Cycling Cities as a Government Effort to Realize Sustainable Cities in Yogyakarta in 2023-2024

Kota Bersepeda sebagai Upaya Pemerintah dalam Mewujudkan Kota Berkelanjutan di Yogyakarta Tahun 2023-2024

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ABSTRACT
The growth in the number of vehicles in Yogyakarta has contributed to increased air pollution, despite a significant decline during the COVID-19 pandemic. To mitigate these environmental impacts, the government is promoting a bicycle-friendly city program, but its effectiveness still requires support in the form of adequate facilities, strong regulations, and public awareness of cycling. This study was conducted using a qualitative descriptive method that combined literature review, interviews, and field observations as triangulation techniques. This approach aimed to obtain an in-depth picture of the implementation of bicycle-friendly city policies in Yogyakarta and the obstacles that arose in their implementation. The results show that the development of bicycle lanes not only supports environmentally friendly mobility but also encourages local economic growth. From an economic perspective, the existence of bicycle lanes not only facilitates environmentally friendly mobility but also encourages local economic growth through bicycle-based tourism, sporting events, and the empowerment of MSMEs. From an environmental perspective, the construction of bicycle lanes is in line with air pollution control, noise reduction, and the development of green open spaces that continue to pay attention to ecosystem sustainability and support climate change mitigation. Meanwhile, from a social perspective, the government has implemented various educational programs and cycling campaigns from an early age to the public, which are reinforced by the development of supporting infrastructure such as special lanes, traffic signs, and bicycle parking. Overall, community involvement is an important factor in supporting this policy because its success depends not only on regulations but also on the collective awareness of citizens. This policy demonstrates the integrated efforts of the Yogyakarta City government in creating a sustainable, inclusive Cycling City that supports the welfare of the community.

Kata Kunci
Cycling Cities;
Kota Berkelanjutan;
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ABSTRAK
Pertumbuhan jumlah kendaraan di Yogyakarta berkontribusi pada meningkatnya polusi udara, meskipun sempat menurun signifikan saat pandemi COVID-19. Untuk menanggulangi dampak lingkungan tersebut, pemerintah mendorong program kota ramah pesepeda, namun efektivitasnya masih membutuhkan dukungan berupa fasilitas memadai, regulasi yang kuat, serta kesadaran masyarakat dalam bersepeda. Penelitian ini dilakukan dengan metode deskriptif kualitatif yang menggabungkan studi pustaka, wawancara, dan observasi lapangan sebagai teknik triangulasi. Pendekatan ini bertujuan untuk memperoleh gambaran mendalam mengenai implementasi kebijakan kota ramah pesepeda di Yogyakarta serta hambatan yang muncul dalam pelaksanaannya. Hasil

penelitian menunjukkan bahwa pengembangan jalur sepeda tidak hanya mendukung mobilitas ramah lingkungan, tetapi juga mendorong pertumbuhan ekonomi lokal. Dari segi ekonomi, keberadaan jalur sepeda tidak hanya memfasilitasi mobilitas ramah lingkungan, tetapi juga mendorong pertumbuhan ekonomi lokal melalui wisata berbasis sepeda, event olahraga, dan pemberdayaan UMKM. Dari aspek lingkungan, pembangunan jalur sepeda selaras dengan pengendalian polusi udara, pengurangan kebisingan, serta pengembangan ruang terbuka hijau yang tetap memperhatikan kelestarian ekosistem dan mendukung mitigasi perubahan iklim. Sementara itu, dari aspek sosial, pemerintah melaksanakan berbagai program edukasi dan kampanye bersepeda sejak usia dini hingga masyarakat umum, yang diperkuat dengan pembangunan infrastruktur penunjang seperti jalur khusus, rambu lalu lintas, dan parkir sepeda. Secara keseluruhan, Keterlibatan masyarakat menjadi faktor penting dalam mendukung kebijakan ini karena keberhasilan tidak hanya bergantung pada regulasi, tetapi juga pada kesadaran kolektif warga. Kebijakan ini memperlihatkan upaya integratif pemerintah Kota Yogyakarta dalam menciptakan Cycling City yang berkelanjutan, inklusif, dan mendukung kesejahteraan masyarakat.

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Introduction

Presidential Regulation No. 59 of 2017 concerning the implementation of sustainable development goals (SDGs) affirms the national commitment to creating inclusive, safe, disaster-resilient, and sustainable cities and settlements, in accordance with the objectives set out in SDG 11 (Maulidya, 2025). In line with this, SDG 13 emphasizes efforts to address climate change through emission reduction, including from the transportation sector, which is in line with sustainable city development such as cycling cities to support carbon neutrality and better quality of life (Ariyanto, 2025). Along with increasing urbanization and demands for urban space development, the existence of public spaces such as parks, urban forests, and pedestrian areas is very important to maintain social and ecological balance, support the quality of life of the community, and realize the objectives of SDG 11 on inclusive, safe, resilient, and sustainable cities and settlements (Trifita & Amaliyah, 2020). In this context, one concrete implementation that supports the achievement of SDG 11 is prioritizing sustainable modes of transportation such as bicycles to reduce greenhouse gas emissions and improve mobility, which also contributes to SDG 13 (Rasli, Juhari, & Halim, 2024).

Transportation is a means of supporting mobility for most people. Indonesia itself has many modes of transportation that people can choose from, such as cars, motorcycles, airplanes, and trains. The existence of this transportation supports the economy (Sugiyanto, Arnaya, Ryanto, & Surya, 2021). Sustainable public transportation includes cycling as a widely recognized mode of transportation that has great potential to increase energy efficiency, reduce traffic congestion and air pollution, and support public health in urban areas (Wibowo & Herwangi, 2022). Based on data from jurnal.poltradabali.ac.id, there are survey results regarding the use of private and public transportation. In this survey, there were 80 respondents, recorded based on data showing that the most dominant mode of transportation used was private vehicles at 56.3%. Meanwhile, online transportation was in second place at 31.3%, and public transportation was in last place at 12.5% (Sugianto & Muhammad Arief Kurniawan, 2020). The number of vehicles in Indonesia has been increasing significantly every year, with a growth rate of around 15% for cars and 30% for motorcycles annually (PRAMESTI et al., 2024). This has led to increased air pollution, as the substances emitted from private and public transportation are very harmful to public health.

Unlike Yogyakarta, in recent years this city has experienced significant changes in terms of the number of vehicles entering Yogyakarta (Dishub DIY, 2025). These fluctuations are due to several factors, such as government policy, public awareness, economic conditions, and several other factors affecting transportation modes in Yogyakarta. Can be seen from table 1 below explains in more detail how these changes have occurred in the city of Yogyakarta from 2019 to 2023.

Table 1. Number of Registered Vehicles in Yogyakarta City

Vehicle Name	Year				
	2019	2020	2021	2022	2023
Passenger Car	168.114	171.824	68.511	70.039	72.712
Bus	5.041	4.754	2.544	2.533	2.378
Load Car	47.372	46.817	14.096	14.240	14 .352
Motorcycle	1.354.547	1.352.758	476.212	489.043	503.969
Amount (Unit)	1.575.074	1.576.153	561.363	575.855	593.411

Source: (yogyakarta.bps.go.id, 2024)

Based on the table above, the number of registered vehicles in the city of Yogyakarta from 2019 to 2023 has decreased. From 2020 to 2021, there was a significant decline due to the impact of the COVID-19 pandemic on technology and transportation (Edward & Najid, 2023). In 2019 and 2020, the number of vehicles remained relatively stable at a total of more than 1.5 million units and Motorcycles are the most dominant mode of transportation used by the community. This mode experienced a drastic decline of more than 1.3 million units in 2019-2020 and became 476,212 units in 2021. This decline helps us prevent increased air pollution. Particles from air pollution can interfere with human health (Maharani & Aryanta, 2023). In the results of the 2022 IQ AIR study, Indonesia was included in the list of countries with the highest concentrations of air pollution in the world (Anugerah Munggaran et al., 2024). With an average PM2.5 concentration of 30 µg/m3, Indonesia ranks 26th in terms of air pollution and has the highest concentration in Southeast Asia in 2022 (Alwi & Mustafa lutfi, 2024). Pollution generated from transportation is air pollution and greenhouse gas emissions, which have a serious impact on human health and even on the environment (Lambonan, Lambonan, & Tawas, 2024). We need to care about our health and the environment, therefore, to prevent an increase in air pollution and emissions, we need alternatives to support our daily mobility.With various challenges in implementing bicycle-friendly city policies in Yogyakarta, this research is important because the increase in the number of motor vehicles has an impact on air quality, public health, and the sustainability of urban mobility. The city of Yogyakarta has implemented the concept of a bicycle-friendly city as a solution, as seen in the policies, programs, and facilities provided for bicycle users. The provision of infrastructure such as protected bike lanes is considered a sustainable transportation alternative for short-distance travel and is a priority in the city of Surabaya (Pinalam, Soesiantoro, & Hariyoko, 2024). Although cycling in Yogyakarta has not yet fully become a daily mode of transportation, the increase in the number of cyclists provides an opportunity for the government to encourage the integration of bicycles with public transportation to support sustainable mobility (Wismadi, et al., 2022).

The Yogyakarta city government launched the Gerakan Sego Segawe (bicycles for school and work) program with the aim of encouraging the people of Yogyakarta to cycle for their daily mobility (Pradana, 2025). The Sego Segawe program did not last long because the Yogyakarta city government has not yet fully provided a sense of security for bicycle users, so that many cyclists still experience incidents such as accidents caused by motorcyclists, as well as children who have accidents on their way to school or tutoring (Kurniasih, 2023). This is a small example of how the Yogyakarta city government has neglected bicycle users. The potential for bicycles to become a more integral part of the sustainable public transportation system in Yogyakarta is significant, but this requires adequate infrastructure support, such as the development of bicycle lanes, parking areas, and pit stop facilities, which still need improvement to enhance the comfort and safety of cyclists (Amijaya & Dimu, 2022). The Yogyakarta city government must improve facilities for bicycle users. With good infrastructure support and enabling policies, bicycles can be a sustainable and environmentally friendly solution to urban mobility challenges (Nurfadlilah, Malika, Naufal, & Wikansar, 2024). The provision of bicycle-friendly infrastructure by the government, as exemplified by the policy of building bicycle lanes, is a fundamental step in promoting an environmentally friendly lifestyle and daily mobility (Wahyuni, Nashrullah, & Ardiana, 2021). In addition to improving facilities, there needs to be an improvement in policies and regulations regarding bicycle safety, such as education on the benefits of cycling is also needed for people who are reluctant to cycle for their daily activities with the sole purpose of preventing an increase in air pollution and increasing the percentage of bicycle-friendly cities in order to create a healthy environment.

Method

The above issues make this research interesting to explore further regarding government policies in realizing a Cycling City in Yogyakarta. This research consists of observational data using a qualitative descriptive approach that combines descriptive and qualitative methods. The data sources for this research are based on literature studies, interviews, and field observations. In this method, the researcher serves as the main instrument, with data collection carried out through triangulation (combination) techniques, which include literature studies, interviews, and observations. Interviews were conducted with several parties, including the Head of the Environmental Agency, the Head of the Transportation Agency, the Planning Division of the Yogyakarta City Regional Development Planning Agency (BAPPEDA), and several community members who use bicycle facilities in Yogyakarta City. Data collection with various stakeholders was intended

to validate the data used by the researchers. In addition, the researchers will add secondary data from various government performance reports. Data analysis is carried out inductively with the aim of describing field conditions without any manipulated variables (Hanyfah et al., 2022).

This study describes the implementation of bicycle-friendly city policies and examines the challenges faced. The research technique involves several steps so that the study can be conducted in a more focused and systematic manner. The research technique in this paper consists of three steps. First, a literature review was conducted by analyzing articles and references related to disability-friendly inclusive tourism. Second, interviews were conducted to obtain accurate data. After the interviews were conducted, the results were transcribed to facilitate the data processing. Third, observations were made through direct observation in the field to collect data and document matters related to the research.

Result and Discussion

Based on the Yogyakarta City Government News Portal, Yogyakarta Deputy Mayor Heroe Poerwadi said that the Yogyakarta City Government is committed to continuously improving the quality of life of the community, with a community-based approach to five vulnerable groups, namely women, children, the elderly, the poor, and people with disabilities. To support an inclusive city, Yogyakarta must do several things, such as developing cycling facilities by preparing bicycle lanes. The Yogyakarta City Government, together with the tourism office, is preparing five tourist routes with thematic bicycle routes (Amijaya, Oentoro, & Wiyatiningsih, 2023). In this regard, the city of Yogyakarta has made several advances, such as holding events related to cycling. One example is the Yogyakarta City Government (Pemkot) organizing the Gowes Van Jogja event in 2021 with the aim of revitalizing tourism in tourist villages (Oentoro & Wiyatiningsih, 2021).

In 2008, the Yogyakarta city government started this cycling activity by organizing the Sego Segawe (Sepeda Kanggo Sekolah Lan Nyambut Gawe) movement. The community and the Yogyakarta city government agreed to build enthusiasm for cycling in the city of Yogyakarta to restore the image of Yogyakarta as a bicycle city (Oentoro & Wiyatiningsih, 2021). Over time, it has become apparent that several business figures, government officials, and community organizations have contributed to cycling tourism, making Yogyakarta a sustainable tourism city (Wachidah & Prasodjo, 2024). The contributions of these various figures will enhance Yogyakarta's progress as an inclusive, bicycle-friendly city.

Economic Aspects

As a tourist city, Yogyakarta has experienced growth in line with the development of its tourism sector. The existence of various tourist attractions provides great opportunities for economic improvement, especially in the field of tourism (Rahayu et al., 2022). One of these opportunities is the impact of bicycle use on the economy in Yogyakarta. The Yogyakarta city government has developed strategies to boost the community's economy, such as providing booths or stands for businesses at several events where cyclists contribute, thereby providing benefits for business actors (Laksmana, Rachmat, & Tahir, 2020).

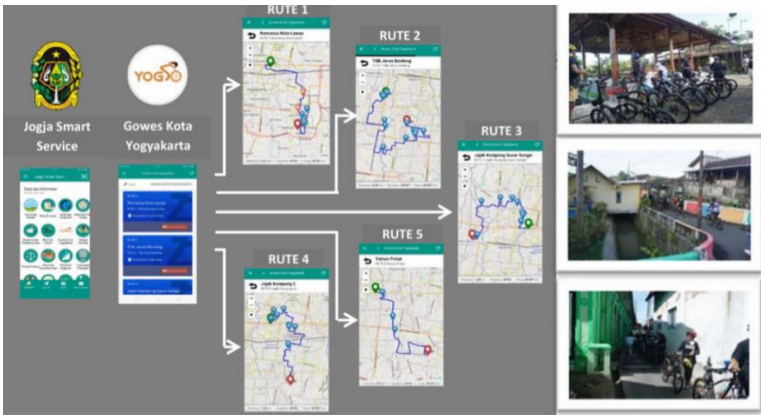
The strategies developed by the government not only open opportunities for business actors but also open up opportunities to boost the tourism economy in Yogyakarta by developing bicycle tourism. The Yogyakarta City Government created a bike-sharing program using an application that was launched in October 2018 and is available at several points in the city of Yogyakarta (Amri, Adni, & Yudilla, 2021). In this program, the Yogyakarta city government provides support in the form of bicycle lanes, stopping points, and others (Wiyoso & Pramitasari, 2021).

In 2016, the Financial Services Authority stated that Micro, Small and Medium Enterprises (MSMEs) in Indonesia were among the largest compared to other countries (Rahayu & Musdholifah, 2017). One cyclist who often cycles in the Yogyakarta area said that cycling tourism can boost the local economy, especially for MSMEs in the culinary sector in the Yogyakarta area. This statement is in line with the news from tribatanews.go.id regarding the “Tour of Kemala 2025” event held in Yogyakarta by the Kemala Bhayangkari Foundation. This activity combines elements of sports, tourism, and MSME empowerment in one series of events. As part of the annual cycling race agenda, the event also features around 100 SME booths, most of which are from the Yogyakarta and Central Java regions, as a tangible form of support for local economic growth.

To realize a ‘cycling city’ as a sustainable city, the development of effective transportation infrastructure must be oriented towards human interests and be environmentally friendly, prioritizing facilities for active mobility and non-motorized transportation that improve accessibility and interconnectivity between land uses, as the main pillars of the humanistic city concept (Putri & Tama, 2018). The development of bicycle lanes in the city of Yogyakarta not only aims to support environmentally friendly transportation but also has great potential in promoting local economic growth. Through synergy with the Tourism Office, bicycle tourism is promoted as part of sport tourism innovation that can attract tourists to explore various tourist villages in Yogyakarta. This

program is part of a creative economy strategy through the “Monalisa” or Menikmati Harmonisasi Jogja (Enjoying the Harmony of Yogyakarta) branding, which involves five main bicycle tourism routes.

The presence of bicycle tourists also drives the local economy, particularly for local SMEs such as food vendors, artisans, and homestay owners located near the tourist routes. As the number of visitors using the bicycle routes increases, residents' economic activities are also boosted, creating new business opportunities and strengthening community-based economic resilience.



Gambar 1. Bicycle Tour Routes on the Gowes Kota Yogyakarta App
Source: Compiled by researchers from the final report of the Bicycle Route Planning Study taken from Jogja Smart Service & Research Team Documentation, 2021.

The development of bicycle lanes has been strategically integrated with important economic areas, such as shopping centers, educational areas, and tourist areas. Through the “Monalisa” program, or Enjoying the Harmony of Yogya City, which can be accessed through the Jogja Smart Service (JSS) application, these lanes are designed to connect strategic points with high economic potential, and this integration aims to facilitate access for tourists and local communities to areas that are centers of economic activity. With this increased accessibility, the movement of residents and tourists using bicycles has also encouraged more visits to shopping centers, cafes, souvenir shops, and other creative economic centers. This has directly impacted on the increased income of local businesses and strengthened the economic cycle in areas connected by these bicycle lanes.

The development of bicycle route infrastructure continues to be improved, with the Yogyakarta City government focusing on advancing it every year, as shown in the table below. From 2019 to 2024, the government and the transportation department updated road

data with the bicycle infrastructure that had been developed. However, in 2020, the COVID-19 pandemic occurred, making observations impossible.

Table 2. Cycling Routes in Yogyakarta City

2024	2023	2022	2021	2019
Wahidin Sudiro Husodo Road	Imogiri Timur Road	Menteri Supeno Road	Kapas Road	Brigjend Katamso Road
Ahmad Dahlan Road	Sisingamangaraja Road	Lowanu Road	Sukonandi Road	Gambiran Road
Panembahan Senopati Road	Tentara Rakyat Mataram Road	Glagahsari Road	Djamiat Dalhar Road	Ki Penjawi Road
Kebun Raya Road	AM Sangaji Road	Pandeyan Road	Kusbini Road	Menukan Road
Gajah Mada Road	Ci Di Tiro Road	Gajahmada Road	Langensari Road	HOS Cokroaminoto Road
	Jendral Sudirman Road	DI Panjaitan Road	Ki Penjawi Road	Tegal Gendu Road
	Pangurakan Road	Imogiri Timur Road	Rejowinangun Road	
		Tentara Rakyat Mataram Road	Kebun Raya Road	
			Imogiri Road	

Source: Yogyakarta City Transportation Agency, 2019–2020.

Collaboration with the tourism department revived the promotion of bicycle tourism as an attraction for the community. To strengthen synergy among stakeholders and enhance branding efforts for bicycle programs, five bicycle tourism routes were established. The Yogyakarta government has responded to the changing times by creating five very attractive bicycle tourism routes that reflect the characteristics of Yogyakarta City. The government has created five bicycle tourism routes with unique names, namely Romansa Kota Lawas (Romance of the Old City), Titik Jeron Benteng (Fortress Point), Jajah Kampung Susur Sungai (Exploring the River Village), Jelajah Harmoni Pesona Kampung (Exploring the Charm of the Village), and Taman Pintar Taman Budaya (Smart Park Cultural Park).

The Yogyakarta City Environment Agency (DLH) has shown that one concrete form of bicycle infrastructure development and tourism enhancement is the “Coaching Cling” program, which is related to strengthening the attractiveness of the area as a tourist destination. In this development, the DLH, together with the Tourism Agency, Trade Agency, Spatial Planning Agency, and Licensing Agency, has identified and designed strategic points that will serve as hubs for bicycle tourism routes, with Kota Gede as a pilot project. This area was chosen because it already has strong economic potential, such as the presence of silver craftsmen, various homestays, tourist icons such as the Bridge of Love and the Pier of Love in Demangan, and by making the Krenggan Green Open Space (RTHP)

the starting point or “terrace” of the bicycle route, cyclists are directed to follow the river and enjoy various leading tourist spots in Kota Gede. The presence of this integrated cycling infrastructure is expected to increase tourist visits while boosting the local economy through trade, lodging, and the creative industries of the local community.

The city of Yogyakarta is one of the cities that focuses on developing bicycle and pedestrian infrastructure, and there are certain hours for restricting wheeled vehicles at several points in the city center (Rahmawati & Pratama, 2023). The Yogyakarta city government and the private sector collaborate through CSR (Corporate Social Responsibility). According to Wicaksono in 2020 in (Wiyatiningsih, Amijaya, Kristiyadi, Oentoro, & Respati, 2021), the jogjbike program is a form of collaboration between the government and the private sector for tourist bicycle rentals. The Yogyakarta City Development Planning Agency (Bappeda) stated that the private sector is investing in the development of a bicycle-friendly city through CSR by building Pits Stops as part of the private sector's responsibility to the community.

Environmental Aspects

The Yogyakarta City Environment Agency (DLH) focuses on reducing air pollution and noise. The noise index is a new addition to the DLH, with plans to purchase equipment for this sector this year, budgeted at around 500 million rupiah. Noise measurements that have been carried out show that noise levels at several points in the city of Yogyakarta are still well below the required threshold of 70 dBA, with the results below the threshold, the DLH has an important basis to begin developing a more structured noise monitoring system. With a budget of around 500 million rupiah allocated this year for the procurement of noise measuring equipment, the DLH is committed to strengthening its efforts to control noise pollution as part of its strategy to maintain the increasingly complex quality of the city's environment.

Table 2 shows the results of air physics parameter measurements in Yogyakarta City at four different times of day, namely morning, afternoon, evening, and night. The data shows that the highest temperature occurred in the morning and afternoon (34.4 °C), the lowest temperature was recorded at night (26.6 °C), air humidity increased as the temperature decreased, with the highest value occurring at night (75.6% RH) and the lowest in the morning (42% RH), so that air pressure was constant throughout the day (756 mmHg), while the highest wind speed was recorded during the day (1.94 m/s) and the lowest at night (0.16 m/s). Noise always was well below the threshold of 70 dBA, with the highest value of

40.34 dBA occurring in the afternoon. Overall, the physical condition of the air was within safe limits and did not exceed the required quality standards.

Table 3. Test results from the Yogyakarta City Environment Agency

Sample Test Code	Data Collection	Wind Direction	Physical parameters	Test Result	Units	Quality Standard	Test Method
UP 8	08.30-09.30	East	Temperature	34.4	°C	Not Specified	Termometer
			Humidity	42	%RH	Not Specified	Thermohygrometer
			Noise level	39.4	Dba	70	Sound Level Meter
			Air Pressure	756	mmHg	Not Required	Barometer
			Wind Speed	0.64		Not Specified	Anemometer
UP 9	12.00-13.00	East	Temperature	34.4	°C	Specified	Termometer
			Humidity	45.4	%RH	Not Specified	Thermohygrometer
			Noise level	38.9	Dba	70	Sound Level Meter
			Air Pressure	756	mmHg	Not Specified	Barometer
			Wind Speed	1.94		Not Specified	Anemometer
UP 10	16.00-17.00	South	Temperature	29.6	°C	Not Specified	TerFmometer
			Humidity	61.2	%RH	Not Specified	Thermohygrometer
			Noise level	40.34	Dba	70	Sound Level Meter
			Air Pressure	756	mmHg	Not Specified	Barometer
			Wind Speed	0.62		Not Specified	Anemometer
UP 11	20.00-21.00	West	Temperature	26.6	°C	Not Specified	Termometer
			Humidity	75.6	%RH	Not Specified	Thermohygrometer
			Noise level	37.19	Dba	70	Sound Level Meter
			Air Pressure	756	mmHg	Not Specified	Barometer
			Wind Speed	0.16		Not Specified	Anemometer

Source: Yogyakarta City Environment Agency, 2024

The Yogyakarta City Environment Agency (DLH) is currently working on the construction of bicycle lanes at several points in Public Green Open Spaces (RTHP). The existence of Green Open Spaces (RTH) is vital in supporting SDG 13 through their ability to absorb carbon dioxide from motor vehicles and provide oxygen, making them a key component in creating a healthy and sustainable urban environment (Musyawarah, Mutmainnah, & Rasjusti, 2025). In line with the concept of a cycling city, the world hopes

that collective action in accordance with SDG 13 can reduce the extreme impacts of climate change, with active community involvement as the key to preventing the spread of infectious diseases and serious crises (Maulidna & Putra, 2022).

With these efforts, sustainable urban development that refers to SDG 11 (Sustainable Cities and Communities) targets reducing the use of motor vehicles as a strategic step to create compact cities and minimize pollution, while supporting the concept of a cycling city as an environmentally friendly mode of transportation (Kustiwan & Ramadhan, 2019). Bicycle-friendly infrastructure is a strategic step towards achieving sustainable and green urban mobility by designing safe and integrated lanes and supporting facilities, with the main objectives of reducing carbon emissions, overcoming congestion, and improving the health and quality of life of the community (Lukita, 2025). However, for bicycle lanes related to other Regional Government Agencies (OPD), coordination and synchronization have not yet been implemented, and the Environmental Agency (DLH) has not integrated bicycle lane development with air quality data, indicating that environmental aspects such as air pollution have not been adequately considered in the planning process. Nevertheless, the construction of bicycle lanes has been aligned with the existence of RTHPs, where these lanes are built to connect one RTHP to another nearby RTHP based on location, to support environmentally friendly mobility and accessibility to green open spaces for the community.

Creating a sustainable ‘cycling city’ requires attention to good and well-maintained infrastructure, as it has been proven to have a significant impact in encouraging the use of bicycles as an important part of sustainable transportation and supporting environmental quality and public health (Indirwati, Agustin, & Mahmudah, 2024). Although the implementation of bicycle lanes in Yogyakarta City has reached 93%, continuous improvement and maintenance are still needed to optimize services for bicycle users, to support the realization of a bicycle-friendly city (Khoirunnisa et al., 2025). Bicycle infrastructure development is highly focused on the ecosystem, so that the bicycle lanes designed and implemented by the Yogyakarta city government do not damage the ecosystem or cause environmental degradation. This is evidenced by the construction of Pits Stop around the Sarjito bridge and the presence of green open spaces (RTH) managed by the community, the bicycle lanes are built in accordance with the surrounding environmental conditions without shifting sidewalks or cutting down trees, while still using the road lanes. On Mina Julantoro Street, there is also a green open space with a very attractive natural view and a pit stop, which can be seen in Figure 2.

Figure 2. Pit Stop on Mina Julantoro Street
Source: Kenalikota.wordpress.com, 2022.

In the final report of the Study on the Arrangement of Cycling Routes in the Villages of Yogyakarta City, there are five cycling routes in Yogyakarta City. One of them is the Jajah Kampung Susur Sungai route, which is 6,759 meters long. Starting from the starting point in the Kotabaru neighborhood, specifically in front of the McDonald's fast-food restaurant on Jenderal Sudirman Road and ending at the Pangeran Diponegoro Museum located on Jalan H.O.S. Cokroaminoto. The journey begins at the Gondolayu Bridge, passing through villages along the banks of the Code River, with the RTH (Public Open Space) along the river serving as a pit stop or resting point.

Social Aspects

Yogyakarta's readiness to implement a bicycle sharing system as a sustainable mode of transportation needs to be supported and integrated with improvements to other public transportation services to provide more alternatives and encourage people to switch from private vehicles (Kurniadhini & Roychansyah, 2020). As a key element in realizing sustainable urban mobility, the development of an efficient and integrated public transportation system is an essential foundation for reducing dependence on private vehicles while creating an environment that supports increased use of bicycles as an environmentally friendly mode of transportation (Sianturi, Harahap, & Saragih, 2025). The Yogyakarta City Government has several cycling education programs to increase public interest in cycling tourism.

These programs have a very positive impact on the community, gradually changing people's perceptions of cycling such as Sego Segawe, Jogja Bike, Jogja Heritage Cycling, Yogowes, and many others are some of the cycling education programs carried out by the Yogyakarta City Government. Collaboration among stakeholders under the auspices of the city government ensures that these programs continue to run and have a positive impact on

the community, so that this cycling awareness program also reaches schools, from elementary to high school levels. The Yogyakarta City Government encourages students to cycle from home to school or from boarding school to school by collaborating with various departments and communities (families) to help implement this program successfully and safely, with the aim of encouraging the community to make cycling a daily habit from an early age, starting with cycling from home to school.

The Yogyakarta City Transportation Agency participates in implementing educational programs and social campaigns to raise public awareness. This Transportation Agency program involves the dissemination of information on traffic safety and ethics to the public and students, including education on the use of bicycles for daily activities. Additionally, the Transportation Department conducts education at traffic safety parks through the Pentas Sahabat Program (Traffic Safety Park Performance Improvement Program), focusing on the Giwangan Terminal area, and involving young children in this educational program. The Transportation Department continues to provide education evenly regardless of age, with workers and students also participating in the educational programs offered.

The implementation of the bicycle education program in Yogyakarta City is also accompanied by the construction and development of bicycle infrastructure. The government is using a strategy of improving and developing bicycle support facilities to facilitate the daily mobility of cyclists, such as the construction of bicycle lanes, bicycle pit stops, bicycle parking lots, and so on. Therefore, the provision of infrastructure such as protected bicycle lanes is considered a sustainable transportation alternative for short-distance travel and a top priority on the road for cyclists (Pinalam, Soesiantoro, & Hariyoko, 2024). The lanes created by the government focus on the safety and comfort of cyclists, and the lanes are designed to connect strategic areas. One example is the lane connecting one RTHP to another.

The implementation of the bicycle education program in Yogyakarta City is also accompanied by the construction and development of bicycle infrastructure. The government is using a strategy of improving and developing bicycle support facilities to facilitate the daily mobility of cyclists, such as the construction of bicycle lanes, bicycle pit stops, bicycle parking lots, and so on. These efforts demonstrate the government’s commitment to promoting environmentally friendly transportation and creating a more inclusive and accessible urban mobility system. Therefore, the provision of infrastructure such as protected bicycle lanes is considered a sustainable transportation alternative for short-distance travel and a top priority on the road for cyclists (Pinalam, Soesiantoro, & Hariyoko, 2024).

The lanes created by the government focus on the safety and comfort of cyclists, and the lanes are designed to connect strategic areas to ensure seamless and efficient cycling routes. The Yogyakarta City Government's goal of building five bicycle tour routes in strategic areas is clear evidence of the government's support for the construction and development of bicycle infrastructure. This integrated design not only supports the mobility needs of the community but also enhances urban connectivity. One example is the lane connecting one RTHP (Public Green Open Space) to another, which reflects the city's effort to link recreational and environmental spaces through sustainable transportation planning.

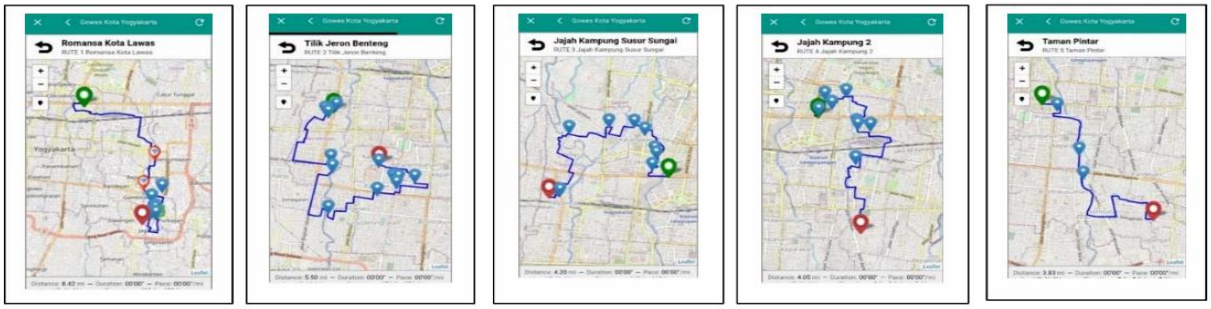


Figure 3. Cycling Tour Routes on the Gowes Kota Yogyakarta App
Source: Compiled by researchers from the final report of the Bicycle Route Planning Study, 2021.

The government built these five routes to minimize accidents involving bicycle users and create a sense of safety for cyclists. These tour routes have been given interesting names: Route 1 – Old Town Romance (12,054 meters), Route 2 – Tilik Jeron Beteng (8,851 meters), Route 3 – Jajah Kampung Susur Sungai (6,759 meters), Route 4 – Jelajah Harmoni Pesona Kampung (6,517 meters), and Route 5 – Taman Pintar Taman Budaya (6,115 meters). The government has conducted research on these five routes to ensure they can be used by the public while considering four main components. The main components of route development are the crystallization point/theme, access to the route, signage along the route, and certain infrastructure.

Conclusion

The development of bicycle infrastructure in Yogyakarta City meets several indicators of sustainable theory, particularly in economic and social aspects through the improvement of MSMEs, sports tourism, and educational programs such as *Sego Segawe* and *Jogja Bike* that have successfully increased public participation and enthusiasm. Certain infrastructure indicators have also been achieved through the availability of bicycle lanes,

pit stops, and integration into strategic areas. However, the environmental aspect has not been fully optimized because air quality data has not been integrated into planning and coordination among OPDs remains limited. To enhance sustainability, the government needs to improve infrastructure safety, integrate air quality data, expand motor-vehicle-free areas, and continue educational programs that involve communities and MSMEs.

Despite these positive developments, this study still has several weaknesses that must be acknowledged. The analysis is limited to a qualitative descriptive approach without quantitative evaluation of air quality improvements, accident reduction, or measurable economic impacts. The scope of observation is also confined to specific areas, and the absence of longitudinal data restricts understanding of long-term environmental and behavioral outcomes. Therefore, future research should employ mixed methods and comparative analysis with other sustainable cities to better evaluate policy effectiveness, identify best practices, and strengthen the implementation of bicycle-friendly infrastructure in Indonesia.

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