



INTERNASIONAL CONFERENCE & CALL FOR PAPER

ECONOMICS, BUSINESS, INNOVATION AND CREATIVITY (EBIC), 16th May 2023

Vol: 1 No.: 1

No. E-ISSN: 3025-4086

**ASSESSMENT OF THE STRATEGY AND PERFORMANCE OF
THE LOCAL GOVERNMENT IN SUPPORTING ECONOMIC
DEVELOPMENT TO REDUCE
CARBON EMISSIONS**

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ABSTRACT

The purpose of this research is to identify the level of performance of local governments in encouraging the implementation of low-carbon economic development. Low-carbon economic development encourages the participation of local stakeholders in accessing potential funding for climate change projects and programs, especially through the implementation of the Call for Project Concept Note (PCN) implemented by NDA GCF Indonesia. This concept appears in Law Number 16 of 2016 concerning the Paris Agreement on the United Nations Framework Convention on Climate Change. However, support from the local government to implement this concept is still lacking. Therefore, in this study, the authors will try to identify the extent to which the level of performance of local governments in supporting the concept of economic development is based on four indicators covering energy use patterns, carbon emissions, and the environment, waste management, and water and waste management. This research uses a qualitative descriptive approach using data triangulation. The results of this study show that low-carbon economic development carried out by the local government is not good enough. This can be seen from the fact that there are still quite a lot of problems in each variable of low-carbon economic development.

Keywords: Low Carbon Strategy, Performance and Economic Development.

1. INTRODUCTION

Economic development oriented towards reducing carbon emissions has a significant contribution to carbon emissions in an environment. During construction, procurement and selection of building materials, construction sites, worker activities, and environmental changes are important aspects that affect the number of carbon emissions. While during operation, energy use, user transportation, and waste management are aspects that affect carbon emissions. The research objective is to assess carbon emissions in the construction process of small cluster housing developments built around old settlements that are already settled and indicated to produce low carbon emissions [1]. This housing development is carried out simultaneously or gradually. It also compares the carbon footprint of gradual housing development to a simultaneous housing development for the same area [2].

Medan is a city with rapid regional growth and development. With an area of 265.10 km², the population density reached 9,186 people/km². In 2020, the population of Medan reached 2,435,252 people. Compared to the total population in 2019, there was a population increase of 155,358 people (6.81%). The rapid growth and development of this area certainly resulted in higher land requirements [3]. The development of the city



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will be directly proportional to population growth, where any increase in population growth will affect the development of the city. Along with the increase in population, the need for land for settlements is also increasing which results in the availability of land being very limited and will continue to decrease every year. As a result of land use change into settlements, it can cause changes in the pattern and direction of regional development [4].

The scope of this research includes several indicators of low-carbon economic development strategies and performance in Medan with carbon monoxide (CO) as the analyzed parameter. Potential emission reduction is done with the scenario of shifting private transportation to mass transportation (CNG and Diesel fuel BRT). CO is a colorless, odorless, and tasteless gas. It can be liquid at temperatures of -192°C . The existence of this gas is mostly the result of burning fossil fuels with air, in the form of exhaust gas. The exhaust of vehicles are also one of the largest CO gas emitters in addition to industrial activities [5].

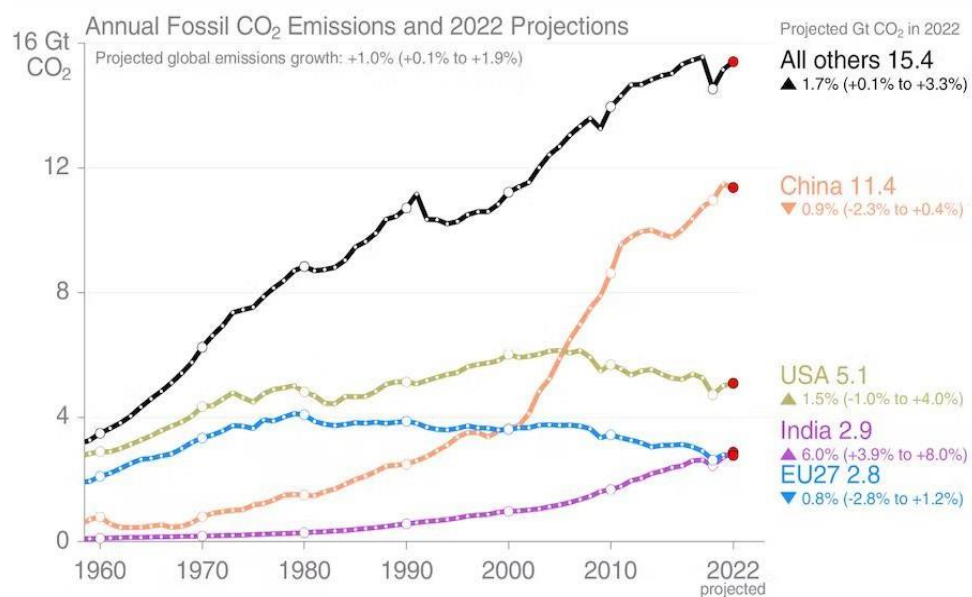


Figure 1 : Carbon Emissions in The World for the year 1960-2022

Source : Global Carbon Project

Global carbon dioxide (CO₂) emissions from human activities will remain at their highest level in 2022, according to an analysis by global scientists. Emissions from fossil fuels are also rising, even higher than pre-pandemic levels. This phenomenon is crucial for the study of low-carbon economic development in renewable energy development, development policies, and commitments from governments and companies to increase emission reduction ambitions. We urgently need to reach an emissions-free state to keep global warming below 2°C by the end of the century. But the massive emissions released by humanity in 2022 make this task even harder and more urgent in the future [6].



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2. LITERATURE REVIEW

Theory of Sustainable Development

The concept of sustainable development has been a concern of the government for a long time. It is not a new idea, but the term sustainability itself only emerged a few decades ago. This concept has been very commonly used as a solution to overcome the trade-off between development and the environment. The concept of sustainable development is essentially a simple but complex concept. This has led to a multidimensional and multi-interpretation of the notion of sustainability. Sustainable development is the development that meets the needs of the current generation without compromising the ability of future generations to meet their needs [7].

This similarity prompted Panayotou (1993) to coin the term Environmental Kuznets Curve (EKC) which states that the level of environmental degradation will continue to increase as income increases until it reaches a certain point where people become aware of environmental sustainability and are willing to pay for it [8]. Lin et al (2015) [9] analyzed the relationship between industrialization and carbon emissions in Nigeria. To examine the short-term and long-term relationship between industrialization and carbon emissions in Nigeria using the Vector Error Correction Model (VECM) econometric technique and the Kaya Identity empirical model framework, the results of this study indicate a significant negative relationship between industrialization and CO₂ emissions in Nigeria in the long run, but not in the short. [9].

According to [10] the impact of Foreign Direct Investment (FDI), population, trade openness, industrial structure of economic growth, financial development, and energy consumption on carbon emissions in five selected member countries in the Association of Southeast Asian Nations (ASEAN-5) namely Indonesia, Malaysia, Philippines, Singapore, and Thailand in 1981-2011. The results show that the effect of independent variables on carbon emissions is heterogeneous across quantities. The effect of FDI on carbon emissions is negative, except at the 5th quartile, and becomes significant at higher quartiles. Energy consumption increases carbon emissions, with the strongest effect occurring in higher quantities [10].

According to [11] the effect of industrial sector activities on environmental quality in terms of carbon dioxide emissions in Indonesia using Ordinary Least Square (OLS). environmental quality in terms of carbon dioxide emissions in Indonesia using Ordinary Least Square (OLS). The results of the analysis show that industrial sector GDP has a negative and significant effect on CO₂ emissions [11].

Low Emissions Economic Development

One of the challenges facing low-emission economic development is how to ameliorate environmental change without compromising the needs of economic development and social equity. Several approaches to housing development have been developed to reduce carbon emissions or the carbon footprint of construction [12].

Low-carbon development is one of the transition strategies towards a green economy and sustainable development. Low-carbon development is also the backbone towards a green economy to achieve the vision of a developed Indonesia in 2045 and achieve zero emissions by 2060. Transforming Indonesia's economy into a green economy is one of the strategies for Indonesia to get out of the "middle-income trap". A green economy and low-carbon development will drive economic growth and improve social welfare while maintaining environmental quality [13].



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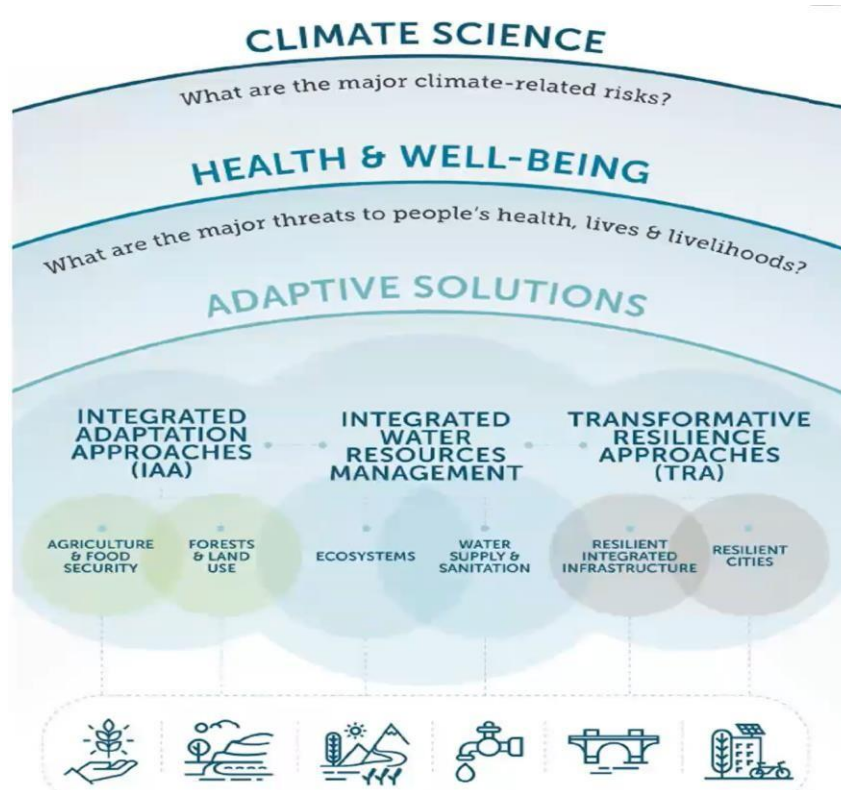


Fig.2. *Climate rationale*
Source: GCF, April 2019

It is becoming increasingly clear that the world is facing major challenges in global environmental degradation and climate change. Climate change is one of the many natural phenomena due to environmental degradation that humans can directly feel, one of which is through an increase in the Earth's temperature.

3. DATA AND RESEARCH TECHNIQUE ANALISYS

This research is qualitative research with library research. Library research is more than just carrying out these functions to obtain research data. Strictly speaking, library research limits its activities to library collection materials only without the need for field research [14] Qualitative literature study research is used to examine strategies and performance in low carbon emission economic development in Medan. The data source used in this research is secondary data. In this research, secondary data comes from literature, articles, journals, and sites on the internet related to the research conducted.

Table 1. Research Indicators

No.	Indicators	Scale
1	Energy Usage Pattern	Proportion of new and renewable energy used
2	Social Lives	Energy Conservation Proportion of green open space to total area



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3	Carbon Emissions & the Environment	Density of population CO emissions/capita
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		NO2 emission/capita
		Daily SO2 rate
		Rail transport length/capita
	Trash Management	Integrated Solid Waste Management
4		Number of waste picked up and properly managed
		Quantity of waste recycled
	5 Water and Waste Management	Daily fresh water consumption
		Wastewater generation and amount of managed wastewater

4. RESULT AND DISCUSSION

Performance and Strategy of Medan Government on Energy Use Pattern Indicator

Efforts to increase the electrification ratio in Medan are supported by the ongoing construction of electricity infrastructure. Not only increasing the construction of power plants, other electricity infrastructure such as transmission and substations are also built spread across various parts of Indonesia. Transmissions that have been in operation until September 2016 amounted to a total of 3,924 km while a total of 16,053 km have entered into the construction phase. In line with the transmission, the construction of substations is also quite rapid. A total of 12,245 MVA of substations are operational and 21,147 MVA are under construction. To ensure that the provision of electricity meets the aspects of safety, reliability, and operability, electricity supervision is an important factor.

Various efforts to provide electricity and supervision from the Medan Government will continue to be carried out even though it is not a simple thing. It takes a long time to provide access to electricity so electricity usage should be done wisely. Along with modernization in Indonesia, we often do not realize that there is still electrical energy used from electronic devices that are left on standby and not used. A lot of electrical energy is wasted due to unwise use. As an illustration, a notebook left on standby still consumes 50 watts of electricity. Similarly, a DVD player consumes 10.58 watts, an oven 4.9 watts, a computer screen 3.5 watts, a printer 4 watts, a fax device 8.71 watts and a cell phone charger 1 watts.

On average, we allow 83 watts of electricity to be wasted per hour. That 83 watts can be used to power 11 LED lights for 1 hour. Imagine the positive impact of these LED lights being lit in remote areas in Indonesia. In the campaign to Cut 10% from the Directorate General of New Renewable Energy and Energy Conservation (Ditjen EBTKE). Electricity saving or energy conservation in daily life is increasingly necessary because the provision of electricity is not easy and cheap. We must continue to improve the good benefits of electricity so that Medan can realize energy independence.

Performance and Strategy of Medan Government on Social Life Indicators

In the indicator of social life in low-carbon development, one of the main components is the availability of green open space (RTH). According to Indonesian Law No. 26 of the Year 2007 on Spatial Planning, the minimum proportion of green open space in an area is 30%, of which public green open space is 20% and private green open



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space is 10%. The extent of RTH in Medan itself is not yet known, given the limited data. To learn more about the condition of green spaces in Medan, it is necessary to study the land cover or land use and its changes that can be analyzed through remote



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sensing data and Geographic Information System. Therefore, in this Final Project research, a study was conducted to find out the extent of the availability of green spaces in Medan by mapping public and private green spaces in order to determine the number of green spaces available in Medan and can be analyzed in accordance with spatial planning regulations.

Table 2. Research for RTH

No	Name	Title	Result
1	Jurgen Akbar (2015)	Breuste, <i>Many Public Urban Parks, but Who profits from them The Example of Tabriz, Iran</i>	Many households do not enjoy the government's recommended level of access to public green spaces. The results highlight social segregation in the distribution of parks and their accessibility in Tabriz. The best parks are located in high social status areas, and their accessibility is the best among all walks of life. Low social status groups do not have good access to city parks [15].
2	Kshama Gupta Arijit Roy Kanishka Luthra Sandeep Maithani Mhavir (2016)	<i>GIS based analysis for assessing the accessibility at hierarchical levels of urban green spaces</i>	The results show that a more accurate assessment of RTH deficit across different hierarchies can be obtained using this approach. Network analysis has been effectively used in this study to assess accessibility based on hierarchy and can be used to identify deficient areas in each hierarchy, which have not been served by PGS and need attention for future RTH development [16].
3	Nur Fachriani (2017)	Analysis of Green Open Space Availability Using Geographic Information System (GIS) Application in Palmerah Sub-district, West Jakarta	There was a decrease in the area of green open space in Palmerah Sub-district, West Jakarta from 2010 to 2015 by 163.88 ha. The area of Green Open Space required based on the area in Palmerah Sub-district is 221.14 ha, while the area of Green Open Space in Palmerah Sub-district is only 147.04 ha. The area of green open space in Palmerah Sub-district has not met the standard criteria set by Law Number 26 of 2007 concerning spatial planning. [17].

In general, public open spaces in urban areas consist of green open spaces and non-green open spaces. Urban Green Open Space (RTH) is part of the open spaces of an urban area filled with plants, plants, and vegetation (endemic or introduced) to support ecological, socio-cultural, and architectural benefits that can provide economic benefits (welfare) for the community. Non-green open spaces can be in the form of paved open spaces or blue open spaces (RTB) in the form of river surfaces, lakes, and



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areas designated as retention puddles [18].

Based on Medan Regional Regulation No. 1 of the Year 2022, the availability of



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public green space must be provided in at least 20% of the urban area. Basically, along with the growth of development and population increase, public green space tends to narrow. Therefore, it is necessary to research the availability of public green spaces in urban areas. The functions of public green spaces are ecological, social, cultural, economic, and aesthetic or architectural. The purpose of public green space development as green infrastructure in urban areas is to improve the quality of the urban living environment that is comfortable, fresh, beautiful, clean, and sustainable [19].

Performance of Medan Government on Carbon Emission and Environmental Indicators

Transportation problems are a major issue in major cities in Indonesia, one of which is Medan. Based on data from Dirlantas Poldasu in 2014, the number of vehicles in Medan was 5,531,77 units (86.29% motorcycles; 7.91% passenger cars; 4.50% freight cars, and 1.3% buses). The estimated emission burden of motor vehicles in Medan for carbon monoxide (CO) is greatest from motorcycles reaching 40 tons/year. BLH Medan (2015) conducted roadside air quality monitoring on Medan roads (Jl. Gatot Subroto, KIM I Mabar entrance, and Taman Makan Pahlawan Medan) and obtained CO concentration results ranging from 3 - 20 ppm. Data from BPS North Sumatra Province (2015) stated that $\pm 10.14\%$ of Medan residents suffered from Upper Respiratory Tract Infection (URTI), which was the highest number of sufferers compared to other diseases [20]. Kampung Lalang area (Medan) obtained the value of F (>1.0) which means that the road section is congested, the speed is low, the volume of vehicles is greater than the existing road capacity, many vehicles take the shoulder of the road, long queues and large obstacles occur because the volume per capacity or V / C ratio of 1.08 so that the traffic flow is hampered [21].

Research conducted on several roads in Medan showed that the CO emission load generated ranged from 11,581.28 g/hour - 42,248.6 g/hour. One of the ways to reduce the CO emission load is by shifting the private transportation mode (motorcycles and cars) $\pm 30\%$ to mass transportation such as BRT with CNG and Diesel fuel. The transfer of this mode of transportation reduces CO emissions to ambient air by around 25.02% - 29.44%. The results show that the type and number of vehicles are strongly correlated with CO emissions. Meanwhile, CO emission load is moderately correlated with ambient air concentration because there are several factors that affect the dispersion of pollutants in ambient air, one of which is meteorological factors. Further research is needed on the influence of meteorological and vehicle factors (engine, age, maintenance schedule) on CO emission load and CO concentration in ambient air.

Performance and Strategy of Medan Government on Waste Management Indicators

One of the visions and missions of Medan Mayor Bobby Nasution is to realize Clean Medan. Moreover, before taking office as the number one person in the Medan Government, the capital of North Sumatra Province was once named the dirtiest city in 2019 by the Ministry of Environment and Forestry (KLHK) RI. On that basis, the mayor of Medan is determined to make Medan clean of waste so that the people feel calm and comfortable.

To realize this, several efforts have been made, including starting from



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delegating part of the waste management authority from the Medan Sanitary and Park Service (DKP) to the sub-district, as well as launching a clean program through the



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Decree (SK) of the Mayor of Medan No. 658.5/31.K/VIII/2021 concerning the Location of the Waste Free Area Pilot in Medan in 2021. Then together with the North Sumatra Provincial Government and the Deli Serdang Regency Government collaborated to build a Regional Landfill in Talun Kenas using a sanitary landfill system. Then, strengthen the existence of waste banks, and landfills (TPS) based on 3R (Reduce, Reuse & Recycle) and build and support cooperation with third parties for waste processing.

The Ministry of Environment and Forestry through the Directorate General of Waste Management, Hazardous Waste and Toxic Substances (Ditjen PSLB3) is also ready to support the Medan Government in managing waste by establishing a waste recycling center in Medan as well as providing methods and efforts in reducing waste piles in landfills. This support is expected to be able to strengthen our efforts in dealing with waste issues while answering the public's desire for the realization of cleanliness in Medan as a result of carbon emissions. This is because solving the waste problem requires collaboration with some parties and stakeholders.

Performance and Strategy of Medan Government on Water and Waste Management Indicators

Carbon emissions can also be caused by inappropriate water and waste management. To protect the environment from hazardous and toxic waste, especially medical waste from healthcare facilities in Medan and surrounding areas, PT Arah Environmental Indonesia (ARAH) opened a service in Medan. At that time, the condition of hazardous and toxic waste handling in North Sumatra was very alarming as many hazardous and toxic waste generators disposed of their waste in the surrounding environment and treated the waste like normal garbage.

In the five-hectare FPLT construction site, there is a laboratory and a wastewater treatment plant (IPAL). The proposal to build an area like this has been running since three years ago, due to several reports and requests from hospitals related to hazardous waste treatment. With this facility, this industrial area will have a large enough capacity for waste treatment. Therefore, they requested that all progress that has been running, be assured to achieve the target.

5. CONCLUSION

Based on the discussion in this study, the researcher concluded the research results as follows: The performance of the Medan government in supporting low carbon development is good enough. This can be seen from the strategies that can be implemented from the performance of agencies within the Medan government in supporting low carbon development in each sub-district, some of which are in the energy pattern indicator, the use and development of new and renewable energy have been carried out in line with the program on this matter in the Medan OPD development document. Indicators of social life, the area of green space in each sub-district is large enough to cover almost every sub-district in Medan. Carbon emission and environmental indicators, concentration, and harmful gases have been addressed. There is a decrease in CO emission load, one of which is the transfer of private transportation modes (motorcycles and cars) \pm 30% to mass transportation such as BRT with CNG and Diesel fuel. The transfer of this mode of transportation reduces CO emissions into the ambient



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air by around 25.02% - 29.44%. The results show that the type and number of vehicles are strongly correlated with CO emissions. Waste management indicators, methods, and



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efforts in reducing waste piles in landfills and riverbanks have been running well following local government targets. Indicators of water and waste management have made strategic efforts, namely with the laboratory construction project and wastewater treatment plant (IPAL).

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