International Journal of Finance and Business Management (IJFBM)
Vol. 3 No. 2, 2025: 83 - 92

Implementation of Greenhouse Gas Emission Reduction Policy in Bogor District

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A R T I C L E I N F O

Keywords: Climate Change, Greenhouse Gas Emissions, Emission Reduction Policies, Bogor Regency, Transportation and Industry

Received : 21 January 2025
Revised : 20 February 2025
Accepted: 23 March 2025

A B S T R A C T

Global climate change is an urgent challenge in Indonesia, including Bogor Regency, which is experiencing rapid economic and population growth. Greenhouse gas (GHG) emissions due to human activities, such as transportation and industry, contribute significantly to this problem. With 1.6 million motorized vehicles in 2024, Bogor Regency faces the risk of increasing emissions, especially carbon dioxide (CO_2). This research aims to analyze the implementation of GHG emission reduction policies in the area, assess the effectiveness of programs run by the government, and identify supporting and inhibiting factors. Qualitative methods were used, including interviews with stakeholders and analysis of policy documents. Results show that public awareness and clear regulations support implementation, while obstacles such as lack of funding and inter-sector coordination hinder policy effectiveness. Strategic recommendations include increasing budget allocation, cross-sector collaboration, and optimizing green technology. It is hoped that this research can contribute to the formulation of more effective strategies in dealing with climate change in Bogor Regency.

DOI: https://doi.org/10.59890/ijfbm.v3i2.10
E – ISSN : 3032-2936
https://jpnmultitechpublisher.my.id/index.php/ijfbm/index

INTRODUCTION

Global climate change is becoming an increasingly urgent issue in various parts of the world, including in Indonesia. One of the main causes of climate change is greenhouse gas (GHG) emissions resulting from various human activities (Ardelia, 2023), such as industry (Aisyah, Rizky, Laksamana, & Al Fajar, 2022), transportation (Syarawie, Subagiada, & Natalisanto, 2024), and deforestation (Iqbal & Ruhaeni, 2022). Bogor Regency, as one of the capital's buffer zones with rapid economic and population growth, faces a major challenge in reducing GHG emissions. Various policies have been implemented by the local government to reduce environmental impacts (Malihah, 2022), but the effectiveness of the implementation of these policies still needs further research.

Source : https://www.aprobi.or.id

Picture 1. Illustration of the occurrence of greenhouse gas emissions

A number of current issues that have driven the importance of this research include the increasing rate of urbanization in Bogor Regency, which has led to an increase in energy consumption and motor vehicle emissions. Data from the Bogor District Environmental Agency (DLH) shows that by 2024 there will be around 1.6 million motorized vehicles in the region, consisting of 1.4 million motorcycles and 214 thousand cars. This increase in the number of vehicles is in line with population growth and economic activity due to urbanization. Motorized vehicles are one of the main sources of fossil energy consumption, such as gasoline and diesel, whose use contributes significantly to increased greenhouse gas emissions, especially carbon dioxide (CO_2) ([Regional Secretariat](https://setda.bogorkab.go.id/berita/seputar-opd/kolaborasi-lakukan-uji-emisi-kendaraan-untuk-ciptakan-lingkungan-kabupaten-bogor-bebas-polusi?, n.d.).

Indonesia's development direction for the next 20 (twenty) years in the 2025-2045 RPJPN applies the principle of Sustainable Development with GHG Emission Intensity being the target vision in the 2024-2045 RPJPN. (Ega, Irwanto, Boreel, & Tupan, 2024) In line with that, the direction of development for the next 5 (five) years in the RPJMN 2025-2029 is to reduce the intensity of Greenhouse Gas Emissions as one of the main development targets.

Research published in the journal "Initiative" in 2024 confirms that the use of fossil fuel energy adversely affects environmental quality and increases greenhouse gas emissions. About 99% of greenhouse gas emissions are caused by energy consumption, with higher concentrations of CO_2 leading to global warming. In addition, other studies have shown that urbanization has a significant relationship to fuel oil consumption and total energy consumption, although not significant to CO_2 emissions from motor vehicle use. However, the increasing number of motorized vehicles in Bogor District suggests that special attention needs to be paid to emissions. To address this issue, the Bogor District Government in collaboration with IPB University has conducted a motor vehicle emission test as an effort to reduce air pollution and maintain environmental quality (Pangestu & Ayuningsasi, 2024) (Daerah, 2024).

In addition, massive land conversion has resulted in the loss of forest cover that functions as a carbon sink. On the other hand, central and local government policies in achieving Indonesia's Nationally Determined Contribution (NDC) targets (Abi Suroso, Setiawan, Pradono, Iskandar, & Hastari, 2022) still face various obstacles, such as lack of inter-stakeholder coordination and limited resources (Tarumingkeng, 2024, p. 7). Sustainability of emission reduction programs is also a challenge due to limited funding and lack of public awareness of the importance of climate change mitigation efforts.

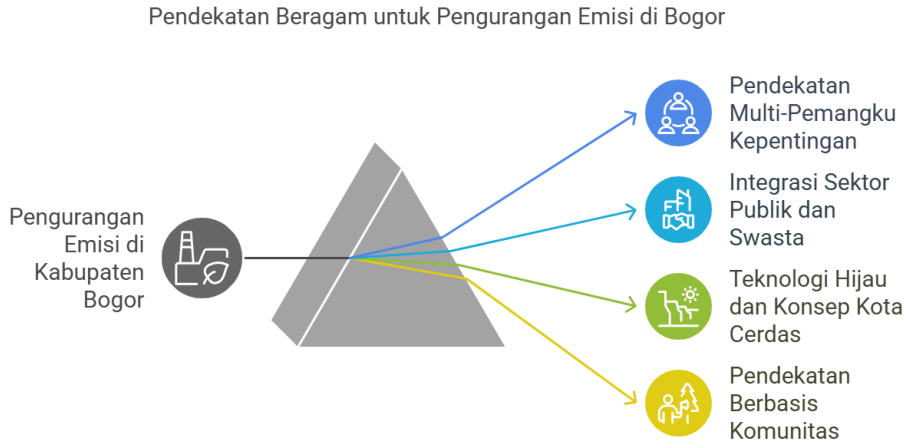
Greenhouse gas emission reduction policies in Indonesia are regulated in various regulations, including Presidential Regulation No. 61/2011 on the National Action Plan for Greenhouse Gas Emission Reduction. At the local level, Bogor District has developed a Regional Action Plan for Greenhouse Gas Emission Reduction that aims to reduce emissions from various sectors. (Syahiib & Safe'i, 2024, pp. 93-103).

This research aims to analyze the implementation of greenhouse gas emission reduction policies in Bogor Regency. In this case, the research will evaluate the extent to which policies have been implemented by the local government in reducing emissions from the transportation and industrial sectors. (Fithori, Ubaidillah, & Mukminin, 2024) This analysis includes understanding the applicable regulations, programs that have been implemented, and their impact on energy consumption and air quality in Bogor District. In addition, the research will also assess the role of various stakeholders, including the government, community, and private sector, in supporting the implementation of the policy. In addition, based on the results of the analysis conducted, this research aims to provide strategic recommendations that can be used by the Bogor District government in improving the effectiveness of greenhouse gas emission reduction policies. The proposed recommendations will include evidence-based practical measures and best practices from other regions that have been successful in emissions management. This strategic approach will consider aspects of policy, technology, and public participation to ensure the sustainability of emission reduction programs in Bogor District. With these recommendations, it is expected that the local government can design policies that are more targeted and appropriate to local conditions.

Another objective is to identify factors that support and hinder the effectiveness of greenhouse gas emission reduction policy implementation. The research will explore variables such as the level of public awareness, availability of supporting infrastructure, budget allocation, and technological support that play a role in achieving emission reduction targets. In addition, external factors such as population growth and rapid urbanization will also be analyzed to understand the challenges faced in implementing policies at the local level. The identification of these factors is expected to provide a more comprehensive picture of the barriers and opportunities in managing greenhouse gas emissions.

LITERATURE REVIEW

Previous studies have examined the implementation of GHG emission reduction policies at the national and regional levels. (Herindrasti, Angelina, & Putriwinata, 2024) However, specific studies in Bogor District are limited. Previous studies highlighted the importance of a multi-stakeholder approach in policy implementation and the need for integration between the public and private sectors in emissions mitigation efforts. (Ginting, Syarifuddin, & Muchlis, 2024). In addition, the development of green technology and the smart city concept is a major focus in reducing emissions in various cities around the world, which can be adapted in Bogor Regency. (Rahdiana, Putri, Maharani, & Darmawan, 2024). Community-based approaches to emissions management have also proven effective in several other regions in Indonesia (Malau, Saragih, & Purba, 2025), showing that community participation is a key element in the success of environmental policies. (Judijanto, Heryadi, Sihombing, Gusti, & Semmawi, 2024). For more details, it can be seen through the following visualization:



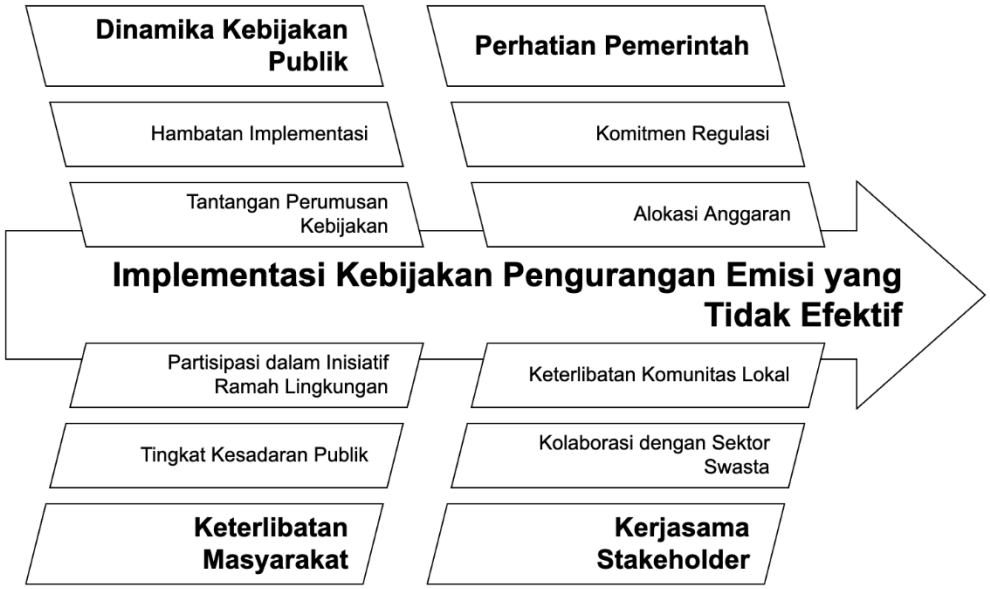
Picture 2. State Of Art

By holistically understanding the implementation of GHG emission reduction policies in Bogor District, it is hoped that this research can contribute to the

formulation of more effective and sustainable strategies in facing the challenges of climate change.

METHODOLOGY

This research uses a qualitative approach with the aim of deeply understanding the implementation of greenhouse gas emission reduction policies in Bogor Regency. The qualitative approach was chosen because it allows for a comprehensive exploration of the dynamics of public policy, the level of community concern, and the attention of the local government as a policy maker. Data collection was conducted through in-depth interviews with key stakeholders, such as government officials, environmental activists, and affected communities. In addition, this research also used direct observation of policy implementation in the field and analysis of policy documents related to reducing greenhouse gas emissions in Bogor Regency. For clarity, the research design can be visualized as follows:



Picture 3. Research Design

In analyzing the elements of public policy, this research will examine various aspects such as policy formulation, implementation, and evaluation that have been carried out by the Bogor Regency Government. The analysis is carried out using a public policy implementation theory approach that includes aspects of policy input, process, and output (Taali, Darmawan, & Maduwinarti, 2024, p. 26). The main focus is on the extent to which existing policies have been implemented effectively, the obstacles faced during the implementation process, and how the involvement of various parties in supporting the policy. This approach is expected to provide a clear picture of policy effectiveness in reducing greenhouse gas emissions in Bogor District.

The aspect of community awareness is an important element in this research, considering the active role of citizens in supporting the success of emission reduction policies. The research will explore the level of community awareness of climate change issues, energy consumption patterns, and their involvement in environmentally friendly programs that have been launched by the local government. Data on community awareness will be obtained through interviews with community leaders, public opinion surveys, and participation in activities related to emission reduction efforts, such as reforestation programs and the use of environmentally friendly transportation.

Furthermore, this research will explore the Bogor District Government's attention in the policy-making process related to greenhouse gas emission reduction. The focus is on the government's commitment to providing supportive regulations, budget allocations, and collaborative efforts with the private sector and local communities in implementing emission reduction programs. A policy analysis approach is used to understand the factors that encourage or hinder government attention to this issue. The results of this study are expected to provide recommendations for local governments in strengthening more sustainable and effective policies in facing greenhouse gas emission challenges.

RESEARCH RESULT

Analysis of greenhouse gas emission reduction policy implementation

The implementation of greenhouse gas (GHG) emission reduction policies in major cities around Jakarta, including Bogor Regency, is an important focus of national efforts to reduce emissions. The Indonesian government has committed to reducing GHG emissions by 29% by 2030 through its own efforts, and up to 41% with international assistance. This commitment is reflected in various policies and programs implemented at the regional level.

In DKI Jakarta, for example, the implementation of GHG emission reduction policies has been carried out through various programs, including methane gas utilization at the Bantar Gebang Integrated Waste Management Site (TPST), the 3R (Reduce, Reuse, Recycle) program, and composting. In 2016, these efforts succeeded in reducing emissions by 107 thousand tons of CO_2e, or about 3.6% of the waste sector target in 2030.

Meanwhile, Bogor City has developed a Regional Action Plan for Greenhouse Gas Emission Reduction that focuses on three city identities: *heritage city*, *smart city*, and *green city*. This includes preserving historic buildings, implementing smart technology, and increasing green open spaces to reduce emissions**.**

Bogor Regency, with the largest population in Indonesia and a large industrial area, faces significant challenges in reducing GHG emissions. The Bogor District Government has adopted Regional Regulation No. 6/2016 that emphasizes the importance of sustainable waste management to reduce methane emissions from landfills. Bogor Regency also shows its seriousness in addressing the waste problem which is one of the contributors to GHG emissions, one of which is collaborating with the West Java Provincial Government in encouraging the acceleration of the operation of the Lulut Nambo Waste Processing and Final

Processing Site (TPPASR) located in Klapanunggal District, Bogor Regency. TPPASR Lulut Nambo uses Mechanical Biological Treatment (MBT) technology and produces RDF (Refused Derived Fuel) which can be used as a very environmentally friendly alternative fuel for the cement industry. (https://pt-jbl.co.id/tppas-lulut-nambo, n.d.). In addition, Bogor District is also the kickoff location for the GHG emission reduction program in Java, demonstrating the local government's commitment to supporting national targets. In the Enhanced Nationally Determined Contribution (NDC), Indonesia increased its GHG emission reduction target from 29% to 31.89% with its own efforts, and up to 43.20% with international support. However, the implementation of these policies is faced with various challenges, including population growth, urbanization and intensified industrial activities. Studies published in the journal "Initiative" in 2024 highlighted that fossil fuel energy consumption has a significant impact on increasing GHG emissions, with about 99% of emissions caused by energy consumption. Higher CO_2 concentrations can lead to global warming. To address this challenge, comprehensive adaptation and mitigation strategies are required. Research conducted in Bogor City recommends route expansion and subsidized public transportation fares as key strategies to increase ridership and reduce emissions from the transportation sector.

In addition, collaboration between local government, industry and communities is key in implementing emission reduction policies. For example, PT Indocement, one of the industrial companies in Indonesia, is committed to supporting the government in reducing GHG emissions by adopting cleaner and more efficient industrial practices. Active participation of the community is also important in supporting this policy. Increased awareness of the importance of emission reduction, use of public transportation, and participation in environmental programs can contribute significantly to GHG emission reduction at the local level.

Identification of factors that support and hinder the effectiveness of greenhouse gas emission reduction policy implementation.

In recent years, Bogor Regency has taken strategic steps to reduce greenhouse gas (GHG) emissions as part of its commitment to deal with climate change. This emission reduction policy is part of the Sustainable Development Program and supports national climate change mitigation efforts. However, the effectiveness of this policy implementation is still affected by various interacting factors. According to research conducted by WWF Indonesia, the involvement of local communities and stakeholders is crucial to ensure the success of the policy.

One factor that supports the effectiveness of this policy is the increasing public awareness and participation in environmental issues. According to a survey conducted by the Bogor District Regional Development Planning Agency (Bappeda), 73% of the community expressed support for GHG emission reduction initiatives, especially through waste management and reforestation programs. This awareness is a positive driver to encourage the implementation of environmentally friendly practices among the community and businesses.

However, significant barriers remain. One of the main obstacles is limited resources and funds to support emission reduction programs. According to a report from the Ministry of Environment and Forestry (MoEF), budget allocations for mitigation programs at the local level are often insufficient for effective implementation. This limitation affects the ability of local governments to provide the necessary infrastructure and technology, thus affecting the planned emission reduction process.

Furthermore, the lack of integration between sectors in emission reduction policies is also a barrier. In many cases, programs run separately without proper coordination between the energy, transport and other related sectors. Research by the Institute for Essential Services Reforms (IESR) notes that a multi-sector approach and policy integration is necessary to achieve success in emissions reduction at the district level. Without synergy, each sector operates in silos, which reduces the potential positive impact of the policy.

DISCUSSION

Overall, the implementation of GHG emission reduction policies in Bogor Regency and surrounding areas requires an integrated approach involving various stakeholders. With joint commitment and effective strategies, the emission reduction targets that have been set can be achieved, supporting national efforts in dealing with climate change.

The effectiveness of greenhouse gas emission reduction policy implementation in Bogor District in the last two years has been influenced by various factors, both supporting and hindering. Community involvement, awareness raising, and support from the central government are categorized as supportive factors, while constraints such as lack of funding, resources, and policy integration are significant barriers. Strengthening collaboration between sectors and better resource allocation will be key to optimizing this policy in the future.

CONCLUSIONS AND RECOMMENDATIONS

Based on the analysis conducted, the implementation of greenhouse gas (GHG) emission reduction policies in Bogor Regency still faces various challenges, including population growth, rapid urbanization, and limited supporting infrastructure. Although the government has adopted various policies and programs, such as motor vehicle emission testing and sustainable waste management, their effectiveness still requires further evaluation and improvement. Factors that support the implementation of these policies include clear regulations, local government commitment, and potential collaboration with the private sector and local communities. On the other hand, inhibiting factors include a lack of coordination between stakeholders, limited funding, and low public awareness of the importance of reducing GHG emissions. Therefore, it is recommended that the Bogor District Government improve cross-sector coordination in policy planning and implementation, strengthen budget allocations for emission mitigation programs, and promote more massive public awareness campaigns. In addition, the use of green technology and smart city concepts needs to be optimized to support emission reductions in the

transportation and industrial sectors. With evidence-based strategic measures and best practices from other regions, it is expected that Bogor Regency can achieve emission reduction targets more effectively and sustainably.

ADVANCED RESEARCH

Of course, there are still many things that can be done to develop research related to the implementation of this GHG emission reduction policy. However, due to limitations, the researcher suggests that further research should incorporate a multidisciplinary approach (environmental, social, political and economic sciences) to understand the complexity of GHG policy implementation in Bogor District. A focus on local knowledge integration, cross-sector collaboration, and data-driven policy adaptation will increase the relevance and sustainability of the proposed solutions.

ACKNOWLEDGMENT

Thanks are due to the supervisors and the Bogor Regency Government for facilitating the publication of this article.

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