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Sustainable Water Management Policies in Banjarmasin City

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ABSTRACT

This study examines the challenges and progress of water sustainability in Banjarmasin, South Kalimantan, with a focus on clean water supply and wastewater management. The city's rapid urbanization has put significant pressure on its water resources, including the Barito and Martapura rivers, resulting in water quality deterioration and over-extraction. Utilizing the SNI ISO 37120:2018 framework for sustainable urban development indicators, the research evaluates the performance of Banjarmasin's water and wastewater services. Data collected from local government reports and field surveys show that the city has made commendable progress in clean water services, with 91.87% of the population receiving access to clean water. However, wastewater treatment remains a major issue, with only 2.85% of the population receiving centralized wastewater services and a high incidence of open defecation (4.9%). The findings indicate that Banjarmasin must adopt a more integrated approach to water management, focusing not only on improving clean water supply but also enhancing wastewater infrastructure and sanitation services. The study suggests that policy reforms, community engagement, and investment in green infrastructure are necessary to achieve sustainable water management and meet the SDG 6 targets.

Keywords: *Banjarmasin; water sustainability; clean water; wastewater; urban sustainability*

INTRODUCTION

Urbanization has transformed cities into the primary engines of economic growth, but this rapid development has come at a significant cost to water sustainability. Globally, over 55% of the population resides in urban areas, a figure projected to rise to 60% by 2030 [1], [2]. This urban expansion places immense pressure on water resources, leading to over-extraction, pollution, and the degradation of aquatic ecosystems. Cities in developing nations, particularly in Asia and Africa, face acute water stress due to inadequate infrastructure, climate change, and inefficient governance. For instance, megacities like Delhi and Jakarta struggle with severe groundwater depletion and contamination, highlighting the urgent need for sustainable water management frameworks [3]. The United Nations' Sustainable Development Goals (SDGs), especially Goal 6 (Clean Water and Sanitation), emphasize the importance of integrated water resource management to ensure equitable access and ecological balance. However, achieving these targets

remains challenging in regions where urbanization outpaces regulatory and infrastructural capacities [4].

In Indonesia, urbanization has surged, with 67% of the population expected to live in cities by 2035 [5]. Java, Bali, and Sumatra exhibit the highest urban densities, leading to exacerbated water crises, including flooding, saltwater intrusion, and declining water quality. The national government has adopted policies like the New Urban Agenda and ISO 37120 standards to promote sustainable cities, but implementation gaps persist. For example, Jakarta's reliance on groundwater has caused land subsidence at alarming rates (25 cm/year in some areas), while river pollution from industrial and domestic waste remains unchecked [6]. These issues underscore the disconnect between policy ambitions and on-ground realities. Banjarmasin, though smaller in scale, mirrors these challenges, with its unique riverine topography adding layers of complexity. The city's struggle to balance economic growth with water sustainability reflects broader national and global trends, necessitating a critical examination of its governance strategies.

The global discourse on urban water management increasingly advocates for nature-based solutions (NBS), such as green infrastructure and wetland restoration, to mitigate flooding and improve water quality. Cities like Copenhagen and Singapore have successfully integrated NBS into their urban planning, demonstrating their viability [7]. However, translating these models to developing contexts requires adaptation to local ecological and socio-political conditions. Banjarmasin's reliance on its extensive river network—earning it the moniker "City of a Thousand Rivers"—presents both opportunities and challenges. While rivers are central to its identity and economy, unchecked urban activities have degraded these waterways, threatening their sustainability. This paradox highlights the need for localized, innovative approaches that align with global sustainability principles while addressing Banjarmasin's unique context.

Banjarmasin, the capital of South Kalimantan, is a city defined by its intricate network of rivers, earning it the nickname "Kota Seribu Sungai" (City of a Thousand Rivers). These waterways have historically served as the lifeblood of the city, supporting transportation, fisheries, agriculture, and cultural practices. However, rapid urbanization has turned this abundance into a liability, as the city grapples with severe water degradation. The Environmental Quality Index (IKLH) for Banjarmasin's water scored a critical 48.18 in 2023, contributing 37.6% to the city's overall low IKLH score [8]. This decline is driven by multiple factors, including industrial discharge, domestic waste, and unsustainable land-use practices. For instance, the conversion of riparian zones into residential and commercial areas has disrupted natural water flow, exacerbating flooding during the rainy season and water scarcity during droughts. The Barito and Martapura rivers, the city's primary water sources, are heavily polluted, with studies showing high levels of heavy metals and organic contaminants [9].

The city's high population density (6,798 people/km² in 2024) intensifies these challenges, as demand for clean water outpaces supply. The municipal water utility (PDAM) serves only 65% of households, forcing many residents to rely on groundwater or untreated river water, further depleting resources and exposing communities to health risks. Additionally, Banjarmasin's low-lying topography and tidal influences make it highly vulnerable to flooding, which is worsening due to land subsidence (2–5 cm/year) and sea-level rise [10]. The 2021 flood inundated 40% of the city, displacing thousands and causing economic losses exceeding IDR 500 billion. These events reveal systemic vulnerabilities in the city's water governance, where short-term fixes, like dredging and levees, fail to address root causes such as watershed degradation and poor urban planning.

Despite these challenges, Banjarmasin's riverine culture offers untapped potential for sustainable solutions. Traditional practices like "lantar jukung" (floating markets) and community-based fisheries demonstrate the socio-economic value of healthy waterways. However, modern governance often overlooks these indigenous knowledge systems in favor of technocratic approaches. For example, the city's Banjarmasin Hijau (Green Banjarmasin) program focuses on tree planting but neglects river restoration. Meanwhile, policies like the 2019 Regional Regulation on Water Resources Management lack enforcement, allowing illegal waste dumping and sand mining to persist. To reverse this trajectory, Banjarmasin must adopt integrated water resource management (IWRM) strategies that harmonize ecological preservation with urban development. This includes revitalizing rivers as green corridors, incentivizing rainwater harvesting, and strengthening community participation in monitoring and enforcement. The city's unique identity as a river-centric urban center positions it to pioneer innovative models for sustainable water management in Indonesia and beyond.

The crisis facing Banjarmasin's water systems demands a paradigm shift in governance, blending global best practices with local adaptations. Internationally, cities like Rotterdam and Bangkok have implemented "water-sensitive urban design" (WSUD), combining infrastructure resilience with ecological restoration [11]. Rotterdam's "Sponge City" approach, for instance, uses permeable pavements and rooftop gardens to absorb rainwater, reducing flood risks while enhancing green spaces. Such models offer valuable lessons for Banjarmasin, but their success hinges on contextualization. For example, the city could leverage its rivers for decentralized wastewater treatment systems, mimicking Bangladesh's "floating gardens" to purify water while supporting aquaculture [12]. Similarly, nature-based solutions like mangrove reforestation along the Barito Delta could mitigate tidal flooding and sequester carbon, aligning with Indonesia's climate commitments.

At the national level, Indonesia's 2020–2024 RPJMN (National Development Plan) prioritizes water security through programs like *"100-0-100" * (100% water access, 0% slums, 100% sanitation). However, Banjarmasin's progress lags, with only 70% water access and 30% sanitation coverage. Closing this gap requires targeted investments in infrastructure, such as expanding PDAM's piped network and constructing wastewater treatment plants. Crucially, policies must address governance fragmentation; currently, water management is split across agencies (PUPR, DLH, and BWS), leading to incoherent planning. A unified authority, modeled after Thailand's Metropolitan Waterworks Agency, could streamline decision-making and improve accountability. Additionally, Banjarmasin should adopt participatory governance, engaging communities in river monitoring and cleanup initiatives, as seen in Surabaya's "Kali Bersih" program.

Local innovation is equally vital. Banjarmasin's "Smart City" framework could integrate IoT sensors to monitor water quality in real-time, enabling data-driven policy adjustments. Fiscal incentives, such as tax breaks for industries adopting zero-waste practices, could reduce pollution. Finally, education campaigns highlighting the cultural and economic value of rivers can foster public stewardship. By embracing these strategies, Banjarmasin can transform its water challenges into opportunities, emerging as a model for sustainable riverine cities. Its journey will not only safeguard local livelihoods but also contribute to global knowledge on balancing urban growth with ecological resilience.

LITERATURE REVIEW

1. Sustainable Development Goals (SDGs) and Their Relevance to Urban Water Management

The concept of Sustainable Development emerged as a response to the failures of

traditional development models, which often overlooked social and environmental aspects, leading to unsustainable ecological and economic outcomes. As a corrective measure, sustainable development aims to align economic, environmental, and social practices in a manner that ensures future generations can meet their needs without compromising the capacity of the earth's ecosystems. The foundation for sustainable development was established with the World Conservation Strategy in 1980, integrating conservation and development goals, followed by the 1991 initiative by IUCN, UNEP, and WWF titled *Caring for the Earth* [13].

In this context, water management is a critical aspect of achieving the SDGs, particularly Goal 6 which focuses on ensuring the availability and sustainable management of water and sanitation for all. Sustainable urban water management is increasingly recognized as a key lever in building resilient and livable cities. For instance [14] argued that effective water resource management is a core component of sustainable cities, with strategies addressing both supply and demand to ensure equitable access to clean water while avoiding resource depletion.

Banjarmasin, with its river-based infrastructure, faces unique challenges in aligning urban development with sustainable water management principles. This city's reliance on water systems for its daily activities underscores the need for integrated management to prevent water pollution, manage waste, and ensure adequate water supply amidst urban expansion.

2. Sustainable Cities and Urban Development: Conceptual Frameworks and Case Studies

The concept of Sustainable Cities integrates ecological, social, and economic dimensions into urban planning. Defined by UN Habitat [15], sustainable cities are those that provide a safe, inclusive, and productive environment for all citizens, ensuring equitable access to resources and services while maintaining the ecological integrity of the environment. Cities, as engines of economic growth and centers of innovation, can also become sources of environmental degradation if growth is not managed sustainably [16].

Sustainable urban development emerged as a response to the environmental crises of the 1960s and 1970s, marked by pollution and uncontrolled urban expansion [17]. According to Ostárek, the 1992 Earth Summit and later urban conferences by the UN stressed the importance of sustainable cities, leading to frameworks like the New Urban Agenda adopted in Quito which focuses on reshaping urban spaces with an eye on long-term environmental and social equity.

In this context, Banjarmasin's urbanization process is tightly linked to the principles of sustainable development. The city's development, characterized by dense population clusters and significant water resource dependencies, requires robust policies and regulations to ensure that water systems can accommodate urban growth while maintaining ecological balance [18].

3. Environmental Carrying Capacity and Urban Sustainability

The concept of environmental carrying capacity is integral to understanding how sustainable urban systems can be designed, especially in resource-constrained environments. Environmental carrying capacity refers to the maximum population or level of activity an environment can support without experiencing degradation. In Banjarmasin, this concept is critical for assessing how the city can continue to thrive without exhausting its water resources or causing irreversible damage to its ecosystem [19].

The carrying capacity framework that urban development should be regulated by the natural limits of the environment, specifically its water and land resources. In cities like Banjarmasin, the balance between supply and demand is essential. The method

of measuring water supply-demand [20] can be directly applied to assess whether Banjarmasin's water resources can meet the growing demands of its population and industries. Key to this approach is capacity-based management, which emphasizes the availability of resources, and threshold-based models, which help identify when water usage exceeds environmental limits.

4. Integrated Approaches to Water Management in Urban Sustainability

Integrated water resource management (IWRM) has emerged as a powerful strategy to balance development and ecological sustainability. IWRM involves managing water resources in an integrated manner across sectors, considering environmental, social, and economic factors [21]. This approach ensures that water supply and wastewater management are planned with respect to the environment, rather than as separate, isolated systems.

In Banjarmasin, water supply management must be coupled with sanitation strategies to meet SDG targets. As indicated by Goal 6, urban areas must improve both access to clean water and wastewater management systems. Banjarmasin, like many developing cities, is actively working to expand its access to safe water and sewage treatment facilities, with ongoing efforts focused on improving wastewater infrastructure and adopting policies that promote sustainable use of water [22].

5. Challenges and Future Directions for Banjarmasin's Water Management Systems

Despite progress in water management, significant challenges remain in Banjarmasin. As reported by local agencies, many areas still lack proper sanitation systems, and water quality monitoring is insufficient. The city's water infrastructure needs substantial investment to keep up with the growing demands of urban expansion, and there is a pressing need for community engagement to support these efforts [23].

Banjarmasin's future water security will depend on adopting more resilient policies that integrate spatial planning, water recycling technologies, and improved regulation of industrial and domestic water use. Internationally, cities with similar challenges, such as Jakarta, have adopted smart city technologies to monitor and optimize water use, offering potential lessons for Banjarmasin.

MATERIALS & METHODS

This study employs a quantitative approach with a descriptive design to analyze sustainable urban water management in Banjarmasin, particularly focusing on Sustainable Development Goal (SDG) 6, which emphasizes access to clean water and sanitation. The research aims to assess the environmental carrying capacity of water resources and identify the gaps between urban water demand and the availability of water resources in the city. By using primary data collected through field surveys, interviews, and observations of water infrastructure, the study will explore the current state of urban water systems and their effectiveness in meeting the needs of the growing population. Secondary data will also be analyzed, including reports from local government agencies, providing a comprehensive view of the water management landscape.

Data collection will involve surveys and questionnaires targeting local residents to assess access to clean water and sanitation, while in-depth interviews with policy-makers, water management officials, and other stakeholders will offer insights into the challenges and strategies used in the city's water management practices. Field observations will evaluate the physical state of water distribution systems, treatment plants, and the general water infrastructure, helping to assess the practical effectiveness of the implemented policies and strategies. These methods will provide both quantitative and qualitative data, offering a robust foundation for the study. The data will be analyzed using descriptive statistics

to summarize the current conditions of water management, and qualitative analysis to identify key themes and issues emerging from interviews. An environmental carrying capacity model will be used to assess the balance between the availability of water resources (supply) and the growing demand for water across different sectors in Banjarmasin. The findings will provide recommendations for improving urban water management practices, guiding future policy decisions to ensure sustainable access to water, and achieving SDG 6 in the city. The following is an outline of the research framework that will be implemented show in figure 1.

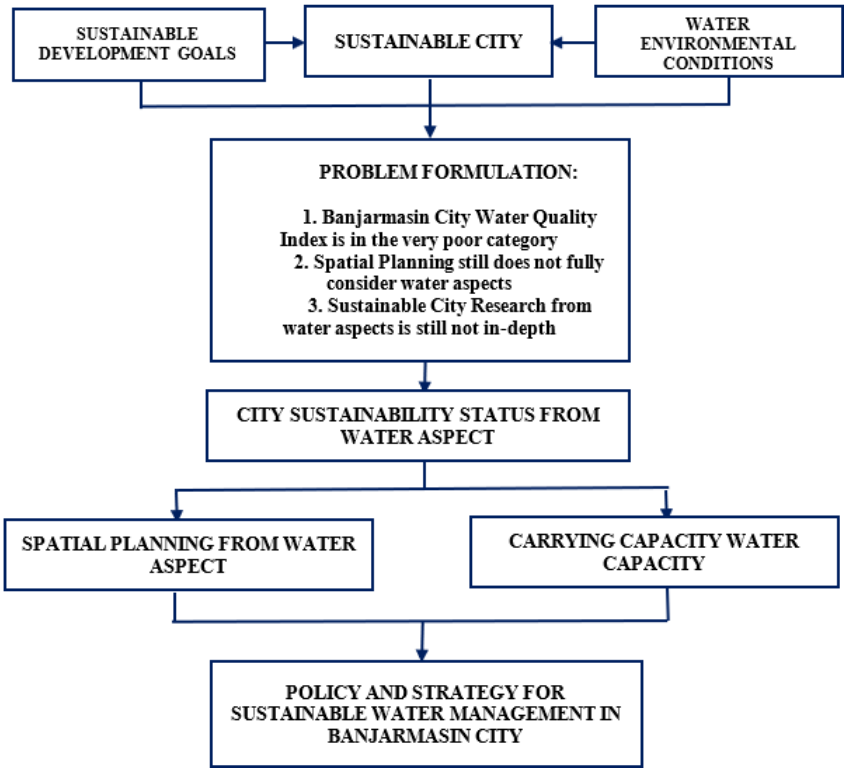

Figure 1. Research Framework

1. Sustainable Development Goals (SDGs)

The first element of the flowchart is the Sustainable Development Goals (SDGs). This global initiative established by the United Nations aims to address a range of societal, environmental, and economic challenges that need to be overcome to achieve sustainable development. The SDGs provide a framework for countries to guide policies that focus on creating a more equitable and sustainable world. The SDGs are directly linked to the issue of Sustainable City and Water Environmental Conditions, as water and urban management are critical factors in achieving several goals, especially SDG 6 (Clean Water and Sanitation) and SDG 11 (Sustainable Cities and Communities).

2. Sustainable City

A Sustainable City refers to a city designed with the goal of minimizing the negative impacts on the environment and promoting the well-being of its residents through the efficient use of resources. This involves using sustainable practices in urban planning, building infrastructure, transportation, and ensuring that environmental issues, such as water management, are effectively addressed. In this flowchart, the concept of a sustainable city is examined in terms of water management and its role in improving overall urban sustainability.

3. Water Environmental Conditions

This section addresses the environmental conditions of water in the city of

Banjarmasin. Water is an essential resource that must be managed carefully in urban environments, particularly in regions where water quality and availability can be impacted by urbanization and industrial activity. The flowchart links the city's water conditions to its ability to maintain a sustainable environment and the need for a sustainable approach to water management, which is integral to urban development and public health.

4. Problem Formulation

The flowchart outlines three major problems identified with Banjarmasin City's water situation:

A. Banjarmasin City Water Quality Index is in the Very Poor Category: This indicates that the city's water quality is below acceptable standards, potentially posing health risks to its population.
B. Spatial Planning Still Does Not Fully Consider Water Aspects: This refers to the gap in urban planning where water-related issues (such as water supply, wastewater treatment, and stormwater management) are not fully integrated into the city's spatial plans. This oversight could lead to inefficient use of water resources and exacerbate environmental problems.
C. Sustainable City Research from Water Aspects is Still Not In-Depth: There is a lack of detailed research and analysis on how water-related factors affect the sustainability of Banjarmasin City. This creates a need for more focused research on how water can be better managed to support urban sustainability.

5. City Sustainability Status from Water Aspect

This section of the flowchart represents the status of city sustainability from the water aspect. It focuses on evaluating the city's water management practices, how well it is doing in terms of sustainability, and how its water system supports its urban ecosystem. This status assessment is essential for identifying gaps and areas for improvement, particularly in the fields of spatial planning and environmental management.

6. Spatial Planning from Water Aspect

The flowchart emphasizes the importance of spatial planning from the water aspect. Proper spatial planning should integrate considerations of water resources, such as where water comes from, how it is used, how wastewater is treated, and how flood control measures are implemented. Effective planning ensures the sustainability of urban areas by managing water resources efficiently and reducing the risk of water-related issues.

7. Carrying Capacity Water

This element of the flowchart focuses on the carrying capacity of water in Banjarmasin. Carrying capacity refers to the ability of the city's water systems (including both natural and human-made infrastructure) to support the needs of its population without degrading the environment. Assessing the water carrying capacity helps to understand the limits of available resources and plan for future needs, ensuring that urban development does not exceed the sustainable use of water.

8. Policy and Strategy for Sustainable Water Management in Banjarmasin City

The final part of the flowchart addresses the policy and strategy for sustainable water management in Banjarmasin City. It emphasizes the need for a comprehensive approach to water management, involving government policies, regulations, and strategies that promote water conservation, reduce pollution, and ensure equitable access to clean water. This section suggests that for Banjarmasin to achieve sustainable development, it must adopt policies that integrate water management into urban planning and ensure the long-term sustainability of water resources.

RESULT

This study focuses on the city of Banjarmasin in South Kalimantan Province.

As the initial capital of South Kalimantan before the law on the capital relocation to Banjarbaru was passed, this city is one of the largest cities on Borneo Island. Geographically, Banjarmasin is located between 3° 16’ 46’’ to 3° 22’ 54’’ South Latitude and 114° 31’ 40’’ to 114° 39’ 55’’ East Longitude. It sits at an average elevation of 0.16 meters below sea level, with relatively flat and swampy terrain. During high tide, almost the entire area is flooded. The strategic location of Banjarmasin, serving as the gateway to Borneo Island with the Trans Kalimantan highway passing through it, has had a significant influence on the city's development. The research location is more clearly shown in Figure 1.

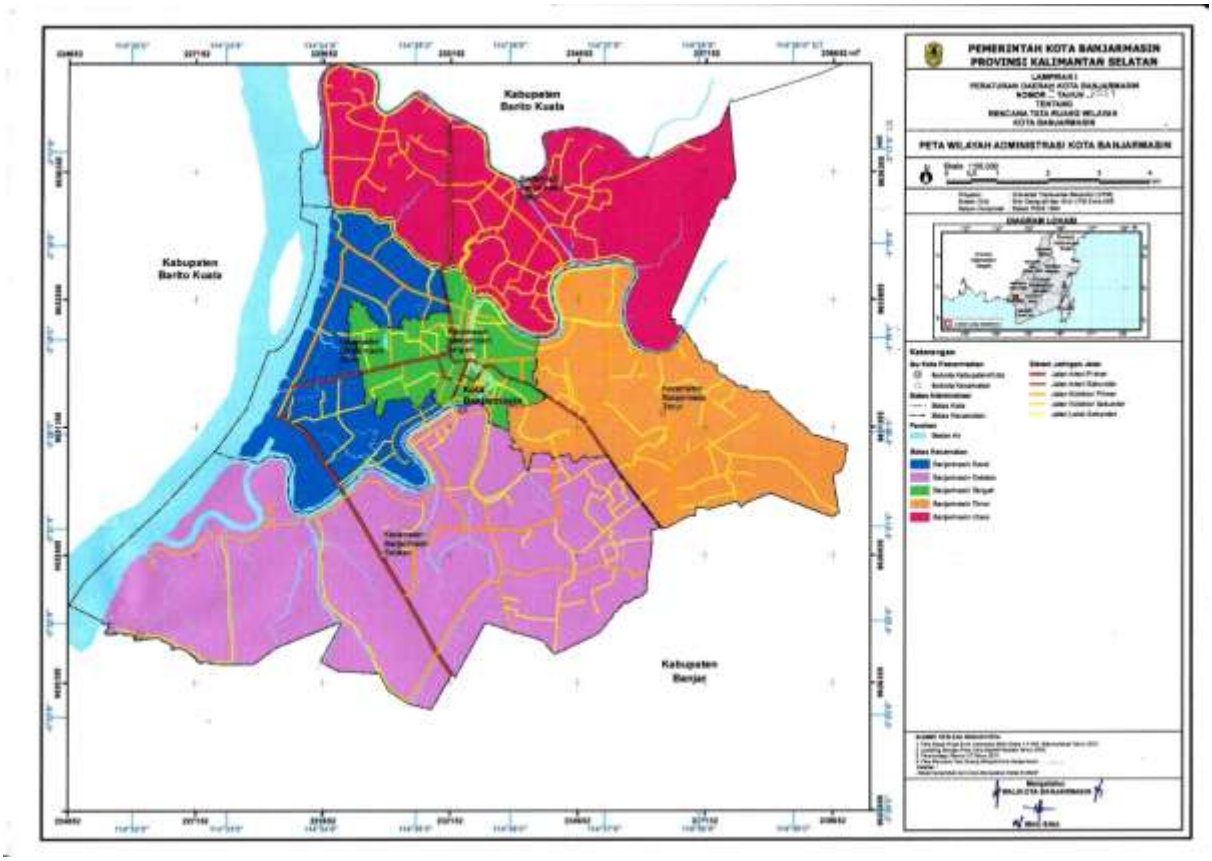

Figure 2 Area Location research in Banjarmasin City

In efforts to develop and implement Banjarmasin as a sustainable city, a set of indicators is necessary to be achieved, as outlined in SNI ISO 37120:2018 on sustainable urban and community development indicators for urban services and quality of life. These indicators serve as a guide for the government and residents of Banjarmasin to take a series of steps or policies to realize a sustainable city. The sustainability indicators achieved by Banjarmasin City from the clean water and wastewater aspects are presented in the following table 1.

Table 1. Sustainability Indicator Achievements of Banjarmasin City

Aspect	Indicator	Banjarmasin Barat	Banjarmasin Tengah	Banjarmasin Timur	Banjarmasin Selatan	Banjarmasin Utara	Banjarmasin City
Clean Water	Percentage of population with clean water services	86.90	82.50	96.87	92.20	95.65	91.87
	Percentage of population with sustainable access to improved water sources	98.82	98.82	98.82	98.82	98.82	98.82
	Total domestic water consumption per capita (L/person/day)	109.97	111.59	137.63	120.10	140.95	125.01
	Compliance with clean water quality standards	94.65	97.78	94.65	97.62	98.80	96.70
	Total water consumption per capita	118.87	163.07	169.54	128.38	160.69	146.12
	Average service interruption time per household (hours)	2.5	2.5	2.5	2.5	2.5	2.5
	Water loss percentage	28.87	28.87	28.87	28.87	28.87	28.87
Wastewater	Percentage of population served by centralized wastewater services	0.21	4.74	0.84	3.49	4.78	2.85
	Percentage of wastewater treated centrally	0.69	0.89	0.32	0.85	1.04	0.76
	Percentage of population with better sanitation access	1.29	6.39	2.73	6.21	5.64	4.49
	Compliance with wastewater treatment standards	85.71	57.14	92.31	62.50	83.33	75.93

Based on the achieved indicators, it is observed that the clean water aspect shows better results compared to the wastewater aspect. Some indicators might differ in numbers due to calculations made by different institutions.

Based on SNI 37120:2018, the clean water aspect is assessed through seven indicators, five of which can be analyzed as attributes using the Rapfish application, while the other two are informational. The results from this analysis provide insights into the clean water dimension in Banjarmasin. Similarly, for the wastewater aspect, SNI 37120:2018 outlines four indicators that serve as attributes of wastewater management. Following an analysis using the Rapfish application on these four attributes, the position (ordination) of Banjarmasin City and its sub-districts in terms of wastewater management was determined, as shown in the following image.

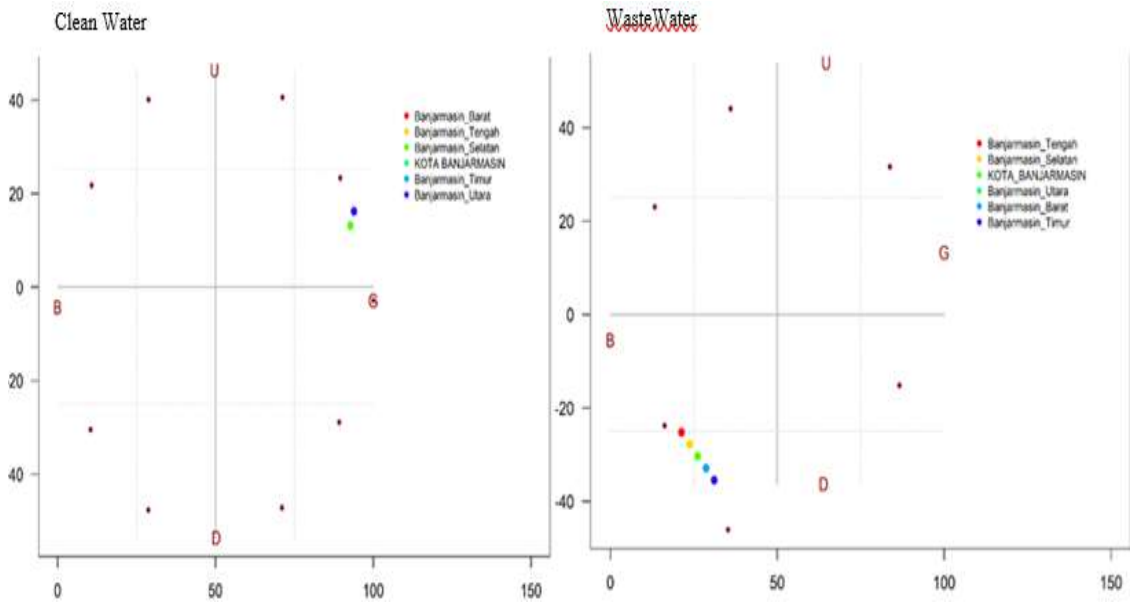

Figure 3. Clean and Waste Water Sustainability Index Ordinance for Banjarmasin City

From the analysis using Rapfish, it is evident that all the sustainability index values are above 50%, categorizing them as sustainable, with the details provided in Figure 3.

The sustainability index values for Banjarmasin City and the districts are all above 50%, which is categorized as sustainable, with the scores summarized in Table 2.

Table 2. Sustainability Status of Banjarmasin City in Terms of Wastewater

Clean Water		**Waste Water**	
Score	**Status**	**Score**	**Status**
93.89	Good (Sustainable)	26,18	Insufficient (Less sustainable)
92.73	Good (Sustainable)	28,64	Insufficient (Less sustainable)
92.73	Good (Sustainable)	21,27	Poor (Unsustainable)
93.89	Good (Sustainable)	31,10	Insufficient (Less sustainable)
93.89	Good (Sustainable)	28,64	Insufficient (Less sustainable))
92.73	Good (Sustainable)	23,72	Poor (Unsustainable)

Clean water is crucial in achieving Sustainable Development Goal (SDG) 6, which aims to ensure the availability and management of clean water and sanitation for all. Based on the achievement of clean water and wastewater indicators in Banjarmasin City, it is evident that the clean water indicators are considerably higher,

with scores exceeding 50%. This suggests that the government and community in Banjarmasin have a high level of awareness regarding the importance of clean water sustainability. In contrast, the percentage of the population in Banjarmasin City receiving centralized wastewater treatment services is very low, at only 2.71%. This reflects the low level of public awareness about the importance of environmental health, contributing to the unsustainable status of wastewater management in Banjarmasin. Table 2 further highlights this discrepancy in sustainability across various sub-districts in Banjarmasin. While some areas scored high, such as 93.89, indicating "Good (Sustainable)" wastewater management, other sub-districts showed concerning results. Several areas scored as low as 26.18, 28.64, and 31.10, falling under the "Insufficient (Less sustainable)" category. Additionally, two sub-districts scored even lower, with 21.27 and 23.72, categorizing them as "Poor (Unsustainable)." These varied scores highlight the significant disparities in wastewater management within the city, underlining the need for targeted interventions to improve wastewater infrastructure, raise public awareness, and promote sustainable wastewater practices in the areas that are struggling to meet sustainability standards. This gap in performance further emphasizes the importance of integrating both clean water and wastewater management efforts to achieve the overarching goal of urban sustainability.

DISCUSSION

Based on the results and findings, the water sustainability situation in Banjarmasin City presents a complex challenge that requires targeted policies and interventions. The city shows relatively good performance in clean water services, with most districts achieving sustainability scores above 50%, indicating positive progress in water supply management. This high achievement suggests strong government efforts and community awareness regarding the importance of clean water and its management. However, the disparity in wastewater management is striking, as indicated by the low percentage of the population receiving centralized wastewater services, which is only 2.71%. This gap highlights the insufficient infrastructure and public awareness related to wastewater treatment and sanitation. The findings emphasize that the city's urban planning and water governance need to be more holistic and integrated to meet the demands of both water supply and wastewater management.

Additionally, the significant environmental and health risks associated with poor wastewater treatment and inadequate sanitation systems cannot be ignored. The high percentage of open defecation (4.9%) further compounds these challenges, highlighting the urgency for public education and investment in sanitation infrastructure. The findings point to an urgent need for policy reforms and investments in wastewater management, including increasing access to centralized sanitation services and improving local wastewater treatment facilities. Without such efforts, the city risks facing prolonged environmental degradation and public health crises, which would undermine its overall sustainability goals.

This study underlines the importance of adopting a more comprehensive and integrated approach to water management in Banjarmasin. The city must move beyond focusing solely on clean water supply and extend its efforts toward improving wastewater treatment facilities. Policies such as enhancing sanitation services, promoting community engagement in waste management, and improving public awareness about the importance of proper sanitation are crucial for achieving a truly sustainable urban environment. Moreover, the development of policies that align with Sustainable Development Goals (SDGs), particularly Goal 6, should be prioritized. Furthermore, implementing spatial policies that promote ecological sustainability, such

as green infrastructure, better wastewater management systems, and flood management policies, will not only support the city's environmental goals but also improve the overall quality of life for its residents. Green infrastructure solutions like urban wetlands, permeable pavements, and rainwater harvesting systems could be integrated into urban planning to reduce runoff and improve water quality. In addition, better wastewater management systems, including decentralized treatment plants and sewage treatment technology, will help reduce pollution and make the city's water resources more sustainable. In this way, Banjarmasin can achieve a balanced and sustainable urban ecosystem that meets the needs of its growing population while preserving the environment for future generations.

CONCLUSION

In conclusion, the sustainability status of Banjarmasin City, particularly in terms of clean water and wastewater management, reveals both positive achievements and critical challenges. The clean water services in Banjarmasin have made significant progress, with a notable achievement of 91.87% of the population receiving access to clean water services. This high percentage suggests that the city is on track to meet the goals for water supply sustainability, with a consumption rate of 125.01 liters per capita per day in 2023. However, the wastewater management aspect presents a significant concern, as only 2.85% of the population has access to centralized wastewater treatment. The low score for wastewater treatment, with a sustainability index of just 26.18% for the city as a whole, indicates a considerable gap in infrastructure and public awareness. Additionally, the percentage of open defecation in Banjarmasin remains at 4.9%, which further exacerbates environmental and health risks. To achieve true sustainability, Banjarmasin must adopt a more integrated approach to water and sanitation management. While the city's clean water services are performing well, the wastewater sector needs urgent attention. Specifically, enhancing centralized wastewater treatment, which currently processes only 0.76% of wastewater, is critical. Along with this, addressing the high loss of water at 28.87% and improving sanitation facilities will be essential for the city's future development. With a more holistic strategy, including investments in infrastructure, public awareness campaigns, and better governance, Banjarmasin can ensure a healthier, more sustainable environment for its residents, aligning with the broader goals of urban sustainability.

Declaration by Authors

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