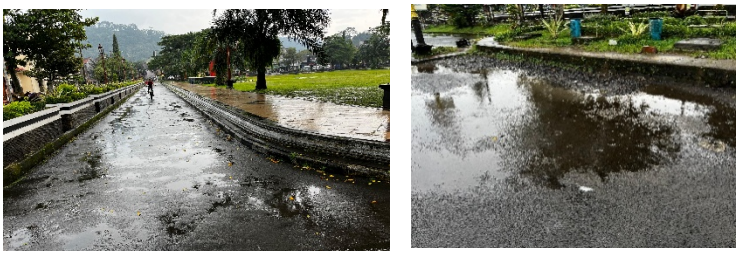
Most of the land cover at Alun-Alun Bung Karno consists of asphalt, which makes it difficult for rainwater to infiltrate the soil. However, some areas have already implemented paving blocks, including small sections of the jogging track and the car parking area.

Picture 6. Non-Green Cover Areas Using Asphalt

Source: Author's Reasearch (2026)

Empirical findings show that during the rainy season, waterlogging often occurs as rainwater cannot flow into drainage channels. Asphalt surfaces hinder rainwater from finding paths to infiltrate the soil.

Picture 7. Jogging track area



Source: Author's Research (2026)

Picture 8. Jogging Track Area Most Prone to Waterlogging

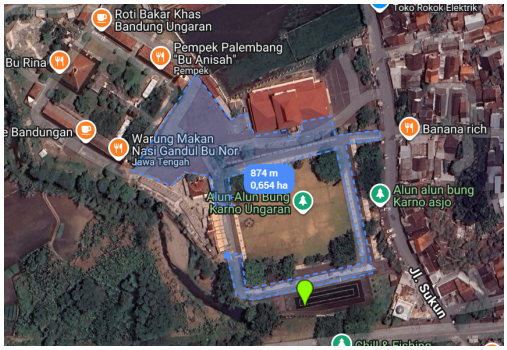
Source: Author's Research (2026)

Picture 9. Small Sections of Alun-Alun Bung Karno Using Paving Blocks

Source: Author's Research (2026)

Based on the map, the non-green cover at Alun-Alun Bung Karno is as follows:

Picture 10. Area of Non-Green Cover Using Impermeable Materials



Source: Author's Research (2026)

From these measurements, the area of non-green cover and the use of impermeable materials exceed 15% of the total 1.290 ha. Therefore, when analyzed using the table, the provision of RTH at Alun-Alun Bung Karno in terms of fulfilling ecological functions is as follows:

Table 3. Analysis of the Fulfillment of the Ecological Function of Alun-Alun Bung Karno

Ecological Function Criteria (Minister of ATR/BPN Regulation No. 14/2022)	Technical Standards	Current Condition of Alun-Alun Bung Karno	Compliance Status
Minimum green cover proportion	≥ 85%	~70% (estimated)	Not Fulfilled
Non-green cover limit	≤ 15%	>15% (0,92 Ha of 1,29 Ha)	Not Fulfilled
Non-green cover material	Permeable (paving blocks, porous asphalt)	Dominant impermeable asphalt	Not Fulfilled
Rainwater absorption function	Optimal infiltration through	Puddles occur when it rains	Not Fulfilled

	vegetation & permeable materials		
Provider of vegetation and animal habitat	Diversity of local flora and fauna	Existed, but limited to poultry	Partially Fulfilled
Microclimate regulator and shade	Shade vegetation with adequate canopy	Large vegetation is available in some areas	Fulfilled
Air pollution absorber	Vegetation with pollutant filtration capabilities	Vegetation is available, but its effectiveness has not been measured.	Partially Fulfilled

Source: Author's Research (2026)

3. Gaps in Regulation Regarding the Supervision of Perda No. 6 of 2023 Implementation

According to Ms. Niken, a staff member of the Environmental Agency of Semarang Regency (DLH Kab. Semarang), on February 13, 2026, the development of an RTH follows several stages. There are three main stages: planning, construction, and supervision. These stages are carried out after the budget is allocated to cover all necessary requirements, including land for RTH development. During the procurement process, DLH Kab. Semarang engages external parties for goods and services to execute the work. Throughout this process, DLH Kab. Semarang maintains full authority over RTH management. In the planning stage, a Detail Engineering Design (DED) is required, containing all plans and designs for the RTH development.

The implementation of spatial planning policies, particularly in the provision and management of RTH, is determined not only by the existence of regulations but also by the effectiveness of oversight mechanisms carried out by

local governments. Regional Regulation of Semarang Regency Number 6 of 2023 on the RTRW 2023–2043 governs spatial planning, including the planning, utilization, and control of land use as an integrated system to ensure orderly regional spatial management. However, in practice, gaps still exist between the normative provisions and the actual physical conditions of RTH on the ground, especially regarding the alignment of spatial design with ecological functions as mandated by the regulations. This indicates that supervision, as part of land-use control, has not been optimally implemented in accordance with the objectives of spatial planning set forth in Undang-Undang Nomor 26 Tahun 2007 tentang Penataan Ruang.

According to the policy implementation theory proposed by George C. Edward III, the success of policy implementation is influenced by four main variables: communication, resources, disposition, and bureaucratic structure. These variables determine whether a policy can be effectively executed or remains only at the normative level. Communication is necessary so that the policy's objectives are clearly understood by implementers, while adequate resources, implementers' commitment, and a supportive bureaucratic structure are crucial in ensuring the policy achieves its intended goals. In the context of implementing the RTRW Regional Regulation of Semarang Regency, weaknesses in supervision may arise due to insufficient communication of technical policy to field implementers, limited supervisory resources, and suboptimal coordination among local government agencies managing RTH. This situation results in spatial planning policies that are normatively sound but not fully translated into effective implementation, as evidenced by the continued dominance of non-green materials in several RTH areas, preventing the

ecological functions from being fully realized.[14]

Furthermore, Minister of Agrarian Affairs and Spatial Planning/Head of BPN Regulation (Permen ATR/BPN) No. 14 of 2022 emphasizes that RTH has ecological functions, including rainwater absorption, microclimate regulation, and noise mitigation. This provision implicitly requires technical supervision of the physical design of RTH to prevent domination by impermeable surfaces such as concrete, solid paving, or asphalt. If supervision is not consistently applied, the development of RTH may only fulfill aesthetic and social functions without meeting the ecological functions mandated by regulations. Therefore, weak oversight mechanisms result in RTH policy implementation that is not yet fully aligned with national ecological function standards.

The effectiveness of green space policy implementation is highly influenced by the presence of continuous supervision and evaluation mechanisms. The success of such policies depends greatly on policy communication and the monitoring of field implementation, including the provision of information and direct control over land use by implementing officers. Weak monitoring results in policy execution being merely administrative, without ensuring that the physical condition of the space aligns with the established spatial plans. This situation leads to suboptimal functioning of green spaces, even though regulations exist normatively. The challenges in implementing green space policies are therefore more related to supervision and technical execution rather than deficiencies in the regulations themselves.[15]

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[14] Ahmad Hidayat and Fadhrian Kemala, "Implementation Of State Property Management Policy At The Secretariat General Of The General Election Supervisory Agency Republic Of Indonesia," *Journal Indonesia Law and Policy Review* 3, no. 2 (2022).

[15] Sulianti Wahida Astuti and Isnaini Rodiyah, "Implementation of Green Open Space Management Policy in Sidoarjo Regency," *Indonesian Journal of Public Policy Review* 20 (2022).

When analyzed using a table, the gap analysis of the RTH implementation at Alun-Alun Bung Karno is as follows:

Table 4. Accountability for Supervision of RTH Implementation

Management Stage	Responsible Agency	Supervisory Instruments	Implementation Gap
Planning	Bappeda Kab. Semarang + DLH	DED, AMDAL, RTRW	Coordination between agencies is not yet optimal
Implementation	DLH Kab. Semarang + Contractor	Technical specifications, field supervision	Physical supervision is inconsistent
Maintenance	DLH + Society (optional)	Routine monitoring, periodic reports	Community participation has not been institutionalized
Evaluation and Enforcement	Inspectorate + DLH	Spatial planning audit, administrative sanctions	Sanctions are rarely applied for technical violations.

Source: Author's Research (2026)

Based on the above description, it can be concluded that the regulatory gap in the supervision of the implementation of Regional Regulation Number 6 of 2023 is not caused by weak legal norms, but rather by suboptimal implementation factors as explained in Edward III's theory. The lack of synchronization between the provisions of the RTRW, the ecological function standards in the Ministerial Regulation of ATR/BPN No. 14 of 2022, and the physical condition of green open spaces in the field indicates the need to strengthen the technical supervision system, inter-agency coordination, and periodic evaluation of the ecological quality of green open spaces so that the goals of sustainable spatial planning can be achieved.

C. Legal Implications and Policy Recommendations for Optimizing the Ecological Function of Green Open Space

1. Legal Responsibility for Violations of RTH Technical Standards

From the perspective of legal compliance theory, Soerjono Soekanto states that the effectiveness of law is determined by five main factors: the substance of the law, law enforcement officers, facilities or infrastructure, society, and legal culture. Compliance with spatial planning regulations will be achieved if legal norms are supported by officers who carry out supervision consistently and if clear law enforcement mechanisms are in place. In the management of RTH, the existing regulations—through the Spatial Planning Law and Permen ATR/BPN No. 14 of 2022—are actually adequate, but legal compliance becomes weak if supervision of the physical design implementation is not carried out continuously.[16]

Satjipto Rahardjo views law as a means of social engineering, aimed at guiding societal behavior toward desired conditions. In the context of spatial planning, regulations concerning the technical standards of green open spaces (RTH) serve to direct land use in a way that supports urban ecological balance. If violations of these standards are not followed by corrective measures through administrative sanctions, the law loses its guiding function and fails to promote behavioral change in the management of public spaces.[17] In line with this, Achmad Ali explains that legal compliance is closely related to legal awareness and the consistent enforcement of regulations by state

[16] Soerjono Soekanto, *Faktor-Faktor Yang Mempengaruhi Penegakan Hukum* (Jakarta: Rajawali Pers, 2014).
[17] Satjipto Rahardjo, *Ilmu Hukum*, IX (Bandung: PT Citra Aditya Bakti, 2021).

authorities. A lack of firmness in implementing administrative sanctions can create the perception that violations of spatial planning carry no real legal consequences, causing legal norms to lose their coercive power in practice. This situation results in the continued use of non-green materials or the utilization of spaces that do not meet the ecological standards of RTH, ultimately hindering the achievement of water absorption and environmental control functions as stipulated in Permen ATR/BPN Number 14 of 2022.[18]

Violations of the technical standards for RTH constitute a juridical consequence of non-compliance with spatial plans established by local governments. Law Number 26 of 2007 on Spatial Planning emphasizes that all land use must conform to the spatial plan, and violations of these provisions are subject to administrative sanctions as stipulated in Articles 65 to 67. Administrative sanctions may include written warnings, temporary suspension of activities, suspension of public services, site closure, and even the demolition of buildings that do not comply with the spatial plan. These provisions demonstrate that spatial planning law functions as an instrument for controlling land use to maintain the sustainability of the ecological functions of RTH.

The conformity between spatial plans and the physical condition of RTH depends on the consistency of supervision and control of land use by local governments. Control that is primarily administrative without field evaluation makes it difficult to legally correct deviations from technical standards, resulting in suboptimal ecological functions of RTH. The mechanism of administrative sanctions, as regulated in Articles 65–67 of Law No. 26 of 2007, serves as a juridical instrument that should be employed to strengthen legal compliance and ensure that land use aligns with urban environmental protection objectives. Consistent implementation of administrative sanctions not only reflects formal law enforcement but also serves as a means to

[18] Achmad Ali, *Menguak Teori Hukum (Legal Theory) Dan Teori Peradilan (Judicialprudence)* (Jakarta: Kencana Prenada Group, 2009).

cultivate a culture of legal compliance in urban space management. Consequently, the juridical implications of violations of RTH technical standards position local governments as the parties legally responsible for ensuring conformity in land use through active supervision and sustained enforcement of administrative law.[19]

2. *Socio-Legal Engineering Strategy for Harmonizing the Function of RTH*

According to Mr. Affandi, the Head of RW 01 in the Alun-Alun Bung Karno area, on March 1, 2026, the area remains within the jurisdiction of RW 01. However, in practice, the government has never involved the community in managing the Alun-Alun Bung Karno environment. Regarding development, the community has never felt invited to participate, so all development and management activities are conducted solely by the government. Previously, local residents had submitted requests to participate in the management and supervision of the RTH, but these were not responded to definitively by the relevant government authorities. The local community generally uses the Alun-Alun Bung Karno area only for public events rather than for specific purposes. According to the source, there has never been any invitation or reporting to the surrounding community. Nevertheless, the local residents have taken the initiative to preserve and maintain the Alun-Alun area by organizing communal work (gotong royong) every Thursday. This condition indicates that the implementation of RTH management has not fully reflected the principle of public participation, which is a core spirit of spatial planning as stipulated in Law No. 26 of 2007, positioning the community as an important actor in land use and spatial control.

From the perspective of socio-legal engineering, Satjipto Rahardjo explains that law functions as a means of social engineering aimed at guiding societal behavior toward desired social conditions through regulations that operate in

[19] Muhamad Yusuf, "Implementasi Kebijakan Pengembangan Ruang Terbuka Hijau (RTH) Publik Di Provinsi Kalimantan Timur," *Jurnal Good Governance* 19, no. 2 (2023).

social practice. Legal provisions regarding RTH should not be limited to written norms but should foster patterns of collaboration between the government and the community in maintaining environmental sustainability. The exclusion of the community from RTH management indicates that the law's function as an instrument of social change has not been fully realized, as the norm of public participation has not yet been translated into operational mechanisms for area management.[20]

Integrating community participation in RTH supervision becomes a crucial strategy for strengthening collective environmental compliance. Involvement of local residents enables the formation of social oversight over the physical condition of RTH, including vegetation maintenance, environmental cleanliness, and the use of space in accordance with its ecological function. The routine communal work (gotong royong) initiatives carried out by the surrounding community demonstrate the presence of social capital that can be integrated into a community-based RTH management system. A participatory approach in managing RTH enhances urban environmental governance through collaboration between the government and the community as part of ongoing public space oversight.[21]

In addition to community participation, the harmonization of the ecological functions of RTH also requires a revision of the standard operating procedures (SOP) for urban park management, so that they are not solely oriented toward the administrative maintenance of physical infrastructure but also integrate coordination mechanisms between local governments and surrounding communities. RTH management based solely on administrative procedures tends to focus on cleanliness, facility arrangement, and space utilization without evaluating the achievement of ecological functions such as vegetation quality, water absorption capacity, and environmental sustainability, making management less adaptive to the ecological and social needs

[20] Rahardjo, *Ilmu Hukum*.
[21] W. Astuti and Rodiyah, "Implementasi Kebijakan Ruang Terbuka Hijau Di Pemerintah Daerah," *Jurnal Good Governance*, 2022.

of urban communities. A participation-based SOP should clearly define the roles between local government agencies as managers and the community as social supervisors, through periodic evaluation of RTH conditions, community involvement in monitoring land use, and transparency of management information as a form of accountability in spatial planning implementation. This collaborative management approach strengthens ongoing supervision, as it does not rely solely on government bureaucracy but is also supported by social control from the community, while bridging the gap between spatial plan (RTRW) design and the actual conditions of RTH in the field, which has so far resulted from weak institutional coordination and minimal operational evaluation of the area's ecological functions.[22]

Furthermore, a socio-legal approach to the implementation of spatial planning policies indicates that the success of a regulation is determined not only by the existence of legal norms but also by its practical execution in the field. Environmental policy implementation often faces challenges in inter-agency coordination and mismatches between normative policies and the social realities of the community. This condition illustrates that the implementation of environment-based policies requires institutional synergy and continuous supervision to achieve ecological protection objectives optimally. This perspective is relevant to the implementation of the ecological function provisions of RTH at Alun-Alun Bung Karno, where the effectiveness of ecological functions depends not only on regulations but also on management and execution at the local level.[23]

The optimization of the ecological functions of RTH can

[22] Achmad Aufa Anggarda, Hartuti Purnaweni, and Sri Suwitri, "Implementasi Kebijakan Rencana Tata Ruang Wilayah (RTRW) Dalam Pemanfaatan Ruang Terbuka Hijau (RTH) Publik Pusat Kota Di Kabupaten Lamongan," *Jurnal Ilmiah Administrasi Publik* 10, no. 3 (2024).

[23] Febryana Maharani and Asmarani Ramli, "Analisis Sosiolegal Terhadap Pelaksanaan Kebijakan Dan Penyelesaian Sengketa Untuk Upaya Perlindungan Hukum Hak Atas Tanah Dan Resolusi Konflik Agraria Di Rawa Pening," *Bookchapter Hukum Dan Lingkungan* 1 (2025).

also be achieved through the implementation of green infrastructure based on the principles of water-sensitive urban design (WSUD), an urban planning approach that integrates stormwater management into landscape design through the use of infiltrative vegetation, permeable surfaces, and natural absorption systems that mimic the natural hydrological cycle. This approach positions RTH not only as a social recreational space but also as ecological infrastructure that reduces surface runoff, enhances groundwater infiltration, and lowers the risk of waterlogging and flooding in urban areas. The application of WSUD elements, such as bioswales, rain gardens, and porous vegetation areas, allows rainwater to be absorbed gradually, thereby maintaining urban environmental quality and reducing pressure on conventional drainage systems. This concept aligns with the ecological functions of RTH as regulated in Permen ATR/BPN Number 14 of 2022, particularly in the roles of RTH as a rainwater absorber and microclimate regulator. Thus, integrating WSUD principles into urban park management can serve as a technical strategy to support the sustainable achievement of spatial planning ecological objectives.[24]

3. Cross-Sector Policy Synergy to Strengthen Urban Ecological Functions

Cross-Sector Policy Synergy to Strengthen Urban Ecological Functions Strengthening the ecological functions of RTH in urban areas requires cross-sectoral policy synergy, as the management of green spaces is not only related to spatial planning but also to environmental protection and integrated regional development planning. The involvement of various local government agencies, particularly the Environmental Agency and the Regional Development Planning Agency (Bappeda), is crucial to ensure that RTH policies are integrated into medium-term development plans and spatial planning documents. Without cross-sectoral coordination, green space policies risk being implemented partially, preventing the optimal achievement of

[24] T. D. Fletcher, "Water-Sensitive Urban Design: Principles and Practices," *Urban Water Journal*, 2021.

their ecological functions. Institutional synergy allows alignment between environmental policies, urban development strategies, and land-use control, ensuring that RTH is understood not merely as an urban aesthetic element but as ecological infrastructure with sustainable environmental protection functions. [25]

Collaboration among government agencies also plays a role in enhancing the effectiveness of RTH management policies by clearly delineating responsibilities in planning, implementing, and supervising urban environmental programs. RTH management involving cross-organizational coordination allows for the simultaneous integration of green development programs, environmental pollution control, and improvement of public space quality. This collaborative approach promotes adaptive environmental governance, as each agency contributes according to its institutional function, including providing environmental data, monitoring ecological conditions, and evaluating the sustainability of urban areas. Consequently, strengthening the ecological functions of RTH does not rely solely on a single managing sector but becomes a shared responsibility within a coordinated local government system.[26]

The integration of cross-sectoral policies in RTH management is also directly relevant to achieving the Sustainable Development Goals (SDGs), particularly SDG 11 on sustainable cities and communities and SDG 13 on climate action. RTH serves as a strategic instrument in enhancing urban ecological resilience through urban heat reduction, improved air quality, and sustainable stormwater management. Therefore, the development of technical guidelines for RTH involving the Environmental Agency and Bappeda is an important step to ensure that regional development policies are not solely focused on physical

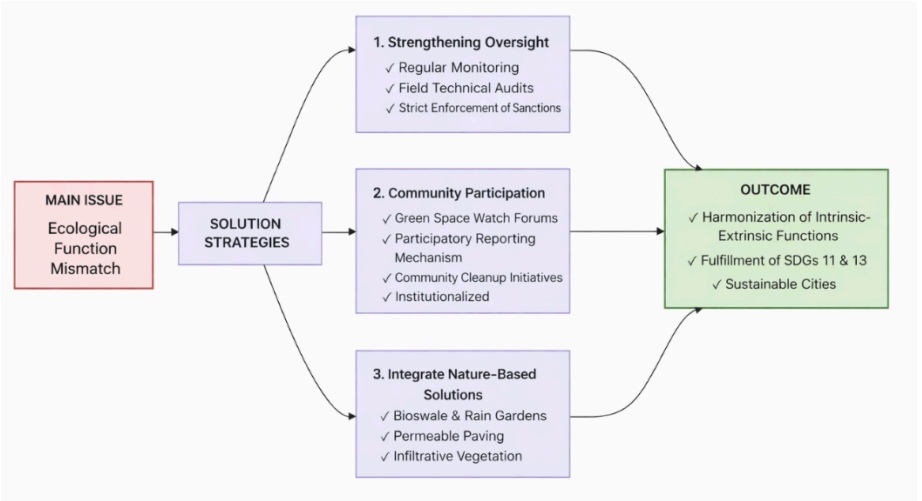
[25] Fletcher.

[26] Nanang Haryono, Pantius Drahen Soeling, and Ami Yayuk Sri Rahayu, "Systemic Leadership in Sustainable Collaborative Governance: A Case Study of Urban Green Space Management in Surabaya," *Jurnal Masyarakat, Kebudayaan, Dan Politik* 27, no. 3 (2024).

growth but also consider long-term environmental sustainability. Such policy synergy enables the operational and measurable integration of sustainable development targets into urban spatial planning practices.[27]

In the context of managing Alun-Alun Bung Karno as a public RTH in Semarang Regency, cross-sectoral policy synergy is necessary to reduce the gap between spatial planning and the implementation of ecological functions in the field. Collaboration between the Environmental Agency and the Regional Development Planning Agency (Bappeda) can be directed toward developing technical guidelines for RTH management that include ecological indicators such as vegetation quality, water absorption capacity, and environmental sustainability. This policy integration also strengthens the coordination of land-use supervision while creating opportunities for community participation as part of environmental control, ensuring that the optimization of the ecological functions of Alun-Alun Bung Karno aligns with sustainable development principles and SDG targets at the local level.

Therefore, the analysis from problem identification to potential solutions can be illustrated in the following diagram:



[27] Laksmi Widyawati, "Ruang Terbuka Hijau Permukiman Di Jakarta Menuju Pembangunan Kota Berkelanjutan," *Jurnal Kalibrasi* 5, no. 2 (2022).

Chart 1. Solution Strategy
Source: Author's Analysis (2026)

D. Conclusion

This study reveals a significant gap between the physical implementation of Alun-Alun Bung Karno as a public green open space and the ecological function mandated under the framework of national and regional spatial planning laws. The predominance of impermeable asphalt in non-green areas not only violates the 15% technical limit stipulated in Semarang Regency Regulation No. 6 of 2023 but also undermines the area's capacity to perform its critical role as a water absorption zone and microclimate regulator. These findings indicate that the utilization of green open spaces has so far tended to prioritize extrinsic functions (socio-economic) without adequate compliance with the intrinsic functions that form the foundation of urban environmental sustainability.

To address this issue, a progressive legal approach is required, involving the strengthening of community-based monitoring mechanisms, the enforcement of strict administrative sanctions for violations of green open space technical standards, and the integration of nature-based solutions principles in the revision of spatial planning documents. Optimizing the ecological function of green open spaces is not only a legal obligation for local governments but also an essential prerequisite for achieving urban climate resilience, as mandated by Indonesia's commitments to the SDGs and the Paris Agreement. Without harmonization between the social and ecological dimensions in green open space management, efforts to realize sustainable cities will continue to face structural challenges that threaten the environmental balance for future generations.

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