Geografia-Malaysian Journal of Society and Space 21 issue 2 (16-33)
 https://doi.org/10.17576/geo-2025-2102-02

Building a low-carbon future in Shah Alam: Governance strategies and community engagement for sustainable development

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Received: 29 September 2024; Accepted: 18 February 2025; Published: 27 May 2025

Abstract

A recognized way to accelerate the transition to a sustainable future is through the combination of sustainable development, which includes the Low Carbon City (LCC) practice, Local Authorities Empowerment, and Community Participation. Somehow, the issue of disorganized institutional management and administration may also result from these approaches. This dilemma was highlighted in the Malaysia LCC Masterplan, which indicated the need for institutional reform. Furthermore, local authorities must promote community awareness and encourage involvement in LCC efforts. The objective of this article is to examine the delivery of LCC for sustainable development through city governance and the community's awareness in supporting the effort. The method applied scoping and document reviews, Expert Interviews, and a Focus Group Discussion (FGD). The participants for the Expert Interviews and FGD were selected using the Purposive Sampling method since the investigation required inputs from key players and communities related to LCC practice. The findings confirmed that city governance is vital in implementing LCC through many applications, like the institutional framework, practices, and delivery. Meanwhile, the outcome from the FGD demonstrated that community awareness and participation in LCC initiatives are relatively low due to a lack of communication approach and collaboration between stakeholders. LCC initiatives through a better governance approach. The outcome of this study is expected to transmit the direction of practicing Low Carbon City concept through city governance by considering public participation into the process.

Keywords: City governance, community, Low Carbon City, practice, sustainable development

Introduction

In the 21st century, climate change has become an issue that cannot be ignored. The physical consequences that nations have witnessed over the years have led to the implementation of policies and strategies aimed at mitigating the effects of this global phenomenon. It was believed that the changes that led to climate change occur due to human or natural activities or the expansion of urban areas, which impact weather patterns and climate (Valante & Laurini, 2022). It was also claimed that the increasing heat towards average temperature results from human activities that overuse fossil fuels and energy resources (Alfonso, Gesto & Sadoul, 2021). Therefore, pursuing

sustainable development is widely recognized as an imperative goal that necessitates a fundamental shift in the perspectives and practices of governments, industries, and society (Silvestre & Ţîrcă, 2019). It is increasingly evident that our present systems require significant changes to ensure a sustainable future for ourselves and succeeding generations.

The idea of sustainable development, which integrates economic, environmental, and social considerations into future planning, was endorsed at the 1992 United Nations Conference on Environment and Development (UNCED), also known as the Earth Summit (United Nations, 2022a; Whitfield, 2015). This concept was further developed into a more actionable Agenda 21, which promotes sustainable development at the local, national, and global levels of governance (United Nations, 2022a). In Malaysia, the green city concept was introduced to accelerate Agenda 21 into action, and the low-carbon city concept was subsequently developed to reduce greenhouse gas emissions (Putrajaya Corporation, 2019). In 2015, the Sustainable Development Goals were introduced to strengthen the concept of sustainable development on a global scale (CEO Action Network (CAN) & Climate Governance Malaysia (CGM), 2022). To achieve these goals, impeccable governance and delivery practices are essential at every level of the framework. Thus, the objective of this article is to examine the delivery of a Low Carbon City for sustainable development through city governance and the community's awareness in supporting the effort. The outcome of this study is expected to transmit the direction of practicing the Low Carbon City concept through city governance by considering public participation in the process.

Literature review

Sustainable development is generally defined as a form of development that fulfils both current and future needs by integrating the principles of economic growth, social inclusivity, and environmental protection into urban planning and governance (United Nations, 2022b). In practice, Malaysia has three (3) tiers of government, and the sustainable agenda is governed accordingly at each level of government. At the national level, climate action is under the Ministry of Natural Resources, Environment, and Climate Change. Meanwhile, at the state level, a dedicated council at the state level is also formed to govern climate change. In addition, the governance approach for sustainable development at the state and local level can be dissimilar between each state or local authority (Shah Alam City Council, 2022; Hang Tuah Jaya Municipal Council, 2023). Therefore, local authorities play the ultimate role in setting up their division or unit to govern matters related to sustainable development (Jamaluddin et al., 2023b).

In 2015, the enforcement of Sustainable Development Goals was fully delivered to all nations. Usually, local authorities in Malaysia will adopt most of the Sustainable Development Goals (SDGs) that relate to their development goals. As an example, the Shah Alam City Council (SACC) adopted all 17 SDGs in their city governance approach and emphasized several SDGs related to climate (particularly SDG 11, 12, 13,15) to achieve their target of a Low Carbon City (LCC) by the year 2030 (Shah Alam City Council, 2022). To minimize the impact of climate change, Goal 13 in SDGs emphasizes taking urgent action to combat climate change and its impact (United Nations, 2015). Moreover, five main strategies were outlined in SDG 13 by the United Nations to fulfil the target by 2030 including strengthening resilience and adaptive capacity to climate-related hazards and natural disasters, integrating climate change measures into national policies, strategies, and planning, improving education, awareness-raising and human and

institutional capacity, implement the UN framework convention on climate change, and promote mechanisms for raising capacity for effective climate change-related planning and management.

Malaysia's sustainable development efforts began in 1992 (Ministry of Energy, Green Technology, and Water (KeTTHA), 2017). In 2002, the government implemented the National Environmental Policy, and in 2000, Local Agenda 21 was enforced. A ministry dedicated to addressing environmental issues was formed in 2000, and several policies and strategies were highlighted in the five-year Malaysia Plan. In 2009, the National Policy on Climate Change was introduced with relevant adaptation and mitigation strategies to address specific issues. The Low Carbon City (LCC) concept was seen as a possible approach to overcome global warming and achieve sustainable development (Abd Razak, Ponrahono & Mohammad Sabri, 2025). In 2011, the Low Carbon City Framework (LCCF) and Assessment System were established, along with the Green Neighborhood Guideline. Responding to climate change issues, the Malaysian government pledged to achieve carbon reduction by 40% in 2020, which steered the shaping of low-carbon city projects (Abdullah et al., 2023). The National Urbanization Policy was introduced in 2016 to address sustainable planning, and the Green Technology Master Plan 2017-2030 served as guidance before the LCC Master Plan was introduced by the Ministry of Environment and Water (KASA) in 2021 (Town and Country Planning Department, 2016; Ministry of Environment and Water, 2021). Moreover, Under the 12th Malaysia Plan, Malaysia has set an ambition to be a carbon-neutral nation by 2050, and by that together with the local authorities, the government aims to reduce the intensity of GHG emissions by 45% by 2030 unconditionally (CEO Action Network (CAN) and Climate Governance Malaysia (CGM), 2022).

Meanwhile, the LCCF is a sustainable development that inspires cities in Malaysia towards the transition to carbon neutrality in the future. The LCCF approach provides an inclusive approach by local authorities to calculate their carbon baseline and reduction progress. The LCCF, therefore, offers cities a set of guidelines to develop low-carbon strategies and initiatives, promoting energy efficiency, sustainable mobility, waste management, and the use of renewable energy sources as part of a comprehensive approach to reducing carbon footprint (KeTTHA, 2017). And because of that, it deals with carbon emissions reduction for the urban environment, urban transport, urban infrastructure, and buildings (KeTTHA, 2011). Many Malaysian cities have adopted their LCC action plan, and 52 local authorities have joined the LCCF Program, emphasizing local-level strategies (Lee, 2019). Following those strategies, in 2020, the Malaysian government, through The Green Technology Application for the Development of Low Carbon Cities (GTALCC), outlined the National Low Carbon Cities Masterplan (KASA, 2021) as the country's major reference for LCC. The master plan was officially published in 2021 by the Ministry of Environment and Water (KASA) as a comprehensive policy incorporating the LCC concept and practice for city development (Abdullah et al., 2022). In short, the Malaysian government has carried out many attempts at sustainable development since the early 2000s.

For Low Carbon City, the role of local governance is crucial in terms of administration and management (Hamdan, Ponrahono & Mohammad Sabri, 2025). The practice of delivering development within the city involves the application of LCC components like institutional framework, guidelines, capacity building, partnership, database, and several other governance criteria. Within the bounds of governance, LCC should focus on energy-efficient buildings and incorporate the latest technology for carbon reduction for buildings (Hamdan, Ponrahono & Mohammad Sabri, 2025). Therefore, environmental measures with attention to renewable energy should be embedded into policies (Iwani et al., 2025). To achieve long-term sustainability goals, Malaysia is required to consider renewable energy policies as part of sustainability efforts through

the Environmental, Social and Governance (ESG) policy framework (Iwani et al., 2025). Policy instruments are thought to be essential in guiding LCC practice (Bei He et al., 2024). However, while embracing green technologies, local authorities should also consider collaborative actions by diverse stakeholders and fostering partnerships in LCC initiatives (Abd Razak, Ponrahono & Mohammad Sabri, 2025).

Methodology

This study applied the case study method involving the city of Shah Alam under the administration of the Shah Alam City Council (SACC). The SACC was chosen for investigation concerning its efforts for the LCC initiative. Apart from that, the National LCC Masterplan had listed SACC as one of the 15 local authorities placed in Group 1 of the targeted cities aiming the Shah Alam city for zero carbon by 2050 (KASA, 2021). To systematically collect the data, the tactics were conducted into four (4) stages (Figure 1). At first, the review focused on similar studies and government documents that cover all policies and strategies related to sustainable development and LCC. Secondly, the revision focused on the indicators published by previous studies regarding LCC governance, and therefore, the indicators were then selected as a basis for conducting Expert Interviews to understand the current practice of LCC delivery at the city council level. So, the third stage was to undertake the Expert Interviews, and finally to conduct the Focus Group Discussion (FGD). As the parties deliver the national target through implementation programs and initiatives in the local context, it was also important to have the end user's expectation and acceptance of the LCC approach implemented by the local government. Therefore, the last approach employed the FGD session as a technique to gather the communities' perceptions on the LCC development.

The Expert Interviews involved four (4) main officers from SACC. However, to gain more insights from experts in the same field, the study also conducted Face-to-Face interviews and Online Interviews with officers from the Malaysian Green Technology and Climate Change Corporation, Sustainable Energy Development Authority, Low Carbon Cities and Sustainable Centre, Hang Tuah Jaya Municipal Council, Seremban City Council, Pontian Municipal Council, Ampang Jaya Municipal Council, and Seberang Perai City Council. The expectation was to collect experiences from the city-level perspectives and experiences in delivering the LCC approach, especially in the local context. Besides that, the study also engaged in a Focus Group Discussion (FGD) with nine (9) participants (community) representing the main referral of Shah Alam City, including representatives from selected communities, kindergartens, local councilors, and non-government organizations. Both for the Expert Interviews and FGD, participants were carefully selected using the Purposive Sampling method. The researchers believed that all participants were competent in conveying their experience and sharing their knowledge on governance for LCC.

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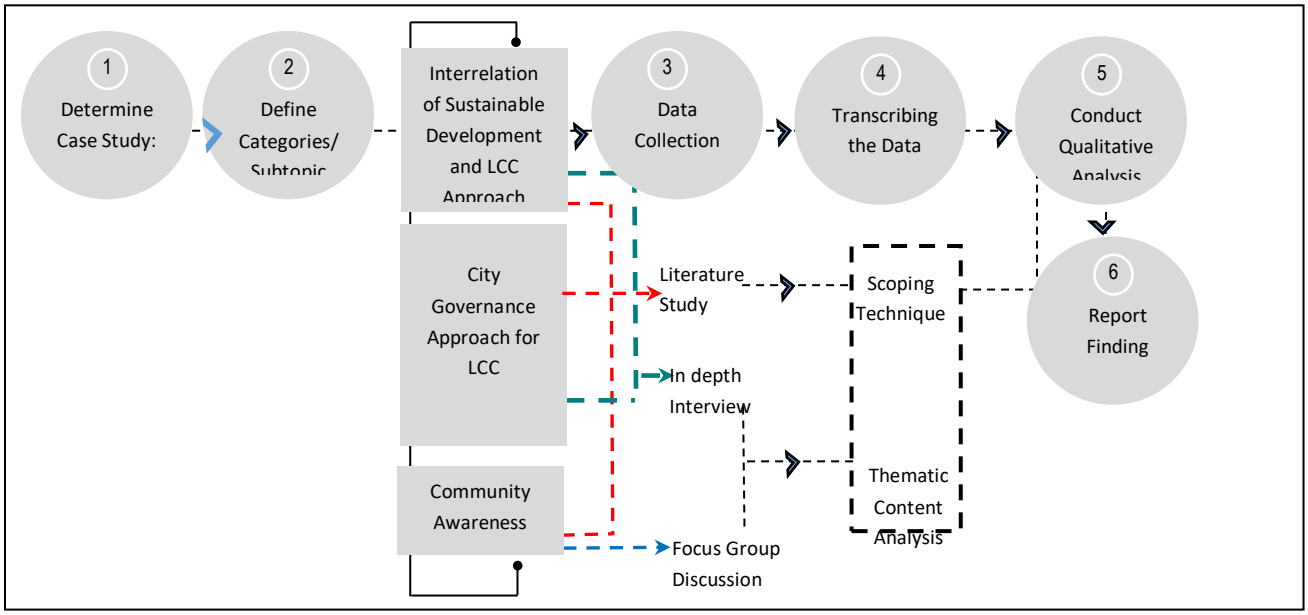

Figure 1. A summary of the methodology for this study

The process of identifying the right indicators for this study applied the scoping technique (Westphaln et al., 2021; Abdullah et al., 2022). Using the scoping technique, the procedure was arranged into four (4) activities, namely, by revising similar literature using the keyword 'low carbon governance' of 19,000 similar topics (both indexed and non-indexed journal articles). To streamline the articles into a more focused subject matter, the following procedure was to search from those articles the keyword 'low carbon governance indicators' in recent documents of the past five (5) years, resulting in 88 articles. Thereafter, the 88 articles were examined manually, by analyzing the content, perspective, and applicability to gain a rather pertinent articles for reference. Finally, from the 88 articles, the study ended up with 35 articles that discussed governance context (of local government), low-carbon governance indicators, and the implementation of low-carbon efforts at the local context. The indicators were then revised and used for the Expert Interview. From the process, five (5) indicators were utilized (institutional structure, roles or job descriptions, tools and referral documents, partnership, and database) to evaluate the practice of current delivery. A set of survey forms containing two (2) sections of questions was prepared to carry out the session. The first section was to know the local authority's commitment in achieving the LCC status, hence fulfilling the sustainable development goals, then it sought to understand the experience and practice of the SACC in delivering the initiatives. In line with the data collection method, the data is then transcribed, coded, categorized, and analyzed using the qualitative content analysis technique.

Meanwhile, the FGD assessed the community's engagement and participation in the Low Carbon City (LCC) Initiative implemented by SACC. The responses from the participants were recorded via an online meeting platform and moderated during the session. Open-ended questions were utilized. The inquiries focused on the initiatives, challenges, and mechanisms for LCC implementation, as well as the effectiveness of SACC's strategies. The approach to analysis used a similar technique for the Expert Interview by transcribing and analyzing using the thematic approach, subsequently identifying the patterns and themes based on the responses, and finally interpreting the accounts and synthesizing the findings.

Results and discussion

The result is divided into four (4) sections according to the objectives of this paper. Based on objective one (1), this paper seeks to understand the concept of sustainable development and its relation to low-carbon governance. Thus, the results indicate the SACC target in achieving sustainable development through SDGs 13 and the indicators adopted for the LCC governance study. Meanwhile, objective two (2) is to understand how low carbon is governed by the local authority. Therefore, the results show how SACC plays its role as the delivery agency to achieve sustainable targets and indicate the current practice in governing the LCC approach. Objective number three (3) aims to look at community participation to support the initiatives by the local authority. Hence, the results demonstrate the acceptance and perspectives of the end users (communities) in receiving the LCC and participating in the LCC development.

Shah Alam City Council (SACC) initiatives for sustainable development through LCC

To achieve SDG 11, by 2030, SACC targeted to ensure all its citizens have access to adequate and affordable housing, a safe and accessible transport system, increase community participation in creating a sustainable city and improving the city governance, protecting natural resources, reducing the numbers of people death caused by the disaster, improve air quality and waste management, providing more green spaces, and more importantly is infusing the sustainable policies into local actions. Meanwhile, to achieve SDG 12, SACC targeted to implement long-term (10 years) programs related to sustainable production and consumption, reducing food loss, improving the management of chemicals and waste, reducing waste through the 3R concept, encouraging sustainable practices toward private sectors, promoting public procurement practices, and increasing public awareness. To be specific, SDG 13 is the main goal toward low-carbon practised. According to SACC, three (3) strategies in Goal 13 of the SDGs are the priority of SACC on low-carbon development. According to the United Nations (2015), the strategies included are strengthening the resilience toward climate change, integrating the climate change measures into national policies, strategies, and planning, and improving public awareness and knowledge. Therefore, SACC established the Shah Alam Low Carbon City Action Plan 2035 in 2021 to address SDG 13 and put the policies into specific action. In line with the statement, the City Council also clarified that the action plan is a tool used by the local authority to translate sustainable strategies into local actions.

The Shah Alam Low Carbon City Action Plan 2035 was developed based on the Low Carbon City Framework (LCCF) that has been used by the city council as their main guidance. The four (4) sectors of the LCCF, which are the use of energy in the building, infrastructure involving water and waste management, mobility of urban transport, and the greenery of the urban environment, were infused into the action plan. In the perspectives of SDG 15, SACC puts targets to ensure the conservation, restoration, and sustainable use of terrestrial and inland freshwater ecosystems, promote the implementation of sustainable management of all types of forests, combat desertification, restore degraded land and soil, ensure the conservation of mountain ecosystems, action to reduce the degradation of natural habitats and finally, integrate ecosystem and biodiversity values into national and local planning and development (Table 1).

Table 1. A summary of SACC's target in achieving sustainable development

Drivers factor	Goals	Target	Output
SDGs	SDG 11: Sustainable Cities and Communities	SACC aims to improve the urban spaces, infrastructure, and mobility to create a safer, more accessible, and vibrant city by encouraging a social and healthier environment	• Shah Alam Draft Local Plan 2035 • SACC Strategic Plan 2016-2020
	SDG 12: Responsible Consumption and Production	SACC aims to sustain its economic and domestic activities by minimising the impact on the environment	• Shah Alam Low-Carbon City Framework • Shah Alam SDGs Roadmap
	SDG 13: Climate Action	SACC aims to cut carbon emissions by 45% by 2030	• Shah Alam Voluntary Local Review 2021
	SDG 15: Life on Land	Preserve the forest as the city's assets and an environmental protection effort	
City target	45% Reduction in absolute GHG emissions by 2035	SACC intends to be the best Low Carbon City and Malaysia's best model in Low Carbon City Initiatives by 2030. To achieve this aspiration, SACC aims to fulfil the National Carbon Reduction target of 45% by 2035. Under this target, SACC will implement the target through the LCCF by reducing carbon emissions and improving the quality of life	Low Carbon City Action Plan 2035
SACC governance mission	Enhancing the Delivery and Administration System to be efficient, effective, competent, and dynamic towards excellence	Encourage participation in policy-making and implementation, improving the governance that covers the aspect of participation, policy coherence, reflexivity, adaptation, and democratic institutions on SDG achievement at the local level	Low Carbon City Action Plan 2035-Governance: Strategy 5- City Governance
SACC commitment	SACC is committed to implementing the LCCF program that is anchored	SACC aimed to reduce GHG with a minimum 3% yearly target from 2015 to 2019. While SACC's final mission is to fulfil the National Carbon Reduction of 45% by 2035	Low Carbon City Action Plan 2035

	on the GHG Reduction element

City governance approach for LCC: Application of LCC indicators in implementation

During the data collection process, the indicators have been used as a set of questions to obtain insight from the City Council based on their current practices and experiences. In addition, it was learned that the indicators from the governance context combined with the LCC context may derive suitable LCC governance parameters and can be adopted to determine the level of effectiveness of LCC governance. Simultaneously, document reviews from the SACC main documents noticed that twenty-one (21) indicators were also employed by the local authorities through their action plan or mechanism implemented (Table 2).

Table 2. The indicators for MBSA practice

Local authority	Indicators (Parameters)
Shah Alam City Council (SACC)	The organization, institutional framework, guideline or main documents (policy/ action plan), achievement in fulfilling or sync with the global and national target, commitment, element/ sectors involved, area, programs, role, work plan, timeline, collaborators, mitigation approaches, procedure, databases system, type of initiatives and incentives, participation among the developer/industries, compliance to the requirements and Green Building Index, carbon assessment performance

The indicators were used to obtain the data from the interview session and as a result, the indicators were able to represent the information that the authors sought to understand (Table 3). However, concerning the indicators, SACC faced many challenges in its LCC practice (Table 4).

Table 3. The practices of LCC governance at the Shah Alam City Council (SACC) Based on the indicators adopted

Indicators	Local authority
Target	SACC intends to be the best Low Carbon City and Malaysia's best model in Low Carbon City Initiatives by 2030. To achieve this aspiration, SACC aims to fulfil the National Carbon Reduction target of 45% by 2030. Under the administration of SACC, Shah Alam City has been recognised as one of the most sustainable cities in Malaysia since 2010
Structured	Under the Planning Department, SACC allocates one unit known as the Sustainable Unit as the main actor to promote and deliver the low carbon approach
Roles	• Conduct any research related to sustainable development (including low-carbon cities) • Conduct capacity building for the improvement of the organisation • Promote sustainable development

Tools/ document	• Shah Alam Low-Carbon City Action Plan • Shah Alam Local Plan
Collaboration and coordination	Good collaboration within internal-external agencies/stakeholders. Aim to reposition the position or establish a formal structure to have greater coordination
Database system	The Action Plan is the main system to derive the implementation and monitor, and no standard database since the authority applied their approach to keep, record, and manage all the data

Table 4. The challenges in adopting the LCC based on the indicators

Indicators	Challenges
Policy/ document/ guideline/ tools	Translating the existing policies/ framework into specific action, however, the city still lacks an expert to handle the LCC delivery
Administrative structure	The team was established under the Planning Department and may cause an overlap in tasks among the officers. It is also a challenge to have more officers/ expertise if there is a change in the existing administrative structure
Roles	The context of sustainability is indeed wider, and the strategies are applied to many sectors/departments within the local authority to achieve the city's target. Yet, the roles played by the Sustainable Units are bound within the department and affect the communication and coordination among the technical departments in the local authority
Bureaucratic / autonomy	The autonomy is restricted due to multiple layers of governance at the local level, resulting in organisational intervention. Therefore, it brings challenges to the unit to reposition itself to gain more power and enhance the efficacy of the governance of LCC
Coordination	To have coordination among the operational stakeholders to work together if any issues regarding the system, procedure, or governance are not fully addressed
Procedure	No formal procedure is being undertaken either by the authority or developers, and therefore brings a challenge to get through the process involved and manage the data
Database	No standard system or database is used. The lack of a centralised database system to store and record the files poses a challenge for the local government to obtain the information
Performance	Authority is not able to see their current achievement if involvement from the various parties is less coordinated, which is seen through the authority roles within the monitoring stage. Thus, there are constraints on who will monitor the implementation of the low-carbon initiative

City governance approach for LCC: Administrative approach for Low Carbon City delivery at the local level

Based on the local authority's administrative approach, this study indicates that there is no specific unit dedicated to delivering low-carbon development at SACC. However, the Planning Department has established specific units responsible for leading sustainable planning development. The LCC initiatives have been assigned to a small team that addresses matters related to sustainable development. The team is known as "The Sustainable Unit," where its roles focus on planning, implementing, and monitoring the LCC initiatives. The Sustainable Unit operates under the Planning Department, and its members concentrate on matters related to sustainable development instead of carrying out their primary duties as town planners, which involve development plans and planning permission. Figure 2 below illustrates the current position of the Sustainable Unit in the SACC administrative structure.

The study found that this entity currently plays a pivotal role in advancing the sustainable agenda. The Sustainable Unit has a more admirable vision to achieve the city's target. The authority's target in shaping the city is to become a sustainable or low-carbon city by 2035. Thus, they are currently delivering low-carbon city initiatives as one of the leading targets delivered by the Sustainable Unit. This situation is due to the shift towards sustainable or low-carbon targets by SACC, where sustainable development is their greater goal in physical planning and development. However, the unit is only a small-sized entity that has limitations in making direct decisions. Meanwhile, in the whole administrative context, there is potential to restructure the LCC administrative approach instead of placing the sustainable agenda solely under the responsibility of the Planning Department.

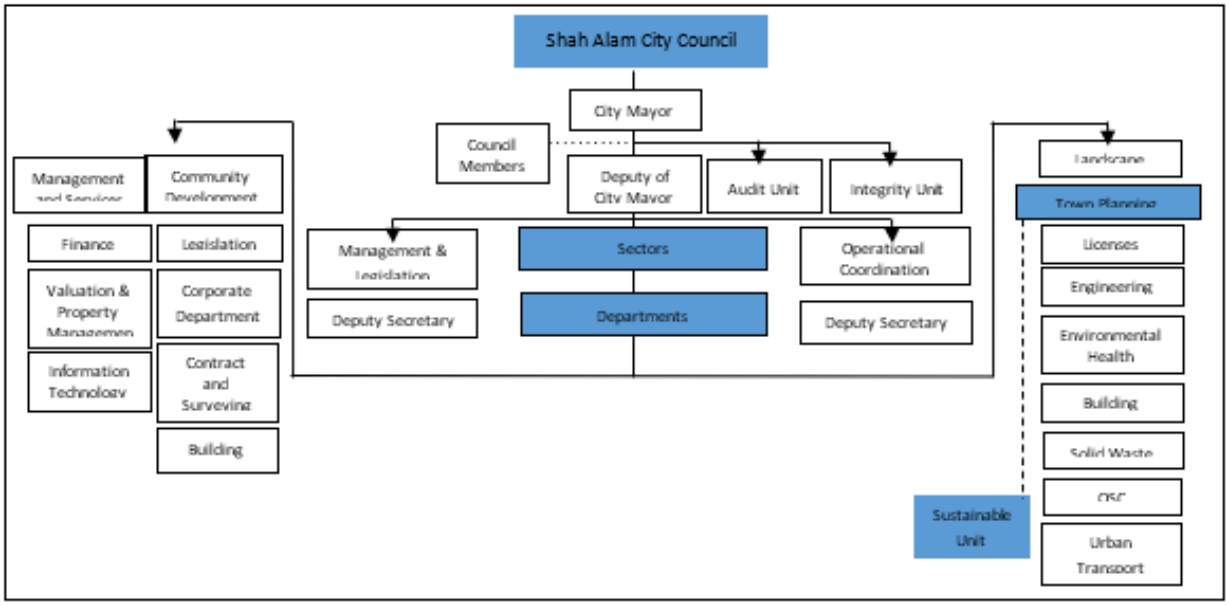

Figure 2. The governance structure at SACC shows the position of the unit that is responsible for delivering LCC initiatives

Currently, there are only six (6) individuals dedicated to the sustainable agenda. It has been agreed that the amount of capacity dedicated by the team is acceptable considering their current

roles and responsibilities. However, if there are changes in the existing administrative structure, it may require additional officers. In addition, it is important to note that this approach might differ for other local authorities if their development goals do not prioritise the sustainable agenda. As mentioned earlier in section 4.2, several indicators that represent administrative context (i.e., structure, approach, capacity, roles, challenges, potential) have been used to determine the scope of the study and used as a variable to gain insights from the officers. Based on this administrative context, the breadth of view from the local authority was determined through four (4) main aspects, such as approach, roles, driving force, and challenges (Table 5).

Moreover, in terms of its administrative roles and functions, the study also reveals that no additional responsibilities are assigned to the unit besides the designated roles. However, there are supplementary roles if the expertise is needed within the entity several times to resolve a situation or provide an opinion. Meanwhile, the implementation of the strategy is subject to the technical departments within the local authority. These sustainable units seek a 'formal' position to resolve the issues encountered during the governing process. Again, this study aims to identify whether the absence of formal institutions affects the implementation of low-carbon cities. It was found that the local authority perceives it as the biggest challenge in administering the low-carbon city initiatives, especially at the local level. The non-existence of a specific unit for LCC development brings challenges in terms of power, coordination between the departments involved, and the decision-making process. It was also claimed that the LCC approach is still not well understood by the departments within the authority on several matters (i.e. ,scope of work, process, involvement). Specifically, the main variable that needs to be highlighted is the derived factor in implementing the LCC approach. Currently, there is no legal requirement that obligates the LCC governance at the city level, as it is a voluntary act undertaken by the city council based on the city's target. However, to restructure the governance framework, it was affirmed that a legal act may be required to initiate the parties that can control and manage the LCC development at the local level. However, it this poses the challenge of determining which parties should lead the establishment of legal drivers for LCC implementation.

Table 5. The output from the administrative context

The context	Local authority
The administrative approach	*''Sustainable development is, above all, however, it was put under the Planning Department''* *''Rearrangement of the structure is needed. However, the reality is, a sustainable unit is currently only a small unit under the Planning Department.* *''We need to know everything before all the development is implemented, however, we are only a small unit and cannot make a decision directly'.'* *''LCC was administered throughthe Sustainable Unit under the Planning Department a starting with Local Agenda 2,1 and now extended into sustainable matters, and after that, we go deeper into low-carbon practices''*
Functions and roles	*''The roles played by Sustainable Units are basically to achieve the sustainable target.''* *''Atthe local authority, we are like a manager, from start to the last thing''*

	''Advise the developer, convince the developer so that they are willing to join the LCC approach, we approach the consultants and the developers.''
Driving force	*"It's a volunteer, we don't have an actor. ''The SDG is one of the factors of why we emphasize sustainable matters.'' It should be that SDG is the driving force for all. Then, sustainable or low carbon is easier to achieve."*
Main issues/ challenges	*''The non-existence of formal institutions is the main challenge, and we need to emphasise on the improvement of the administrative aspect."*

City governance approach for LCC: The operational approach practiced by the local authorities

In terms of procedure, current practices show that there is no formal procedure that needs to be undertaken either by the authority or developers. This is due to the nature of the approach, which only occurs when involvement from the private sector exists. The scenario applies when the developers fulfilled the checklist of low-carbon indicators, and the authorities calculated the index of carbon reduction from the previous year. Usually, the private sector will be encouraged by the local authority to incorporate the LCC initiative into their development plans, thereby contributing to the local authority's efforts to achieve a low-carbon status. A blueprint will then be submitted to the Malaysian Green Technology and Climate Change Corporation (MGTC) under the Ministry of Natural Resources, Environment, and Climate Change for evaluation. As an example, SACC has garnered a significant degree of participation from the private sector towards the integration of low-carbon city elements into their buildings and development projects. This signifies the growing awareness and commitment among diverse stakeholders towards the promotion of sustainable development practices, which is pivotal to the accomplishment of the goals of a low-carbon city. Meanwhile, in terms of the process involved within the organization under the sustainable planning unit, it normally starts by; (i) coordinating the target for the implementation of sustainable development projects or programs; (ii) preparing the agenda; (iii) preparing any letters regarding project implementation; (iv) distributing of actions to the internal departments and other agencies; (v) coordinating the collection of paperwork or report; (vi) managing the actions from the presentation to obtain management considerations; (vii) follow up with actions and finally; (viii) recording and filing.

In terms of the system, studies show that there is presently no formal system or database applied to record all the data in the context of operations or management. The local authority has been provided with a comprehensive Excel sheet format that includes a checklist and indicators that are essential for them to fulfil. Submissions for these requirements are made online, primarily through email systems. Meanwhile, in the management aspect, all the data is recorded separately according to the parties involved, private or government agencies, and other departments within the local authority. Since there is no centralized database system to record and keep the files, it becomes another big challenge for the local authority to retrieve the data. This issue also arises when coordination among the agencies is needed, bringing consequences to both the operational and administrative aspects of LCC delivery.

In another part of the operational context, SACC claimed that one of the tools used to monitor the implementation of LCC initiatives is made through the strategy outlined in their primary referral document. The monitoring tool utilized by SACC is derived from their action plan, known as the Low Carbon City Shah Alam Action Plan 2035. This comprehensive plan outlines the strategies being addressed in the recently established National LCC. On the 21st of

October 2021, the Shah Alam LCC Action Plan 2035 was officially launched and made available for implementation as a powerful development tool. The city council anticipates that this plan will effectively reduce carbon emissions within Shah Alam and contribute to a more sustainable future. As the challenges occur in an operational context, it may indicate performance issues. The City Council are not able to assess their current achievements if involvement from various parties is less coordinated which is seen through the authority roles within the monitoring stage; there are constraints on who will monitor the implementation of the low-carbon initiative.

Community contribution to sustainable practice

Based on the output from the FGD session, in terms of community awareness, the study indicates that the communities in Shah Alam may possess a limited understanding of low-carbon practices, thereby impeding their capacity to contribute actively. Participants also focused on the value of community involvement in low-carbon city projects and initiatives. The majority of participants brought up this point, emphasizing how crucial it is to promote community involvement and participation in these programs and activities to guarantee their success. The participants also highlighted the importance of community involvement in low-carbon city projects and initiatives. Some participants emphasized the significance of gaining knowledge from the optimal approaches employed by others who have effectively executed this endeavor. The rest recommend that early community education be a component of the endeavor to achieve community behavioral change. As such, the local authorities must undertake educational and engagement efforts with the community and raise the awareness of the community of Shah Alam regarding the low-carbon concept and its benefits. In addition, it is required to draw lessons from the best practices of those who have successfully implemented such initiatives.

Regarding factors that lead to community participation in sustainable practice, most of the participants emphasized the importance of adapting participation methods to specific target groups, as they are closely related to socio-economic background, and different segments and target groups may require different approaches. From other perspectives, the communities also agreed that a collaborative approach based on the Low Carbon Cities Initiative would improve community participation capacity by stimulating community interest throughout the process, especially in decision-making. The communities also claim that effective communication strategies might improve how the information is delivered, accessed, and effectively reaches the target group. Moreover, in encouraging active participation from the communities, it is important to ensure continuous collaboration between stakeholders, especially between the local authorities and communities. On top of that, the communities believe that sufficient resources, such as financial assistance, would be of great benefit in encouraging sustainable practices by the local communities. Additionally, incentives, rewards, and all forms of recognition are essential to encourage community participation in programs and initiatives that ultimately contribute to community behaviour change. Table 6 below outlines the summary of community perceptions on LCC awareness.

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Table 6. Level of understanding and awareness of the community

The context	Participants								
	P1	**P2**	**P3**	**P4**	**P5**	**P6**	**P7**	**P8**	**P9**
Level of understanding and awareness of the community									
1. Understanding the importance of community participation in projects and initiatives	X				X	X	X	X	X
2. Understanding of the concept of low carbon, which hinders their ability to actively contribute	X				X		X	X	X
3. Best practices in other communities and countries	X				X				X
Factors that influence community participation									
1. Method of participation	X				X	X	X	X	X
2. Promotion and information on low low-carbon concept	X				X	X		X	X
3. Financial and resource	X				X				X
4. Collaboration between stakeholders	X				X		X	X	X
5. Government's role and initiative					X	X			X
6. Government policies and guidelines					X				X

Shah Alam City fell into the Group 1 category in the current National Low Carbon Master Plan, which requires it to achieve carbon neutrality by 2050. The government recognized that the efficacy of an LCC initiative is heavily dependent on the governance and implementation framework, in addition to urban planning and community participation. As such, the government has acknowledged that the governance component is a crucial driver of the initiative, and it should be prioritized accordingly. Hence, SACC's target for the city is mainly to transform the city to become a ''Quality, Peaceful, Conducive and Renowned City'. Meanwhile, towards achieving sustainability, SACC aims to make Shah Alam City a low-carbon city by 2030. From the governance perspective, SACC highlighted that the mission needs to be accomplished by ''enhancing the delivery and administration system to be an efficient, effective, competent and dynamic towards excellence''.

To justify, the city has started emphasizing its sustainable journey since 1998 based on the State Agenda 21: Strategies for Sustainable Development and Selangor Agenda 21. In line with that, the agenda has been specified in the local context as Shah Alam Local Agenda 21 (LA21) from 2000 until 2015, before the Shah Alam Low Carbon City Framework (LCCF) took place in

deriving the city goals toward sustainability. Along with that, Shah Alam SDGs Roadmap, or Voluntary Local Review (VLR), was introduced in 2020 as preliminary guidance that highlighted the strategies and guiding frameworks for SDG implementation. Through this document, a complete plan, allocation, and actions have been outlined to implement the Sustainable Development Agenda thoroughly. Also, the city council highlighted that the city targets a prompt target based on the documents as its main reference. The City Council also clarified that SDG 13 consists of comprehensive strategies to address climate issues.

Twenty-one (21) indicators were employed by SACC through their action plan (as shown in Table 3) to implement the LCC actions. However, only six (6) indicators have been used in this study, including the target, structured roles, tools or documents used, coordination among the parties involved, and lastly, their database system. Eight (8) challenges also discovered from the study which shows that the local authority needs to emphasizes more on the policy planning, the improvement of current administrative structure, the roles play by the responsible unit, the autonomy aspect which include organization intervention, coordination among internal and external parties, the procedures, existing database system, and finally the monitoring aspect.

In the context of the administrative approach, all the sectors and departments within the local authority need to work together to achieve sustainable development. As mentioned earlier, the low-carbon city initiatives were administered by a small unit within the Planning Department. Nonetheless, it has been argued that the concept of sustainable development is beyond the core roles of the planning department. Yet, the current practices have not given enough priority to these units, thus resulting in an organizational issue, hence affects the governance of low-carbon initiatives. Simultaneously, this study summarized that the ultimate role of the low-carbon unit is to act as a secretariat to implement the approach. The roles include (i) conducting research related to sustainable development, including low-carbon cities; (ii) conducting capacity building for the improvement of the organization, and (iii) promoting sustainable development. Despite the challenges mentioned above, there is significant potential to improve the current administrative approach to LCC development. The current approach can be enhanced by repositioning the units as one of the activators and a formal framework, hence allowing more authority to the team to ensure the effective implementation of low-carbon city initiatives throughout the entity.

SACC aims to achieve LCC Status by 2030 and strives to deliver a more efficient system and make improvements for better practices. In an operational context, the private sector or developers are one of the major players. Although the implementation of LCC is not forced on the development in their administrative boundaries, SACC has made commendable efforts to encourage active participation from private sector entities in implementing LCC development initiatives into physical planning and development. This demonstrates the organization's unwavering commitment to achieving its low-carbon status and promoting sustainable development for a better and more sustainable future. Besides, the planning department, through the sustainable planning unit, other technical departments within the authority, such as building, engineering, transportation, and waste management, work together and occasionally get involved in any related projects or programs relating to LCC. Essentially, this highlights that technical departments need to play their roles as they are the actual implementers of the relatable programs. In addition, the communities also play their roles in contributing to the effort of carbon reduction. It can be seen through communities' participation in programs contributing to carbon reduction. Active involvement of communities in the efforts to achieve a low-carbon city is a commendable and essential step towards sustainable development. For instance, their participation can be seen

through improving energy usage, waste management, the use of public transportation, and other related programs.

Since the delivery requires involvement from other departments within the city council or private participation, effective coordination among various entities is a crucial factor to consider in ensuring the optimal performance of any process or system. Without proper coordination, the attainment of desired outcomes becomes challenging, resulting in an inefficient and ineffective process. Therefore, it is imperative to establish clear communication channels and ensure that all entities involved are working towards a common goal to achieve maximum efficiency and productivity. Moreover, the elements of governance in operational practices need to be emphasized even more. The aspect of governance influences both the operational and administrative contexts, thus affecting the effectiveness of LCC delivery. As mentioned earlier, one of the consequences is the effect on the coordination among the parties involved. Good coordination among entities will ensure smooth actions in data management, communications, and implementation of procedures. In 2020, the city council decided to enhance its previous action plan to align it with its current objectives and the National LCC Masterplan 2020. Following the assessment, SACC has discovered that certain strategies were not fully accomplished. SACC then underwent a revision process, resulting in an improved version of the LCC Action Plan. The updated plan sets a target of reducing absolute GHG emissions by 45% by the year 2035. Moreover, the new action plan was developed through a collaborative process that involved community members, stakeholders, and the departments within the city council. One of its six (6) strategies focuses on "Communication, Education, and Public Awareness". Since the local authority deliberates the LCC initiatives, the communities are the end users who will also contribute to and be impacted by the approach. The findings aim to demonstrate the acceptance of local communities towards sustainable practices through awareness and understanding of the LCC concept. Thus, it is necessary to assess the level of understanding and awareness of the community in Shah Alam regarding the low-carbon concept to determine needed to see the future potential related to sustainable community development.

Conclusion

This study summarizes the broader view of LCC governance from four (4) different contexts. First, it starts with the need to understand the LCC concept as a local tool for sustainable development and translate it into an institutional framework, policies, and strategies. Then, this study tries to summarize the scope related to the LCC governance study through several indicators as the basis for indicating the current practices of LCC delivery. Thirdly, the current practices of LCC governance by the case study, which is SACC, are elaborated through its administrative and operational approach. Finally, after looking at the agency's efforts to deliver sustainable initiatives, this paper aims to assess end-user acceptance, which is the local communities' awareness and understanding of the LCC concept, hence allowing them to contribute more to sustainable practices. From the policy application, it was identified that local authorities convey global and national strategies for achieving sustainable status by establishing their action plan as the ultimate document and tools for implementing and monitoring the LCC initiative delivered at the local level. Meanwhile, six (6) indicators for LCC governance were identified and determined, and these indicators were then applied for investigation in the case study. To conclude the current practices of LCC delivery in administrative and operational features, the findings indicated that the current administrative practice needs to be restructured to empower the roles of the dedicated unit for LCC

efforts and enable a more effective delivery system, including coordination among the related agencies and database management. Meanwhile, on community acceptance, the results indicate that the community of Shah Alam might require a better low-carbon idea to allow them to actively participate in the LCC initiatives, whether initiated by the community or the local authority. Based on the findings, the researchers believe that this collective summary can serve as a reference for LCC measurement by other local governments in Malaysia.

Acknowledgement

This study is funded by the Ministry of Higher Education Malaysia (MoHE) under the Fundamental Research Grant Scheme (FRGS) sponsorship file number: (FRGS/1/2021/SS0/UITM/02/46); and RMC registration number: 600-RMC/FRGS 5/3 (180/2021). The authors, therefore, would like to extend their gratitude to the Ministry and thank the UiTM Research Management Centre (RMC), as well as the College of Built Environment (UiTM) for supporting this research. The researchers also appreciate the participation of the experts from the local government in providing valuable information for the study.

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