

Urban Sustainability in Practice: Analyzing the Implementation of the Low-Carbon City Program in Makassar

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ABSTRACT

The Indonesian government, through Law Number 32 of 2009, emphasizes that a good and healthy environment is a fundamental right of every citizen. Various efforts have been made, including the development of regulations, the "Blue Sky" program, and the use of alternative fuels to reduce air pollution. The city of Makassar, through Regional Regulation Number 4 of 2015 concerning the Makassar City Spatial Plan 2015–2034, integrates concepts such as low-carbon city, green city, and climate mitigation city to create a more comfortable and less polluted environment. This study aims to analyze the implementation of the "Low Carbon City" program in Makassar. Using Van Meter & Van Horn's (1975) theoretical framework with a mixed methods research approach, the findings indicate that in early 2024, the Makassar city government focused on carbon emission reduction by promoting the low-carbon city program. The city government collaborates with universities and NGOs in implementing this initiative. While some programs have already been implemented and others are still in progress, a lack of public awareness campaigns has resulted in low public awareness of the program. Additionally, leadership changes at the local level are feared to hinder the sustainability of the initiative.

Introduction

The rapid growth of the economy and urbanization, particularly in urban areas, has significantly increased energy consumption. This is reflected in the growing demand for fuel to support industrial activities and transportation. Air pollutants can directly affect human health at certain concentration levels, either suddenly acutely or over the long term chronically (Nikmanesh et al., 2022; Chen et al., 2022). These effects range from respiratory tract irritation, eye irritation, and skin allergies to the development of lung cancer (Budiyono, 2001).

Makassar, as one of Indonesia's major cities and a hub of public activity, experiences a moderate level of air pollution. As the study of Jamil and Barkey (2023) forecasts that air pollution levels in Makassar City are among the moderate and unhealthy classifications.

Hence, studies on air pollution and carbon mitigation play a strategic role in urban governance, particularly in addressing today's global environmental challenges. Air pollution, as a significant threat, not only affects human health but also degrades the quality of life, harms ecosystems, and increases economic burdens due to healthcare costs and productivity losses (Czermański et al., 2024; Jaafar et al., 2018).

Tambunan (2024) states that one of the key aspects of climate change mitigation is sustainable urban planning. Proper urban governance can help reduce carbon emissions, enhance disaster resilience, and maintain a healthy environmental quality.

In light of this phenomenon, addressing air pollution should be a top priority for the Makassar City Government. One way to tackle this environmental challenge is to promote environmentally friendly urban development through decarbonization, commonly called building a "Low Carbon City."

To combat air pollution, various efforts have been made, including the development of environmental legislation, such as Law No. 32 of 2009, and the implementation of programs like "Langit Biru" (Blue Sky), which was first launched in 1996 by the Ministry of Environment through Ministerial Decree No. 15 of 1996.

The Makassar City Government's environmental protection and reducing air pollution program is outlined in Makassar City Regional Regulation (Peraturan Daerah or Perda) No. 4 of 2015 concerning the Spatial Plan of Makassar City 2015–2034. The spatial planning of Makassar integrates and harmonizes all potentials and spatial values that have developed from two dimensions of the city's development. In its vision of an environmentally conscious city, the spatial plan incorporates and elaborates the core concepts that have long characterized Makassar: Low Carbon City, Green City, Climate City (mitigation and adaptation), Sunset City, and Waterfront City. Accordingly, the Low Carbon City program is expected to become a flagship initiative of Makassar to realize a clean, livable environment with low pollution levels.

The research problem in this study is formulated as follows: How is the implementation of the 'Low Carbon City' program in Makassar? What obstacles are faced in implementing the 'Low Carbon City' program?

Literature Review

Several theoretical frameworks have been developed to explain the dynamics of policy implementation. Edwards III (1980) identifies four key variables that determine the effectiveness of policy implementation: communication, resources, the disposition of implementers, and the structure of the bureaucracy. Grindle (1980), meanwhile, argues that implementation outcomes are primarily influenced by two major dimensions: the content of the policy and the context of its implementation. In contrast, Van Meter and Van Horn (1975) propose a more comprehensive model, asserting that the success of policy implementation. As noted by Winarno (2004), the model identifies five key variables influencing implementation performance: policy standards and objectives, Resources, Inter-organizational communication and strengthening of activities, Characteristics of implementing agents, and Socio-economic and political conditions.

Among these perspectives, this study adopts the implementation model developed by Van Meter and Van Horn (1975). The choice is grounded in the model's integrative nature, which not only accounts for internal organizational variables but also systematically incorporates external environmental factors. This multidimensional approach provides a robust analytical framework for understanding the complexities of policy implementation processes.

Although the policy implementation theory developed by Van Meter and Van Horn (1975) is considered a classic, the conceptual framework they proposed remains relevant for analyzing the dynamics of policy implementation today (O'Toole, 2000). This theory provides a strong analytical foundation for understanding factors such as communication among actors, resources, and the disposition of implementers, which continue to pose major challenges in the practice of policy implementation (Sager & Gofen, 2022). Therefore, the use of this theory not only strengthens the theoretical foundation of the research but also enables a comparison between past implementation challenges and contemporary contexts.

Several studies have discussed the implementation of government programs aimed at reducing air pollution. One such study was conducted by Riyanto (2024), which examined the implementation of the policy on the motor vehicle emissions testing program to reduce air pollution in East Jakarta. The study indicates that the implementation of the motor vehicle emissions testing program in East Jakarta has been running smoothly. The implementers clearly and consistently communicated the Governor's Regulation Number 66 of 2020 and its objectives, including regular emissions testing and outreach activities throughout East Jakarta (Riyanto, 2024). However, this study focused solely on a single policy related to carbon emissions reduction.

Another study was conducted by Evitasari & Komarulzaman (2023), which addresses environmental policy related to the effect of climate finance on carbon emissions reduction through renewable energy in Indonesia. The study argues that climate finance does not directly reduce carbon emissions, nor does it significantly drive renewable energy adoption to lower carbon emissions. These findings suggest the need for a reallocation of climate finance towards sectors with greater potential for carbon reduction in Indonesia (Evitasari & Komarulzaman, 2023). This study provides insights at the national level regarding the effectiveness of financing in carbon reduction, but does not identify specific impacts or strategies at the city level.

Although studies of Riyanto (2024) and Evitasari & Komarulzaman (2023) provide significant insights into Indonesia's carbon reduction initiatives, they neglect essential aspects that this research on Makassar's low-carbon program aims to fill. Riyanto (2024) provides an implementation-centric analysis but restricts it to a singular regulatory instrument – the vehicle emissions testing regulation – so diminishing its explanatory capacity for comprehensive, multi-sectoral low-carbon policies. Evitasari & Komarulzaman (2023) offer macro-level perspectives on the national deficiencies in climate finance but fail to address the local dynamics and administrative realities that influence policy outcomes in urban settings. This study addresses these gaps by employing the policy implementation framework proposed by Van Meter and Van Horn (1975), which highlights six interconnected variables: policy standards and objectives, resources, inter-organizational communication, characteristics of implementing agencies, economic and social conditions, and the disposition of implementers. Utilizing this theoretical framework, the examination of Makassar's low-carbon initiative transcends mere policy substance and funding structures to rigorously assess the interplay of implementation processes, actor networks, and contextual elements that affect policy efficacy at the municipal level. This research provides a comprehensive and practical understanding of low-carbon policy implementation by focusing on the dynamics of local levels while expanding the analysis beyond individual policy assessments.

Research Methods

This study employs a qualitative method with a narrative approach to understand the implementation of carbon emission reduction policies in Makassar City. The narrative approach was chosen because it allows for exploring experiences, perspectives, and dynamics involved in implementing the Low Carbon City (LCC) program through the stories and experiences of key stakeholders.

The research was conducted within the municipal agencies (Satuan Kerja Perangkat Daerah or SKPD) of Makassar City, considering their strategic role in supporting low-carbon development. These units hold the authority and capacity to implement programs aligned with the regional development vision and national targets.

The data sources for this study consist of both primary and secondary data, primary data were collected through in-depth interviews with key informants,

including the Acting Regional Secretary (PJ Sekretaris Daerah) of Makassar City, the Regional Development Planning Agency (Bappeda), the Environmental Office, the City Spatial Planning Office, and community representatives. Informants were selected purposively based on their strategic roles and relevance in the program's implementation, particularly in policy formulation, planning, and the execution of carbon emission reduction initiatives at the local level, then the secondary data were obtained from policy documents, government reports, academic publications, and statistical data related to low-carbon development in Makassar City. These secondary sources supported the analysis and provided a more comprehensive context for the research findings.

To analyze policy implementation, the study adopts Van Meter and Van Horn's policy implementation theory, which offers a structured framework to understand the key variables influencing the effectiveness of policy execution. Through this approach, the research seeks to reveal how these factors contribute to implementing the Low Carbon City program in Makassar and identify the challenges encountered during the process.

As a narrative-based study, the approach focuses on data and policy content and policy actors' experiences, stories, and perspectives. This perspective helps uncover the on-the-ground dynamics and how various stakeholders respond to and interpret carbon emission reduction policies.

Results and Discussion

The findings of this study focus on the analysis of the "Low Carbon City" initiative, which provides insight into how the Makassar City Government implements this program in its efforts to create a city free from pollution and with high air quality. This research adopts the Van Meter and Van Horn (1975) model, a classic theory in public policy implementation. The theory emphasizes that successful policy implementation depends on the policy design and how it is executed on the ground. This model's key indicators of policy implementation include: policy standards and objectives, resources, inter-organizational communication, characteristics of implementing agents, and the social, economic, and political environment.

Identification of Policy Objectives

The "Low Carbon City" program has been identified as a strategic initiative by the Makassar City Government. This was evident in the theme of the Special Coordination Meeting (Rakorsus) held at the beginning of 2024. The program, designated as a priority by the local government, is part of an effort to create a low-emission region and aligns with the national government's target to reduce greenhouse gas emissions by approximately 29% by 2030.

This commitment was confirmed by the Acting Regional Secretary (PJ Sekretaris Daerah) of Makassar City, FHP, who stated:

“Starting in early 2024, the Makassar City Government is committed to transforming Makassar into a Low Carbon City, a commitment discussed in a forum called Rakorsus. This meeting is held annually at the beginning of the year. It involves all levels of the city government, from neighborhood and community leaders (RT/RW), sub-districts, and districts, to academics, members of the pentahelix, media teams, NGOs, and even several international speakers.” (Interview, October 7, 2024)

Over the past seven years, the Air Quality Index (AQI) and the contribution of NO₂ as a pollutant in Makassar have been recorded as follows:

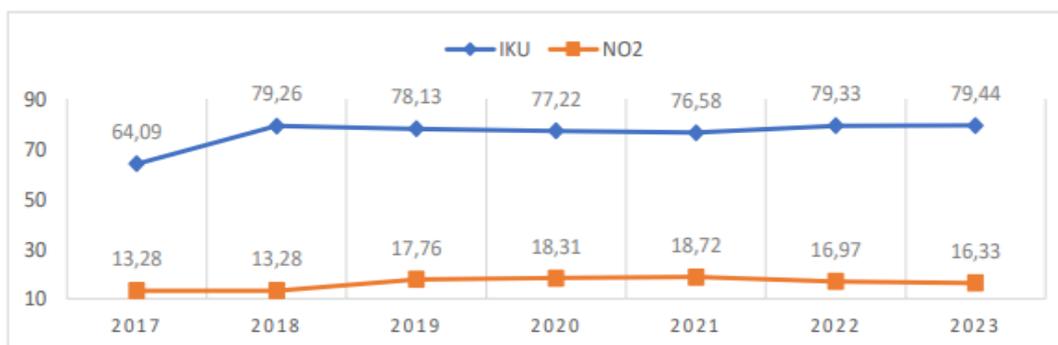


Figure 1. Air Quality Trends in Makassar City (2022-2023)

Source: Long Term Development Plan, City of Makassar 2024-2025 (data processed by author)

Based on the diagram, the overall air quality index shows an upward trend, with minor fluctuations between 2019 and 2021. However, it has remained reasonable since 2018 and improved further in 2023, when the index rose to 79.44. Meanwhile, NO₂ concentration remained relatively stable, though it peaked in 2021 and declined over the following two years (2022-2023). This data suggests the potential for improved air quality in recent years.

According to the 2024 Greenhouse Gas Inventory Report in the Makassar City Long-Term Development Plan (RPJPD) 2025-2045, the transportation sector remains the most significant fuel consumer in the city. The community's dependence on private vehicles is a major contributor to the increasing number of cars in Makassar.

In general, the Low Carbon City (LCC) program initiated by the Makassar City Government has a comprehensive grand design focused on Waste-to-Energy (PSEL), Urban Tourism Alleys (*Lorong Wisata*), Electric Vehicles, Solar Energy, Digitalization, and Environmental Education.

Based on this grand design, several initiatives have been launched by the local government to reduce greenhouse gas emissions and adopt sustainable practices, including energy efficiency, eco-friendly transportation, waste management, and environmental conservation through *Lorong Wisata*.

This aligns with a statement from the Acting Regional Secretary of Makassar City, F.H:

“Following the Rakorsus (Special Coordination Meeting), several actions have been taken by the Makassar City Government as initial steps in reducing emissions. These

include the replacement of official government vehicles with hybrid or electric vehicles. All 47 public health centers (puskesmas) in Makassar now use electric vehicles for home care services. We are also piloting the use of electric buses for school transportation. In addition, solar panels have been installed in several schools.” (Interview, October 7, 2024)

All of these efforts are expected to positively impact the environment, improve residents’ quality of life, serve as a model for the use of eco-friendly technology, and raise public awareness of the importance of environmental sustainability. These actions reflect a proactive approach by the Makassar City Government in addressing climate change and creating a healthier, more sustainable environment for its people.

Resources

In implementing the Low Carbon City (LCC) policy, the Makassar City Government possesses a variety of resources that can be utilized to support the development of this program. These begin with human resources, where several government agencies execute LCC initiatives. This was demonstrated during the Special Coordination Meeting, where all Municipal Agencies of Makassar City presented their ongoing and upcoming innovations to realize a Low Carbon City.

In addition, the City of Makassar collaborates with various technical experts, including engineers, urban planning specialists, and environmental and spatial planning professionals.

This commitment is further reflected through partnerships established with several universities, signifying collaboration with academics and researchers from local and international institutions. Some of the universities partnering with the Makassar City Government in support of the LCC program include Hasanuddin University (UNHAS), Bandung Institute of Technology (ITB), and Gadjah Mada University (UGM). Additionally, partnerships have been formed with foreign universities from countries such as China and the United States.

As stated by DW, the Head of the Subdivision of the Makassar City Environmental Agency:

“We are committed to supporting implementing the Low Carbon City program in Makassar. This year, we are collaborating with several NGOs and domestic universities such as Hasanuddin University, Bandung Institute of Technology, and Gadjah Mada University, as well as with some international institutions from China and the United States. In the coming days, they will visit several locations to monitor the installation of their solar panel equipment.” (Interview, October 7, 2024)

Beyond human resources, infrastructure and technology support the Low Carbon City program. One such resource includes eco-friendly transportation, a key effort toward developing sustainable public transport, such as electric buses and renewable energy-based mobility. This is in line with the statement made by YZ, a planning officer from the Makassar City Regional Development Planning Agency (*Bappeda*):

Since 2023, the Makassar City Government has provided three electric school vehicles, and in 2024, we are introducing the Commuter Metro Moda or 'Co'mo' as a tourist transportation service. Next year, we will expand our electric transport for students and introduce electric waste-collection motorcycles." (Interview, October 8, 2024)

Another essential resource supporting the LCC program in Makassar is the Green Open Space (RTH), which is distributed across several key locations in the city. These green areas, such as parks and urban forests, significantly reduce carbon emissions and improve air quality. Notable examples of RTH in Makassar include Karebosi Field, Taman Macan, Taman Pakui Sayang, City Hall Park (Taman Balai Kota), Maccini Sombala Park, and the Urban Forest at Hasanuddin University.

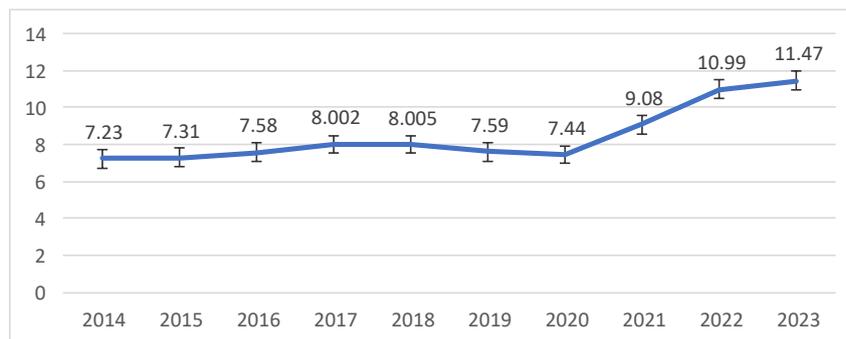


Figure 2. Green Open Space (GOS) Proportion in Makassar City (2014–2023)

Source: Long Term Development Plan City of Makassar 2025 – 2045 (data processed by author)

The graph above illustrates the development of Green Open Space (*Ruang Terbuka Hijau* or RTH) proportion relative to the total land area of Makassar City from 2014 to 2023. Based on the data presented, there were fluctuations in the proportion of green space throughout the period. In 2014, the proportion of RTH was recorded at 7.23%. Over the next three years, until 2017, the proportion gradually increased, reaching its peak at 8.002% in 2017. This suggests a consistent expansion of green space during that period.

However, in 2019 and 2020, the proportion of RTH experienced a slight decline, with figures of 7.59% and 7.44%, respectively. According to data from the Environmental Agency of Makassar City, this decline was primarily due to the reduction of green median areas along AP Pettarani Street due to the construction of a flyover.

The trend changed significantly in 2021, when the percentage of RTH rose sharply to 9.08%. This upward trajectory continued into 2022, reaching 10.99%, indicating a more substantial commitment from both the government and the community to expand green areas in Makassar City. Overall, the data shows that despite a slight decrease, efforts to increase green space in Makassar have been successfully revitalized since 2021, culminating in the highest proportion observed during the analyzed period in 2022.

Table 1. Green Open Space (RTH) Coverage in Makassar City (2023)

Sub-Districts	Availability of Green Open Space (Ha)							Green Open Space (Ha)	Sub-district Area (Ha)	Percentage of Green Open Space to City Area (%)
	Urban Forest	Green Path	Open Field	Park	Cemetery	Mangrove	Road border			
Biringkanaya	16.21	10.29	75.51	20.98	19.24	3.04	30.41	398.29	3,678.17	10.828
Bontoala		1.37		8.39	0.41			14.55	173.79	8.37
Makassar		1.72	0.67	2.98	2.02		0.07	21.23	265.36	8.00
Mamajang		2.47	0.74	2.66	4.46			16.94	250.87	6.07
Manggala	89.88	1.48	11.68	6.06	42.49	0.52	2.19	273.99	2,291.46	11.76
Mariso		2.92	1.89	8.30				55.38	286.70	19.32
Panakkukang	23.42	27.15	21.91	13.36	15.92	3.68	28.27	240.46	1,567.65	15.34
Rappocini	5.11	5.90	15.02	14.32	3.02			107.24	1,096.29	9.78
Tallo		20.85	2.68	5.93	8.00	14.10	17.06	117.50	966.76	12.15
Tamalarea	68.73	14.9	11.41	9.36	12.52	35.31	59.78	488.74	3,856.29	12.67
Tamalanrea	0.95	9.90	24.77	46.06	5.2	7.24	4.78	213.21	2,522.51	8.45
Ujung Pandang		8.54	3.58	13.92				44.71	289.38	15.45
Ujung Tanah		2.46	2.32	2.97	3.23			17.00	136.19	12.48
Wajo		2.63	0.49	2.29	0.03			7.80	204.27	3.82
Kepulauan Sangkarrang			1.81	0.34	2.02			11.37	94.96	11.97
Total	204.3	112.58	174.48	157.92	115.33	63.89	142.56	2,028.41	17,680.65	11.47

Source: Government Organizer Report (LPPD) City of Makassar 2023 (data processed by author)

Although there has been an increase, the existing condition of green open spaces (RTH) in Makassar City has yet to meet the target and regulatory requirement of 30%, which includes an allocation of 20% for public green open spaces and 10% for private green open spaces. According to the Head of Spatial Planning Division at the Makassar City Spatial Planning Office, AR, efforts continue to increase the availability of green open spaces in the city to support the optimal implementation of the Low Carbon City program.

“In the Indicative Programs of the Spatial Planning Plan, we have incorporated programs aligned with the Mayor's vision and mission, including efforts to enhance both the quantity and quality of green open spaces (RTH),” (Interview, 5 November 2024).

The Spatial Planning Office is also coordinating with the Environmental Agency concerning the agenda for green open spaces.

“We are currently drafting the RTH Master Plan based on the directives of the Regulation of the Minister of Agrarian Affairs and Spatial Planning/National Land Agency (Permen ATR/BPN) concerning the provision and utilization of green open spaces. This will later serve as a guideline for the Environmental Agency, community stakeholders, and other related municipal agencies to ensure the provision and utilization of green open spaces following legal mandates, to achieve 30% RTH in each regency” (Interview, 5 November 2024).

Regarding financial resources, the Makassar City Government utilizes funding from the State Budget (APBN), Regional Budget (APBD), and financial

assistance from foreign countries. For instance, in developing environmentally friendly transportation such as electric buses, the Makassar government engages in international cooperation with several foreign-based Non-Governmental Organizations (NGOs), which have contributed funding and equipment, such as solar panels, to support the Low Carbon City initiative.

Meanwhile, regarding waste management, the Makassar City Government has signed a cooperation agreement with Shanghai SUS Environment Co., Ltd, a waste management company from China. This cooperation covers the development of a Waste-to-Energy (WTE) project, which is scheduled to begin implementation in 2027.

“The WTE project is currently in the permitting and construction planning phase, and is expected to commence in 2027,” said the Head of the Waste and Hazardous Toxic Materials Division at the Makassar City Environmental Agency (DLHD), BA (Interview, 21 October 2024).

Inter-Agency Communication in Program Implementation

Effective communication among implementing agencies ensures program implementation proceeds as intended. Kotter (1995) emphasizes that governments utilizing comprehensive communication instruments are more likely to achieve successful policy transformations.

Therefore, clear communication enables implementers to understand and execute directives and objectives rapidly. The bureaucratic structure of Makassar City in implementing the Low Carbon City (LCC) program can be evaluated through several aspects, particularly in terms of coordination, policy integration, and cross-sectoral collaboration.

“BAPPEDA is not a municipal agency (SKPD). Thus, BAPPEDA coordinates the various programs implemented by SKPDs across Makassar City. Additionally, as the leading sector of this program, we frequently facilitate meetings among s in Makassar, both internally and with NGOs,” stated YZ, a Functional Planner at the Regional Development Planning Agency (BAPPEDA) of Makassar City (Interview, 7 October 2024).

In addition to the Regional Development Planning Agency (BAPPEDA), the Environmental Affairs Agency (DLH) also plays a key role in environmental management, including greenhouse gas emission reductions and the utilization of renewable energy. The Makassar City Environmental Agency maintains intensive communication with several municipal agencies, especially sub-district (kecamatan) and urban village (kelurahan) governments, as these policies essentially take place at those administrative levels. This communication includes regular meetings, project coordination, and joint evaluations.

“We consistently coordinate through internal meetings among SKPDs [municipal agencies] to ensure synergy, particularly with sub-districts and urban villages, because all government programs, including waste management, are executed at those levels,” stated DW, Head of Subdivision (KASUBAG) at the Makassar City Environmental Agency (Interview, 7 October 2024).

Characteristics of Implementing Agencies

In the implementation of the Low Carbon City (LCC) program in Makassar City, the roles of several government agencies – such as the Regional Development Planning Agency (BAPPEDA), the Environmental Agency (DLH), the Transportation Affairs Agency (DISHUB), and the Public Works Agency (PU) – are crucial. Each of these agencies possesses distinct characteristics and responsibilities in supporting the realization of a Low Carbon City.

BAPPEDA (Regional Development Planning Agency)

BAPPEDA is central to strategic planning and cross-sectoral policy coordination in Makassar City. As the planning institution and leading sector, BAPPEDA is the central coordinator, ensuring that the Low Carbon City program is integrated into the city's short-term and long-term development plans. This positions BAPPEDA to align the low-carbon development vision with other local policy agendas.

“All planning is under the authority of BAPPEDA, as they are the leading sector of this program,” stated FHP, Regional Secretary of Makassar City (Interview, 7 October 2024).

As an institution engaged in planning, BAPPEDA is required to coordinate effectively with other agencies such as DLH, DISHUB, and PU to ensure that the Low Carbon City program is harmonized with infrastructure, transportation, and environmental development plans. BAPPEDA also plays a significant role in formulating the necessary budget allocations to support the program, ensuring that funding for low-carbon initiatives is properly designated.

Environmental Agency (DLH)

The Environmental Agency (DLH) plays a central role in implementing the Low Carbon City program in Makassar City. DLH is tasked with ensuring the execution of emission reduction policies, environmental management, and the application of low-carbon technologies in sectors related to the environment, such as waste management and energy conservation.

DLH is responsible for emission reductions, air and water quality, and waste management. These responsibilities are broadly outlined in Makassar Mayor Regulation No. 93 of 2016.

According to the Makassar City Long-Term Development Plan (RPJPD) 2025–2045, emission reduction is a key target. As of 2023, Makassar City recorded a cumulative potential carbon emission reduction of 74,751.31 tons of CO₂ equivalent, contributing 2.5% to South Sulawesi Province's overall emission reduction achievement.

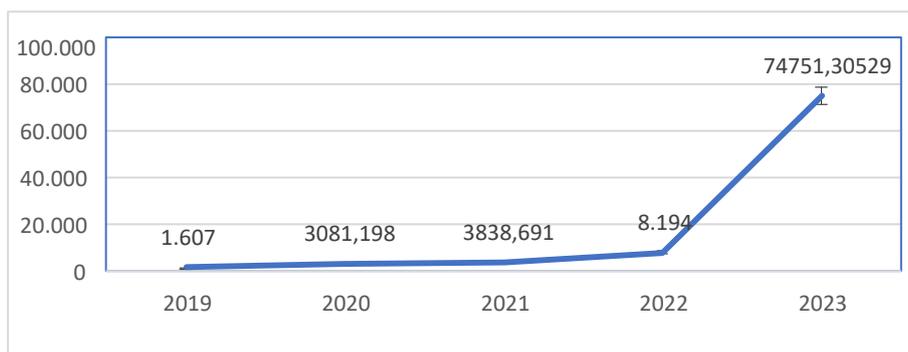


Figure 3. Emission Reduction Achievement (Ton CO₂eq) of Makassar City in (2019 –2023)

Source: RPJPD Kota Makassar 2025 – 2045 (data processed by author)

The figure indicates a significant increase in the potential for emission reduction in Makassar City from 2019 to 2023. In 2019, the figure stood at 1,607.463 tons of CO₂ equivalent and steadily increased over the years, reaching 74,751.30529 tons in 2023 – the highest recorded value within the observed period.

Meanwhile, regarding air and water quality management and waste management, the Environmental Agency continues to play a vital role in ensuring that these sectors align with the city’s broader low-carbon development goals.

Table 2. Performance Indicator Realization of the Waste Management Program of Makassar City in 2023

Performance Indicator	2022 Target	2022 Realization	% 2022	2023 Target	2023 Realization	% 2023
Percentage of Waste Management Implementation in Makassar City	99	75.17	75.93	99	87.44	88.32
Percentage of Waste Reduced Through 3R (Reduce, Reuse, Recycle) Strategy	26	6.11	23.5	27	3.89	14.41

Source: Laporan Penyelenggara Pemerintahan (LPPD) Kota Makassar 2023 (data processed by author)

The data in this table presents two key indicators within the waste management program in Makassar City during 2022 and 2023. These indicators include: the percentage of waste management implementation across the city, and the percentage of waste reduction achieved through the 3R approach (Reduce, Reuse, Recycle).

Department of Transportation (DISHUB)

The Makassar City Department of Transportation (DISHUB) also plays a vital role in supporting the Low Carbon City program through the transportation sector,

particularly by reducing emissions from motorized vehicles and promoting environmentally friendly public transportation systems.

DISHUB is actively involved in the development of sustainable public transportation systems. This was highlighted by the Head of the Department of Transportation during the 2024 Strategic Coordination Meeting (*Rakorsus*), where plans were presented for the procurement of electric buses such as *Co'Mo*.

Department of Public Works (PU)

The Department of Public Works (PU) plays a critical role in infrastructure development and supports the implementation of the Low Carbon City initiative. PU is responsible for constructing roads, drainage systems, water networks, and other public infrastructure, all of which must align with sustainability principles.

By ensuring that physical infrastructure is developed following low-carbon and environmentally friendly standards, the PU reduces emissions and enhances climate resilience within urban development processes.

Table 3. Drainage System Management and Development Program

Performance Indicator	2022 Target	2022 Realization	2022 Achievement (%)	2023 Target	2023 Realization	2023 Achievement (%)
Percentage of Drainage in Good Condition	87,05%	75,30%	86,50%	89,45%	125,76%	140,60%
Percentage of Flood Points Reduced	78,82%	22,52%	28,57%	84,12%	46,66%	55,47%

Source: Laporan Penyelenggara Pemerintahan (LPPD) Kota Makassar 2023 (data processed by author)

The data reflects an increase in performance achievements for both indicators between 2022 and 2023. Efforts to improve drainage conditions saw a significant rise in 2023, with achievements surpassing the set target. Meanwhile, reducing flood-prone areas also showed progress, although it has not yet met the predetermined target.

The Department of Public Works (PU) is vital in integrating green technology into infrastructure development. This includes using environmentally friendly construction materials and efforts to minimize the environmental impact of urban development projects.

“The Department of Public Works remains committed to supporting and implementing the Mayor of Makassar’s program to transform Makassar into a world-class city with Net Zero Carbon. This effort aligns with our vision to create sustainable and environmentally friendly infrastructure,” stated ZZ (Interview, 11 June 2024).

The Public Works Department (PU) must collaborate with the Environmental Agency (DLH) to ensure that infrastructure development aligns with emission reduction goals. Additionally, coordination with the Department of Transportation (DISHUB) is necessary to ensure that urban transportation infrastructure supports the Low Carbon City concept.

The four central agencies must work synergistically for the Low Carbon City program in Makassar to be successfully implemented. The technical execution from DLH, DISHUB, and PU must support planning conducted by BAPPEDA. Meanwhile, DISHUB and PU must ensure that urban infrastructure and transportation systems contribute to the established emission reduction targets.

Socioeconomic and Political Conditions in the Context of Implementing the Low-Carbon City Program in Makassar

Socioeconomic and political conditions play a significant role in implementing public policy programs at the local level. These conditions are closely linked to how society interacts with the program, particularly the extent to which the public is willing and able to adapt to the Low Carbon City policy.

Several fundamental aspects of socioeconomic conditions – such as public awareness, education levels, and environmental consciousness – directly influence community participation in the Low Carbon City program. According to available data, the level of education among Makassar’s residents is as follows:

Table 4. School Participation Rates by Level of Education in Makassar City (2023)

Level of Education	Male	Female
University	80.380	69.632
Diploma	4.996	10.335
Vocational High School	46.711	20
Senior High School	126.866	57.660
Junior High School	52.421	23.228
Didn't go to school / didn't finish school	58.43	31.883

Source: Makassar in Figure 2024 (BPS Kota Makassar, 2024)

Based on this data, the government is better positioned to understand how education can enhance public awareness, capability, and participation in carbon emission reduction efforts. Environmental education programs tailored to the population’s educational background can significantly improve the effectiveness of the Low Carbon City policy implementation in Makassar and encourage citizens to adopt more environmentally friendly lifestyles.

According to a survey conducted by Polinet among residents of Makassar, 78.4% of respondents had a Bachelor's degree (S1), 11.8% had completed Senior High School (SMA), and 9.8% held a Postgraduate degree (S2).

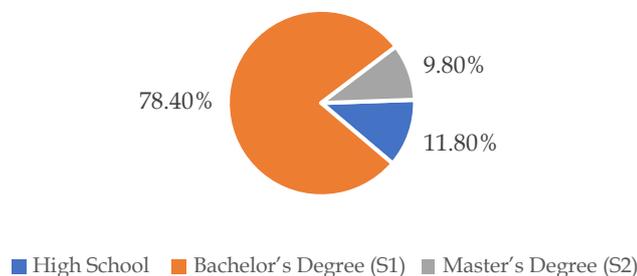


Figure 4. Respondents' Educational Background Based on Questionnaire Results

Source: Public Policy Network Survey 2024 (data processed by author)

Regarding access to information about the program, 56.9% of respondents stated that the government has not yet provided reliable information regarding the Low Carbon City initiative. Despite this limitation, 82.4% of the community supported the program and have already engaged in daily practices aligned with its goals, such as reducing plastic use, conserving electricity, and utilizing public transportation.

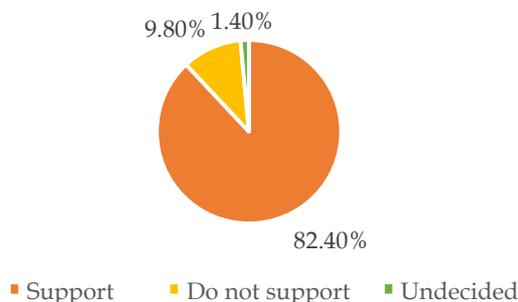


Figure 5. Support The Low-Carbon City Program

Source: Public Policy Network Survey 2024 (data processed by author)

In areas with better socioeconomic conditions, communities tend to be more aware of sustainability issues, resulting in greater support for programs such as the Low Carbon City initiative. The political context also plays a critical role in implementing such programs, as political interests, dynamics, and stability within the region often shape policy directions.

Several political conditions may influence policy outcomes, including stakeholder engagement, which involves collaboration between local and central governments, the private sector, and civil society. Emmerson et al. (2012) describe collaboration as a process and structure of policy decision-making involving

multiple actors, ranging from government and community groups to private entities and the general public.

This program has received significant support from the central government and the Provincial Government of South Sulawesi regarding stakeholder involvement. The Acting Governor of South Sulawesi, Bahtiar Baharuddin, has emphasized the importance of such collaboration, aligning it with the regional government's vision of building a sustainable blue economy ecosystem.

"When the City of Makassar puts forward a major vision to promote low-carbon initiatives and a greener environment, it aligns with South Sulawesi's long-term 20-year development strategy. We are heading toward a blue economy, and Makassar can serve as a model for other cities across Indonesia, including other regencies and cities within South Sulawesi," stated the Acting Governor of South Sulawesi, BB, during his remarks at the 2024 Strategic Coordination Meeting of the Makassar City Government.

In addition, this approach also emphasizes public participation and collaboration with the private sector, particularly in financing and deploying green technologies, such as installing solar panels in residential areas and constructing offshore solar power plants (PLTS).

The central government has also shown its support for this initiative, as evidenced by the signing of a Memorandum of Understanding (MoU) between the Makassar City Government, represented by the Mayor, and the Chief Technology Officer (CTO) of SUS Shanghai, alongside the CEO of PT. Sarana Utama Synergy. The signing was witnessed directly by the Assistant Deputy for Energy of the Coordinating Ministry for Maritime Affairs and Investment.

Looking ahead, program implementers must consider several considerations, as Makassar is set to hold a regional head election in 2025. Nevertheless, BAPPEDA and the Acting Regional Secretary remain confident that the program will continue, as it has been integrated into the Regional Medium-Term Development Plan (RPJMD).

In conclusion, although challenges remain, implementing the Low Carbon City initiative in Makassar can significantly enhance the quality of life for its citizens while simultaneously reducing the negative environmental impacts of carbon emissions, ultimately fostering a more sustainable urban future.

Conclusion

The effort to reduce carbon emissions in pursuit of a clean and sustainable environment has become a priority for the City of Makassar through the implementation of the Low Carbon City (LCC) program. The city government has thoroughly prepared this initiative, and as of 2024, it has entered a preliminary implementation phase. Full-scale implementation is expected to begin in 2027. Several strategic measures have been introduced, including expanding green open

spaces, developing environmentally friendly transportation, improving waste management efficiency, and saving energy through solar panels.

However, the journey toward becoming a low-carbon city is not without challenges. One of the most notable is the unrealized goal of achieving 30% green open space (GOS), partially hindered by ongoing infrastructure developments in various locations.

Using the theoretical framework developed by Van Meter and Van Horn (1975), this study evaluates the program's implementation and offers recommendations to improve its effectiveness. The Low Carbon City program in Makassar has clear objectives: to support carbon emission reduction efforts and foster a healthy, low-emission urban environment. In terms of resources, the city government has demonstrated preparedness by providing human resources, facilities and infrastructure, and financial support. Partnerships with several international NGOs have also contributed funding for the procurement of low-carbon technologies.

From an inter-agency communication perspective, there is strong collaboration among the key municipal agencies (SKPD), coordinated by the Regional Development Planning Agency (Bappeda). Nevertheless, public communication remains a significant challenge. Survey data indicate that many of the population is still unaware of the program's existence. Despite this, most respondents support the initiative, recognizing its potential for long-term environmental and societal benefits.

Socioeconomic conditions also play a critical role in determining the success of this program. Optimal implementation requires sufficient economic capacity among residents to adopt low-carbon lifestyles and inclusive government strategies to address social challenges. Politically, the approaching election year presents a potential risk to the continuity of the program. However, integrating this policy into the Regional Medium-Term Development Plan (RPJMD) and regional regulations is expected to ensure its prioritization under future leadership.

While offering valuable insights, this study has certain limitations. First, data on public outreach efforts remain incomplete, providing a limited understanding of the underlying causes behind weak public communication. Second, the analysis focuses solely on Makassar without a comparative assessment of other cities that have successfully implemented similar programs.

Several strategic actions are recommended to enhance the Low Carbon City program's success. Comparative studies with other successful cities may offer valuable lessons and best practices. Furthermore, a more effective public outreach strategy is required to raise awareness, including educational campaigns involving local communities.

In conclusion, the Makassar Low Carbon City program exemplifies the unique trajectories and contextual circumstances of policy execution in a non-Western administrative system. In contrast to traditional Western models that typically assume institutional stability, elevated public awareness, and robust civic

infrastructure, Makassar's experience underscores the significance of adaptive governance in the context of swift urban development, constrained public participation, and shifting political environments. The observed partial progress indicates a hybrid governance paradigm in which state actors, international partners, and growing local networks collaborate to advance policy despite structural and socioeconomic limitations. This study utilizes Van Meter and Van Horn's (1975) paradigm to elucidate the procedural strengths and shortcomings of the LCC program, while also enhancing the broader discourse on policy implementation in dynamic, non-Western urban contexts. Future policy refinement must incorporate culturally relevant communication tactics, enhance society engagement, and guarantee institutional resilience, especially as Makassar moves from pilot phases to comprehensive implementation. Consequently, the results presented provide a pragmatic framework for Makassar and a theoretical enhancement to global public administration discourse, drawing insights from the Global South.

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