

EXPLORING SHAH ALAM CITY COUNCIL'S COMMITMENT TOWARDS A LOW-CARBON CITY

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ABSTRACT

Shah Alam, the economic hub of Selangor has undergone rapid urbanization over the years. As a result, it has led to a significant increase in carbon emissions in the city. In response to meeting the global vision for the Sustainable Agenda, Shah Alam City Council (MBSA) has established the Low Carbon City Action Plan which promotes sustainable urban development. This paper explores Shah Alam City Council's commitment through its initiatives and strategies in achieving a low-carbon city. It employs a qualitative analysis through semi-structured interview of MBSA personnel. The result showed that Shah Alam City Council (MBSA) had implemented numerous initiatives through its action plan which is analysed through the urban environment, urban infrastructure, urban transportation, and buildings. However, the lack of financial support and participation by the elderly hinders the full capabilities of a low-carbon city development.

Keywords: Low carbon city, Shah Alam City Council, Urban development, carbon emission, Low Carbon City Action Plan



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INTRODUCTION

Climate change is regarded as a global phenomenon that has a significant impact on urban life. It is reported that urban areas account for 70% of the world's carbon emissions, which are mainly caused by emissions from motorised transport systems and buildings (Luqman et al., 2023). It is evident that over the past decades, anthropic activities have led to a steady increase in carbon emissions which are the leading causes of global warming (Wang et al., 2023). As a result, this has led to numerous catastrophic events such as a rise in the sea level, droughts, extreme heat waves, floods, and intensified tropical storms (Chen et al., 2023). With the current global warming rate, it is projected that the global temperature to rise 2.7 degrees Celsius as compared to pre-industrial temperatures (Subramaniam, 2023). In response to the ongoing climate change challenges, cities came together to work towards the Paris Agreement goal of keeping the global temperature rise below 1.5 degrees Celsius. Through this commitment, cities have incorporated sustainable city concepts in their urban planning.

As part of the mitigating plan, low-carbon city (LCC) strategies have emerged as a common approach among cities in addressing climate change. The concept of LCC is defined as a city that incorporates sustainable and green practices which emits low carbon emissions (Wang et al., 2023; Caprotti, 2017). It's a sustainable urbanisation approach that limits or abolishes the use of fossil fuel-based energy sources (Ismaila Rimi & Yakubu Aliyu, 2019). Numerous studies have analysed the importance of low-carbon city initiatives and the positive impact on the residents and environment (Song et al., 2020; Li & Xing, 2024). In the context of Shah Alam, despite Shah Alam City Council (MBSA) implementing LCC initiatives which could bring positive outcomes, the carbon emission in the city remains relatively high with an average of 9.2 kg/cap/day as compared to the Klang Valley of 0.46 kg/cap/day (Yami et al., 2021). Therefore, this study aims to explore the commitment of MBSA to achieving a low-carbon city in Shah Alam. It intends to analyse the efficacy of MBSA's initiatives in targeting a 45% greenhouse gas reduction by 2035.

LITERATURE REVIEW

Shah Alam's Low-Carbon City Journey

Shah Alam, the economic heartland of Malaysia with an urban population of 6.7 million, contributes to carbon emissions in the country. With MBSA's effort to mitigate the level of carbon emission in the city, they have been actively engaged in its low-carbon city initiatives. MBSA's commitment towards achieving a low-carbon city has been progressive with a track record of consistent improvement of carbon emission. The initial initiative is Agenda 21 Selangor which aims to formulate sustainable strategies and action plans at a state level to achieve a developed status by 2005 (Azam & Osman, 2012; Mohd Yusof & Ariffin, 2020). The action plan includes famine, unhealthy living conditions, the deterioration of the ecosystem, social class inequality, and dependency on the well-being of life. Agenda 21 Selangor highlighted the importance of local government in ensuring sustainable development through the Local Agenda 21 (LA21) plan in the Shah Alam (Abidin et al., 2016). As such, the Local Agenda 21 Plan (LA21) stressed the development and preparation of action plans adopted by MBSA to translate sustainable development principles into practical actions. Under this action plan, it serves as a collective effort from MBSA, non-governmental organisations, and the community of Shah Alam. The collaboration between these groups will empower the decisionmaking process which drives towards the success of a sustainable future (Kamaruddin et al., 2016). Under the MBSA's Local Agenda 21 (LA21) action plan, there are three key sustainable development elements: social, environment, and the economy. Through this, numerous programs had been introduced by MBSA as part of their action plan.



Figure 1. Shah Alam Local Agenda 21 (LA21) Action Plan Source: Author

Table 1. Shah Alam Local Agenda (LA21) Programs Initiated by MBSA

No.	Action Plan	Program						
Social								
1	Smort Community	Shah Alam Residents' Representative Council Seminar 2011						
2	Smart Community	Shah Alam Smart Community Competition						
3		Workshop on Preparation of Shah Alam LA21 Blue Print						
4	Environmental Awareness Campaign	Publication of "Adam Cares For The Earth Series" book sources						
-		and activities						
5	Disabled people	Disability Access Audit						
6	Disabled people	Workshop Program for Disabled						
7	Safa City	Safety Campaign : Preventing Street and Property Crime						
8	Sale City	MBSA CCTV Launching						
9	Preservation of Urban Forest Park	2011 World Environment Day @ Shah Alam						
Environment								
10		Urban Forest Park program						
11	Preservation of Urban Forest	Green Pilot Program						
12		Tree Planting Program with NGOs - River & Trees for Life 2011						
13	Love Our River Campaign	Clean-Drain Campaign						
14		IPTA River Rangers Mini-Carnival						
15		Recycling Campaign 2011						
16	Bernele Commission	Kitchen Waste Recycling Campaign						
17	Recycle Campaign	Wisma MBSA Recycling Competition						
18		City Centre Buildings Recycling Competition (Seksyen 14)						
19	Smart Community	Community Orchard						
Economy								
20	Urban Kiosk	Urban Kiosk - Woven bag distribution						
21	Shah Alam as a Tourist Destination	Weekend Bazaar						
22	Shan Alam as a rourist Destination	Anggerik Exhibition						
23	Poverty Fradication	Poverty Eradication Program: Job Opportunities in Shah Alam						
24	1 Overty Eladication	Selangor Entrepreneurial Empowerment Seminar						

Source: Author

The initiatives and programs carried out by MBSA are the means of realising the importance of a sustainable future which conforms to the objectives of LA21 Action Plan. These programs addressed various aspects of a sustainable community including social cohesion, green environment, and vibrant economy (Pozo-Llorente et al., 2019). Despite the implementation of programs, it's important to assess their impact and success. As such, in 2002, the first sustainability indicator, Malaysian Urban Indicator Network (MURNInet), was developed and adopted by MBSA. MURNInet assessed Shah Alam's level of sustainability based on 11 planning components which include the city's demographic, housing, economy, infrastructure and utilities, public recreation and facilities, urban environment, sociology and social impact, land usage, tourism and heritage, transportation and accessibility, and management and finance (Marzukhi et al., 2011). Initially, 56 urban sustainability indicators were considered. However, it was found to be ineffective due to data unavailability and the measurement was carried out manually. As a result of the agreement between the stakeholders, 38 indicators were used to assess the sustainability in the city. Over the years, these indicators were analysed and found to have a positive outcome toward a sustainable and low-carbon city.

Low Carbon City Framework (LCCF)

Urban Environment

The urban environment was identified as one of the key contributors to carbon emissions in the city. An urban environment is an area developed via urbanisation into the cities with a high population density and infrastructure such as buildings, bridges, and green spaces (Islam, 2022). However, through proper implementation of strategies, the urban environment could potentially be a factor that contributes to the reduction of carbon emissions within cities.

According to Li et al. (2023), as about 18% of worldwide carbon emissions are correlated with energy use in urban environments, reducing vulnerability and the risk of degradation of the urban environment can lower carbon emissions. It is necessary to create sustainable urban environments which allow cities to regenerate and change to make them more liveable and eventually lessen their negative environmental effects. Malah et al. (2022), suggested that to improve the quality of the urban environment, town planners and local government need to implement policies that consider smart growth and sustainable development of urban disadvantages. For example, China implemented a strict rule which prohibits using rural land for urban development unless the state expropriates it beforehand (Kundu et al., 2020). However, in Europe, the commission made significant investments in projects and programmes that focus on noise, water, and air quality, while also maintaining and restoring urban green areas as part of the policy and the European Green Deal (European Commission, 2022).

Under MBSA's initiatives for a low-carbon city, numerous activities and programs have been implemented which involved collaborating with stakeholders and the community. The involvement of stakeholders is crucial as they are arguably a significant driver of decarbonization strategies (Yunus et al., 2020; Cadez et al., 2019). Seroka-Stolka (2023) studied the impact of stakeholders on CO2-related performance in Poland. The result showed a positive relationship between stakeholders' involvement and the adoption of low-carbon strategies which resulted in a reduction of carbon emission. Falana et al. (2024) suggested that having effective partnerships with stakeholders is a pathway toward a low-carbon city. While stakeholders have a crucial role in influencing a low-carbon city program, community engagement too has a fair share towards the success of the program initiated by MBSA. Leknoi et al. (2022) in their study on community engagement in Bangkok, Thailand found that engaging the community produces a level of confidence which leads to positive empowerment for the community to work together towards the low-carbon city programs. Therefore, MBSA has identified strategies for engaging with these important groups in their low-carbon initiatives.

Urban Infrastructure

The urban infrastructure refers to a built environment that includes buildings and transportation, sanitation, electricity, water, and gas. 79% of global greenhouse gas emissions are related to urban infrastructure, whereby most of these emissions come from transportation, power plants, and buildings. Therefore, it must be built, maintained, and improved to keep up with the increasing population and economic development (UNOPS, 2021). Creutzig et al. (2016) suggested providing estimations of the mitigation potential while organising urban climate initiatives on newly constructed and existing infrastructures.

Numerous studies suggest that Urban Green Infrastructure (UGI) could provide various ecosystem services, including carbon sequestration and climate mitigation, with co-benefits to the environment, society, and economy. It consists of multifunctional ecological networks that are natural,

semi-natural, and man-made, which exist at all geographical scales within, surrounding, and beyond urban regions (Pamukcu-Albers et al., 2021). The National Energy Policy 2022-2040 was introduced by the Malaysian government to foster economic resilience, energy security, social equity, and affordability which will lead to a sustainable environment. Through green energy, the NEP aims to create environmentally friendly infrastructure with five main areas of attention: hydrogen, energy, oil and gas, reducing carbon footprint, and energy vehicles. Several targets were included in the Low Carbon Nation Aspiration 2040, developed as part of the National Energy Policy (NEP). These targets include saving 11% of energy in the industrial and commercial sector, 10% in residential energy efficiency, 17% in renewable energy supply, and other aspects related to transport vehicles (Ministry of Economy Malaysia, 2022). According to LCCF (2017), there are several aspects of urban infrastructure, including waste management, renewable energy, infrastructure provision, and sustainable development, that need to be addressed to reduce carbon emissions.

Urban Transportation

Urban transportation is another significant element that plays a role in the LCC implementation (LCCF, 2017). By considering urban transportation, it can mitigate carbon emission and improve the community's health (Binder et al., 2020). A comprehensive strategy for urban transportation is required to develop low-carbon cities. In Malaysia, the government is targeting 50% urban public transport use by 2040 as part of the Low Carbon Nation Aspiration 2040 plan, based on the National Energy Policy 2022-2040 Dasar Tenaga Negara, DTN. In other words, from 20% in 2018 to 50%, represents the modal share of urban public transit. Along with promoting electric cars which they hope to reach 38% by 2040, one of their goals is to raise the percentage of alternative, lower-carbon fuels in heavy vehicles and maritime transportation, and to improve energy efficiency in the commercial, residential, and industrial sectors.

Ahmed & Monem (2020) found that a green urban transport system with an integrated approach to the policymakers and decision-makers is crucial. This will ultimately change the direction of urban transportation toward a more sustainable and green future. This is done with affordable, people-oriented, and environmentally friendly transport systems. Achour & Belloumi (2016) compared the transportation intensity, population scale, transportation structure, and energy intensity in their model. According to Achour & Belloumi (2016), most variables have a significant impact on carbon emissions. Furthermore, vehicle ownership is also another variable that is used in some studies, which is the major source of carbon emissions in the road transport sector. Consequently, the Chinese government released a series of policies and legislations that focus on air pollution prevention with an action plan that aims to improve air quality.

Buildings

According to the Global Status Report (2022), buildings contribute to 39% of the greenhouse gas emission (GHG) globally, which is an ongoing concern for cities. In the U.S., their buildings in New York account for 70% of the city's greenhouse gas emissions (Gasha, 2022). According to (UN, 2022), carbon emissions from buildings and construction hit a new high, leaving the sector off track to decarbonize by 2050. To mitigate this issue, they increased their investments in building energy efficiency by 16 percent in 2021 over 2020 levels to USD 237 billion. They also believed that a solution may lie in governments directing relief towards low and zero-carbon building investment activities through financial and non-financial incentives.

The government of Malaysia created the Green Technology Master Plan (GTMP) in tandem with the Green Technology Policy. The objective is to establish a low-carbon and resource-efficient economy by leveraging the energy, manufacturing, and construction sectors which emphasised the use of a green building grading system. Mpreover, another goal is to attain a 5% decrease in energy usage in ministerial buildings (KeTTHA, 2017). The plan also divided the goals for the building sector into three categories which are environmentally friendly construction techniques, green building materials, and green building design. Moreover, the Malaysian government implemented energy efficiency measures to lower building energy usage (KeTTHA, 2017).

However, in Shah Alam, to reduce the emission from buildings, MBSA had expanded the carbon measurement area to include Section 1, which covers UiTM Shah Alam, and Section 5, which covers several Selangor government buildings. To improve the city's carbon emission from buildings, Zainol et al. (2017) suggested that building's energy and water efficiency should be assessed through green assessment rating tools. As such numerous rating tools were considered by MBSA to assess the energy and water consumption of the buildings in Shah Alam.

METHODOLOGY

This study employed a qualitative approach through semi-structured interviews to assess MBSA's commitment to transforming Shah Alam into a low-carbon city. The semi-structured interview provides flexibility to the researcher and informants in answering a series of open-ended questions which require the elaboration on MBSA's implementation of LCC programs, and a review of the current and future programs that have been and will be conducted in the future. In this study, five MBSA personnel were selected for the interview session based on their years of involvement and role in MBSA's LCC program. These professionals include town planning officers, enforcement officers, engineers, and senior assistant directors who are directly engaged in the LCC implementation in Shah Alam. The selection of these professionals are significant as they determine the reliability of their knowledge which has an overall impact on the quality of the research analysis and findings, and the sufficiency to achieve data saturation.

ID	Agency	Position			
PA1	Shah Alam City Council (MBSA)	Town Planning Officer			
PA2	Shah Alam City Council (MBSA)	Committee Member			
PA3	Shah Alam City Council (MBSA)	Committee Member			
PA4	Shah Alam City Council (MBSA)	Enforcement Officer			
PA5	Shah Alam City Council (MBSA)	Engineer			

Source: Author

The semi-structured online interview was conducted in English and Malay. To help prepare them, a series of questions were provided before the interview. The open-ended questions were designed for the respondents to give an in-depth explanation about MBSA's implementation of LCC programs, a review of the current and future programs that have been and will be conducted in the future. The responses provided were recorded and analysed through thematic analysis whereby the initial step is to get familiarized with the data by transcribing the recorded audio. Subsequently, based on the transcribed notes, codes were generated by highlighting segments addressing the research objective. Using these generated codes, patterns were identified by combining the codes into a single theme. These themes were then defined and further analysed in the write-up. With the responses obtained, the actions taken by MBSA were further analysed with past studies from other literatures to determine whether the initiatives are enough to reduce carbon emission in the city.

FINDINGS

The findings of this research highlighted MBSA's dedication of implementing low-carbon city programs and strategies to achieve a low- carbon city by 2035. The study emphasised the importance of MBSA's programs in reducing carbon emissions in the city. Therefore, this study reviews MBSA's commitment towards a low carbon emission to determine if the strategies and programs by MBSA are sufficient for Shah Alam to achieve a 45% reduction of carbon emissions by 2035 to the 2015 levels. Based on the results, MBSA had incorporate numerous programs further classified into themes which includes urban environment, urban infrastructure, urban transportation, and buildings. These initiatives are in tandem with the LCCF indicators for a low-carbon city.

Theme	Statement	PA 1	PA 2	PA 3	PA 4	PA 5
	Planting trees program to reduce urban heat in the city.	~	~	~		~
Urban Environment	Conversion of 1.5 hectare retention pond into a community orchard.		~		~	~
	Revitalising back alleys to enliven the underused spaces into an "Instagram worthy spots".	~	~	~	~	
	Educate the community through food wastage program.	~			~	~
Urban Infrastructure	Collaborate with stakeholders such as Nestle & KPT Recycle to reduce the wastes in the city.	~		~		~
	Introduce food separation facilities near to the housing estates, market areas and restaurants in Shah Alam.	~	~	~	~	~
	Introduced free buses (Smart Selangor) which extends to all parts of the city.		~		~	
Urban Transportation	Road closure to facilitate the use of active transport.	~				~
	Reduce parking spaces within the city.			~	✓	
	Awarding building owners for their effort in reducing the building's carbon footprint.	~			~	
Buildings	Installation of building energy management system to control and monitor energy consumption in buildings.	~	~			~
	Changing from sodium bulb to LED bulbs.	~	~	~		~

Table 2. Summary of Initiatives Implemented by MBSA

Source: Author

The result of this study contributes to a deeper understanding of the importance of MBSA's low-carbon city initiatives. The four themes highlighted under MBSA's program have proven the city council's commitment to reducing the carbon emissions in Shah Alam. Through these initiatives, it has been remarked by all respondents (PA1 to PA5) that over the years, Shah Alam had prospered and reduced the carbon emission which was recognised by other city councils within Malaysia. They added that MBSA's development towards a low-carbon city was widely recognized. In 2021, MBSA received 16 diamond recognitions and provisional certification awards during the Low Carbon City (LCC) 2030 Challenge ceremony.

The study further found that MBSA's initiatives were mainly focused on the community's engagement which is a key factor to reduce the city's carbon footprint. The current efforts by MBSA focus on revitalising the city to produce benefits such as reducing the heat island which leads to negative impacts on the community's health (Yusof et al., 2017). The impact of the heat island effect is reduced by planting trees that block the solar radiation and reducing the temperature through tree shading (Ettinger et al., 2024). Therefore, planting trees was emphasised by MBSA to lessen the impact of climate change which in turn produced benefits.

Regarding the urban infrastructure, MBSA had introduced recycling programs across all areas in the city. They had acknowledged the importance of waste management programs which is still an ongoing concern in the city. During the interview, one of the informants stressed the importance of recycling programs as one of the mitigating measures in reducing the wastes that go to landfills. From the interview, it's found that in Shah Alam, one of the hindrances towards a low-carbon city is solid waste. It is one of the ongoing issues in Shah Alam that has yet to be resolved which requires a collective effort by the community. The solid waste has negative impacts to the city which include air pollution, water pollution, degradation of land, emissions of methane and hazardous leachate, and climate change (Abubakar et al., 2022). Recycling programs are one of the mitigating efforts to reduce the wastes that go to landfills. According to Robinson & Huun (2023), recycling is a strategy to combat the ongoing climate crisis which reduces the amount of waste that goes into landfills. They further found that between 2020 and 2050 the global carbon emissions can be reduced by 5.5 to 6.02 carbon emission through recycling.

Malaysian Journal of Sustainable Environment

Regarding urban transportation, MBSA has introduced eco-friendly transportation alternatives such as a bicycle-sharing system, bicycle lanes, and free shuttle bus services. MBSA has underlined urban transport as a focal point to reduce carbon emissions in the city. They had implemented strategies and programs to encourage the community to opt for sustainable transportation. MBSA's focus on urban transportation is evident through the programs being held. The programs aim to raise awareness on the importance of active transport and to promote the use of public transportation. These programs correspond to the Shah Alam Action Plan which aims to reduce the carbon emission from transportation.

Another element that is considered in the implementation of a lowcarbon city is buildings. MBSA had worked closely with stakeholders and community in engaging them towards reducing the energy and water consumption within buildings and homes. One of the ways to engage building owners is through acknowledging their efforts by giving awards to buildings that reduce their energy consumption. MBSA's effort to in engaging the stakeholders and community in the retrofitting and solar PV program have experienced a positive impact on the city's energy and water consumption. As a result of this collaboration, it has improved the energy consumption from buildings and homes in recent years whereby the efforts by MBSA had received 23 diamond recognition for the achievement in reducing the city's carbon emission. These programs also help to educate and raise the awareness of the importance of the low- carbon initiatives by MBSA.

Based on the findings, it can be concluded that numerous strategies have been implemented and initiated by MBSA. In recent years, MBSA have done many initiatives in implementing and improving their LCC program in Shah Alam. They have considered the factors which define a low-carbon city. This includes urban environment, urban infrastructure, urban transport, and buildings. From the interview, it can be analysed that their initiatives are known to the community in Shah Alam, which is proven by the number of the community involvements and support of the program. However, despite these efforts, there are still obstacles in implanting the program. According to the respondents, one of the major barriers that MBSA faced is the lack of financial support which limits the number of programs conducted by MBSA. In addition, it's mentioned in the interview that the age group that participated in the program is mainly young and middle-age adults. This shows that the other age groups, particularly the elderly are still not receptive in changing their habits. Therefore, continuous improvement towards the program is required to ensure that the LCC program achieve its ultimate target of reducing the carbon emission in Shah Alam.

CONCLUSION

This study explored MBSA's commitment towards achieving a low carbon city through a qualitative research methodology. It studies MBSA's effort through the programs being implemented to highlight the continuous improvements that have been made. Five MBSA personnel were interviewed, and the result was further analysed through Braun & Clarke's (2006) thematic analysis. From the results and findings of this study, Shah Alam is on track to reduce the city's carbon emissions and transform into a low-carbon city. Throughout the years, MBSA has been awarded numerous awards linked to its low-carbon city efforts. The city council has implemented programs which highlighted the four main themes in this study: urban environment, urban infrastructure, urban transportation, and buildings. However, despite the efforts by MBSA to achieve its 2035 goal, there are some limitations highlighted which influence the outcome of their program. Financial support is one of the key aspects that is lacking. With more financial support allocated to MBSA, it would increase the programs being held in the city, thus influencing the level of carbon emission in Shah Alam. Another factor is the age group that participates in the program. It is highlighted that only young adults and middle-aged adults are the key participants in the LCC program conducted by MBSA. Overcoming these limitations is crucial as it hinders the progression towards a low-carbon city. Therefore, future research are encouraged to build on this current study on the impacts of funding influencing a low- carbon city, and the study of demography and its impact towards low- carbon city initiatives.

ACKNOWLEDGEMENT

The authors would like to express their sincere gratitude to the MBSA personnel for their time in the interview and the contributions in providing

critical information on Shah Alam's Low Carbon City initiatives.

FUNDING

There is no funding for this research.

AUTHOR CONTRIBUTIONS

All authors contributed to the design of the research, the online survey, and the write-up. The extraction of information and analysis was conducted by the researchers. All authors have read and approved the final manuscript.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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