A content analysis of sustainability reporting: A pathway to advancing low-carbon cities development in Malaysia

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ABSTRACT

Low-carbon cities represent a vital agenda of sustainable development, aligned with the United Nations Sustainable Development Goals (SDGs) and prioritized under the 12th Malaysia Plan. Although many local authorities have initiated programs to promote low-carbon development, limited secured funding remains a constraint. To attract private investment, effective communication, especially through public documents like annual reports, remains essential but is currently underutilized. Past research has found that disclosure of low-carbon initiatives by Malaysian local authorities is often limited, inconsistent, and varies widely. This is partly due to differences in how report preparers interpret and balance local priorities with global sustainability expectations. Consequently, stakeholders may face difficulties in evaluating these initiatives during the decision-making process. This study examines the annual reports of Malaysian local authorities, focusing on three objectives: to assess the comprehensiveness of disclosure, evaluate compliance with reporting guidelines, and identify variations in reporting practices. The analysis highlights similarities in core content elements but reveals differences in how low-carbon initiatives are reported, the level of compliance with guidelines, stakeholder inclusion, and the use of financial indicators. These variations reflect the differing contexts, capacities, and strategic priorities of local jurisdictions. The study offers insights into the current state of sustainability reporting among Malaysian local authorities and serves as a benchmark to improve transparency and consistency. It highlights the need for transparent and comprehensive reporting to meet stakeholder expectations and strengthen commitment to the SDGs, while also acting as a critical step toward securing private financing for sustainable development initiatives.

Contribution/Originality: This study contributes to the existing literature on sustainability reporting in Malaysian local governments within the context of low-carbon city initiatives. By applying stakeholder theory and international frameworks, it offers contextual insights into public sector sustainability reporting in a developing country setting.

1. INTRODUCTION

Low-carbon cities (LCC) agenda is a key component of climate change mitigation strategies aimed at reducing carbon emissions in pursuit of sustainable development objectives. Climate change poses significant threats to the global community, including loss of livelihoods, food and water insecurity, and adverse impacts on human capital,

such as poverty and inequality. According to the World Bank Group's Climate Change Action Plan 2021–2025, while industrialized countries were historically the major polluters, some emerging economies have now become top contributors to carbon emissions. For example, in 2019, China and India were responsible for 35.1% of global CO_2 emissions. Cities are the largest consumers of energy worldwide. Although they represent only 6.7% of the global population, the 27 largest cities account for 9.3% of global electricity use and generate 12.6% of the world's solid waste. Ideally, cities should strive to improve energy efficiency, adopt renewable energy sources, use land effectively, promote composting, recycling, and waste-to-energy technologies, and implement low-carbon or electric transportation systems. These efforts can lead to better pollution control, resource optimization, and waste reduction. Globally, several cities have led the way in sustainable urban planning. For instance, Copenhagen, ranked the world's greenest city twice by the Global Green Economy Index, has halved sewage discharge through holistic environmental planning. Similarly, Stockholm has reduced per capita carbon emissions by over 25% since 1990 and aims to become fossil fuel independent by 2050.

To balance economic development with environmental protection, Malaysia has pursued a national sustainability agenda since the introduction of the National Policy on the Environment in 2002. In line with global efforts, Malaysia is committed, along with 192 other countries, to achieving net-zero carbon emissions by 2050. Under the 12th Malaysia Plan, sustainability is one of seven national priorities in response to rapid urbanization and development pressures. The National Low-Carbon City Masterplan (NLCCM), launched in 2021, complements the earlier Low-Carbon Cities Framework and Assessment System (LCCF), introduced in 2011. Malaysia's low-carbon development strategy is structured around three key pillars: (1) City Reform and Transformation, (2) Green Cities, and (3) Green Lifestyles. These aim to guide local authorities toward building environmentally and socially sustainable cities that are attractive to private investment. However, the NLCCM also identifies seven major challenges to achieving the 2050 target, including limited community participation, funding constraints, and capacity-building gaps.

Achieving the LCC agenda requires collective participation from all sectors to balance economic growth with the reduction of carbon emissions that affect urban livability. Local authorities play a central role in this agenda, as they are the closest governing bodies to communities and the environment. Their proximity enables quicker responses to climate-related issues and enhances their ability to influence behavioral change at both individual and community levels (Ascui, 2014; Uyainik, 2021).

Nevertheless, the implementation of low-carbon strategies at the local level has often been inconsistently designed and underfunded, leaving room for local authorities to shape their own priorities (Gudde, Oakes, Cochrane, Caldwell, & Bury, 2021). This underscores the importance of establishing a strong monitoring and coordination mechanism between federal and local governments to ensure alignment with national sustainability targets. Increasingly, citizens, taxpayers, and stakeholders are demanding that public sector institutions demonstrate how they are addressing sustainability issues, including climate change and carbon reduction (Accountants Today, 2022).

In this context, this study examines the annual reports of three Malaysian local authorities using content analysis to achieve three objectives: (1) to assess the comprehensiveness of disclosure, (2) to evaluate the degree of compliance with sustainability reporting guidelines, and (3) to identify variations in reporting practices. The study highlights both similarities and differences in how local authorities disclose low-carbon initiatives, including aspects such as the type of reporting framework used, stakeholder engagement, and the inclusion of financial indicators.

Although this study focuses on only three local authorities, which may limit the broader applicability of the findings, efforts have been made to ensure analytical depth and contextual relevance. The selected cases offer rich insights into sustainability reporting practices within differing local governance settings. While not intended to be statistically generalizable, the findings are potentially transferable to other local authorities in Malaysia that operate under similar institutional, regulatory, and development frameworks. Therefore, the study identifies key elements that can be benchmarked by other local authorities, particularly in terms of reporting structure, use of indicators, and alignment with the SDGs and the national sustainability agenda. In addition, the study highlights general principles

in sustainability reporting, such as clarity, consistency, stakeholder inclusion, and outcome-based disclosure, which are relevant and applicable to the wider context of local governance in Malaysia.

2. LITERATURE REVIEW

2.1. Low-Carbon Cities Development in Malaysia

Rapid development and urbanization have been identified as key contributors to greenhouse gas (GHG) emissions, which, in turn, drive global climate change (Rahman, 2021). Statistics show that for every one percent increase in urbanization, GHG emissions rise by 0.92 percent (NLCCM, 2021). In response to the environmental pressures of rapid urbanization, the Malaysian government has introduced a range of policies and agendas to address issues related to sustainability, climate change, and carbon emissions. As part of its goal to become a low-carbon nation, the government has included climate action as one of its seven primary concerns under the 12th Malaysia Plan. Additionally, Malaysia has set an ambitious target of establishing 200 low-carbon zones by 2030 to help improve carbon management and urban environmental performance.

Low-carbon city initiatives in Malaysia promote the use of efficient green technologies with low-carbon outputs to mitigate the impacts of climate change. Under the NLCCM, 33 local and regional governments have been selected as Target Cities, categorized into three groups based on a key criterion: a minimum population of 300,000. According to the Malaysian Department of Statistics (2010) local authorities such as Putrajaya Corporation, Kulai Municipal Council, Pasir Gudang City Council, Pontian District Council, Sepang Municipal Council, and Hang Tuah Jaya Municipal Council were not included in the initial selection.

By 2020, a total of 52 cities had begun implementing the Low-Carbon Cities Framework (LCCF), and 19 cities had initiated the preparation of their action plans. Furthermore, five cities had already achieved low-carbon city status. Between 2011 and 2020, these initiatives collectively reduced carbon emissions by 148,572.20 tons.

Local authorities have taken various steps to demonstrate their commitment to GHG reduction, including implementing mitigation measures guided by local frameworks and international best practices. Many have engaged with global networks such as the C40 Cities Climate Leadership Group (C40), Local Governments for Sustainability (ICLEI), and the Global Covenant of Mayors (GCoM) to strengthen leadership in addressing climate change. Consequently, local authorities play a crucial role in developing action plans, setting carbon reduction targets (both short- and long-term), documenting strategies, and communicating relevant GHG reduction progress within their jurisdictions. However, despite these visible efforts, there remains a significant gap in how systematically and transparently these actions are reported, particularly in terms of consistency, completeness, and alignment with national and global reporting frameworks.

2.2. Communicating Low-Carbon Initiatives to Investors and Stakeholders

Investors and stakeholders in government projects are increasingly interested in understanding how climate impacts are being addressed, especially as they consider expanding their investments in zero-carbon initiatives. Substantial financial commitments are required to mitigate climate impacts, and local authorities often face challenges in allocating sufficient funds to balance environmental and social projects while also supporting national economic growth and improving citizens' quality of life. Some argue that it is unnecessary to rely solely on local government funding, as such resources should primarily serve the direct needs of local communities (Wong et al., 2022). Therefore, private sector involvement is essential to support local authorities in meeting national commitments toward net-zero carbon. It is estimated that Malaysia will require RM350 billion in investments to achieve its net-zero carbon agenda (NCCP 2.0). However, past studies suggest that private investors may be reluctant to fund public sector initiatives due to the high capital requirements and perceived risks involved (Hashim, Ismail, & Ahmad, 2016). Another contributing factor is that carbon reduction initiatives have not consistently demonstrated significant positive impacts on economic growth (Yang, Liao, & Wei, 2020). Additionally, some investors believe that environmental and social

risks and opportunities in public-interest projects are not adequately communicated (Masuda, Kawakubo, Okitasari, & Morita, 2022). Without specific reporting that addresses the environmental, social, and economic implications of low-carbon projects, investors may lack the information needed to assess sustainability performance effectively (Matthew & Day, 2011).

A comprehensive report that includes environmental and social impacts can also function as a monitoring tool to ensure low-carbon project implementation aligns with national targets. This approach is commonly practiced in the private sector, where sustainability reports explain how corporate initiatives affect environmental, economic, and social performance, thereby complementing financial reporting for investor decision-making (Esrig-Olmedo, Rivera-Livio, Munoz-Torres, & Fernandez-Izquierdo, 2017). In the public sector, sustainability reports primarily serve to convey legitimacy, transparency, and accountability in the use of public funds for environmental and social initiatives (Kassim et al., 2021).

To attract greater private financing, public sector sustainability reporting must now serve a dual purpose: to provide transparent information for public scrutiny and to disclose material environmental and social efforts that support informed investment decisions (Bursa Malaysia Securities Berhad, 2018).

Despite this, the practice of sustainability reporting remains controversial, as it is not yet an institutional norm and remains largely voluntary (Andrades, Jorge, Muriel, & Calzado, 2024). Reporting entities have wide discretion over the format, frequency, authorship, and dissemination strategies they adopt (Niemann & Hoppe, 2018). Some use sustainability reporting merely to highlight current efforts rather than to disclose broader performance or impacts (Joseph & Taplin, 2012; Manes-Rossi, 2020). This results in highly diverse and non-standardized practices, lacking consistency in disclosure content, timing, and format. Contributing to this inconsistency are the absence of a coherent reporting framework, limited clarity, and a lack of historical precedent (Andrades et al., 2024). These issues present challenges for stakeholders seeking to interpret or evaluate sustainability information effectively. Stakeholders increasingly expect information that is not just promotional but also transparent, balanced, and inclusive of both positive and negative impacts. This inconsistency may also stem from differing perceptions among report preparers regarding the relevance of sustainability reporting in addressing local challenges while meeting global expectations (Dissanayake, Tilt, & Qian, 2021).

In Malaysia, sustainability reporting related to the low-carbon city agenda is still in its early stages. While progress has been made, it has yet to reach the level of maturity seen in many developed countries (Accountants Today, 2022; Domingues, Lozano, Ceulemans, & Ramos, 2017). At present, local authorities in Malaysia are only moderately engaged in sustainability reporting, particularly in relation to climate change and low-carbon city initiatives. Internationally, the Global Reporting Initiative (GRI) has noted that countries such as Australia, Hong Kong, Japan, and New Zealand have long been disclosing environmental and social impacts (Joseph, 2010). In Italy, sustainability reporting is viewed as a communication tool between governments and their citizens, associations, and interest groups (Global Reporting Initiative (GRI), 2005). France is progressing further, with legal mandates requiring all municipalities to periodically report on their sustainability performance (CGDD, 2012; Mol, Van Schie, & Budding, 2024).

Although frameworks such as GRI, the Global Covenant of Mayors Common Reporting Framework (GCoM CRF), and the Low-Carbon Cities Framework (LCCF) exist to guide sustainability reporting, limited research has evaluated their effectiveness in the public sector context, particularly among Malaysian local authorities. Furthermore, while prior studies (e.g., Joseph, 2010; Niemann & Hoppe, 2018) have documented variations in reporting practices, few have explored how such differences affect stakeholder engagement, decision-making, or access to funding.

This study addresses that gap by examining the content of low-carbon disclosures and identifying key inconsistencies that may influence the credibility, comparability, and usefulness of sustainability reports.

3. RESEARCH METHODOLOGY

A content analysis method is the most appropriate method as it enables the extraction of information from printed or digital documents that serve as preliminary evidence. In this case, the sources are the annual reports of three local authorities in Malaysia. These local authorities were selected through purposive sampling, based on the availability and accessibility of informative reports. This sampling method is particularly useful when only a limited number of documents meet the criteria or possess the characteristics under investigation (Cooper & Schindler, 2014). Additionally, the selected local authorities are recognized for their active engagement in the low-carbon cities agenda (NLCCM, 2021).

According to the National Low Carbon Cities Masterplan (NLCCM 2021), a total of 33 local and regional governments have been designated as Target Cities for low-carbon development. These include city councils, municipal councils, district councils, economic regions, and modified local authorities. All participate in the Low-Carbon Cities 2030 Challenge, a government-led program aimed at accelerating the transition toward low-carbon cities. These authorities are divided into three groups based on their implementation timeline, with the first timeline of NLCCM involving Group 1, which comprises 15 target cities; the second timeline of NLCCM implementation in 2026 involving 11 target cities; and the third timeline of 2050 involving Group 3, consisting of 7 target cities.

This study focuses on three Group 1 local authorities: Petaling Jaya City Council (MBPJ), Shah Alam City Council (MBSA), and Hang Tuah Jaya City Council (HTJ). These authorities are categorized at the same level of implementation and are known for their strong commitment to low-carbon initiatives. They were selected to gain an initial understanding of how such local governments disclose information related to climate change and the low-carbon cities agenda to stakeholders. The analysis aims to highlight similarities and variations in the sustainability reporting practices of these three active local authorities.

A deductive content analysis approach was employed, using pre-established themes derived from both national and international reporting guidelines and policies. The coding process was guided by frameworks such as the Global Reporting Initiative (GRI), the Global Covenant of Mayors Common Reporting Framework (GCoM CRF), and the Low-Carbon Cities Framework (LCCF) for the national context.

Themes and coding were developed manually with certain key phrases. Manual coding allows the researcher to work closely with the data and to capture the nuances in the meaning of information. Moreover, manual coding also promotes more reflective analysis on the subject matter (Braun & Clarke, 2006). Each code consisted of a code name, a clear definition, and an example quote extracted from the annual reports. Coding was applied at the paragraph and sentence levels, focusing on statements or sections that contained meaningful information related to sustainability or low-carbon initiatives.

The data were coded into six thematic categories as shown in Table 1.

Table 1. Thematic categories of low-carbon initiatives are reported in the annual report.

No.	Theme	Key Phrases
1	Report type	Specific low-carbon targets or implementation schedules.
2	Reporting guidelines	References to frameworks like GRI or LCCF.
3	Content elements	Types of sustainability disclosures (e.g., energy use, emission data).
4	Dissemination strategies	Communication channels used (e.g., websites, infographics).
5	Stakeholders' inclusiveness	Evidence of stakeholder engagement or consultations.
6	Financial indicators	Inclusion of budget allocations, funding sources, or cost-benefit disclosures.

The themes were developed to capture the depth and breadth of the reporting on sustainability practices. Each theme was aligned with relevant dimensions from established frameworks, such as GRI (e.g., stakeholder inclusivity, materiality, completeness) or LCCF (e.g., baseline data, action plans, emission reduction metrics), depending on the type of content disclosed. This thematic alignment allowed for a structured comparison across local authorities and

helped assess both the completeness and quality of sustainability disclosures. To enhance reliability, a second author reviewed the coding and thematic categories, refining them where needed and ensuring interpretive consistency.

4. FINDINGS AND DISCUSSION

4.1. Report Type

An effective report is essential to assist users in their decision-making processes. Specifically, in the context of low-carbon city initiatives, local authorities are encouraged to coordinate their reporting practices not only to comply with established standards but also to reflect the expectations and value propositions relevant to a range of stakeholders (Kassim et al., 2021; Zubir, Mariati, Zauwiyah, & Muzrifah, 2019).

The adoption of reporting frameworks may vary among local authorities, depending on their individual approaches to addressing climate change and carbon reduction, as well as the complexity of information required by different local authorities' alliances (Gudde et al., 2021; Niemann & Hoppe, 2018). The selected local authorities presented a variety of reporting methods on low-carbon initiatives in terms of reporting type and frequency, as shown in Table 2.

Table 2. Comparison of report types and frequency for MBPJ, MBSA and HTJ.

No		MBPJ	MBSA	HTJ
1.	Report type *The type of report in which low-carbon cities' initiatives are presented. It may be in the form of an annual report (a comprehensive report of an organization pertaining to financial performance, activities and etc.) or a stand-alone report (a focused, detailed report on specific issues)*	Part of the annual report	Stand-alone report	Stand-alone report
2.	Title	Annual Report MBPJ 2023	Low-Carbon City Action Plan 2035	Hang Tuah Jaya Climate Action Plan 2030
3.	Frequency	Annually	Once in 2021	Once in 2020

The results indicate that differences in disclosure practices and report types may influence the comparability of qualitative characteristics in local authorities' reporting. Users of such reports typically require consistency in presentation over time to analyze changes effectively and to make relative comparisons with other organizations (Global Reporting Initiative (GRI), 2020). For example, one local authority, Petaling Jaya City Council (MBPJ), presents its low-carbon initiatives within its annual report, which is produced on a yearly basis. This consistent reporting allows stakeholders to assess the effectiveness and efficiency of the authority's planning and implementation efforts over time.

The variation in report types, ranging from standalone sustainability reports to integrated or minimal sections within annual reports, indicates differing levels of institutional commitment to sustainability disclosure. Such inconsistencies may negatively affect the overall quality, accessibility, and transparency of reporting, particularly when formats lack the depth and comparability needed to adequately reflect low-carbon initiatives. To enhance stakeholder engagement and improve policy alignment, the adoption of clearer national guidelines or standardized reporting templates would support local authorities in integrating low-carbon disclosures more systematically across all report formats.

4.2. Reporting Guideline

Reporting guidelines are a fundamental aspect of sustainability reporting. They serve as a framework of reference in preparing a report to ensure the information presented is reliable, relevant, transparent, and to uphold the highest level of stewardship towards the subject matter. Adherence to such guidelines reflects local authorities' accountability and their commitment to achieving low-carbon objectives. However, the absence of comprehensive and standardized reporting frameworks remains one of the key reasons why sustainability reporting in the public sector is not yet fully regulated, leading to inconsistent and limited disclosures (Andrades et al., 2024).

Effectively communicating information related to carbon emissions is critically important. As local authorities are encouraged to develop action plans and establish both short- and long-term carbon reduction targets, a well-defined reporting guideline is essential. It ensures that plans and targets are properly documented, consistently reported, and clearly communicated. Disclosures related to climate change and greenhouse gas (GHG) reduction must meet the expectations of report users within each jurisdiction.

Several frameworks and reporting guidelines are available for public sector reporting, particularly for local authorities involved in climate-related initiatives. For GHG inventory and emission reporting, common references include the Intergovernmental Panel on Climate Change (IPCC) Guidelines, the Global Protocol for Community-Scale Greenhouse Gas Emissions Inventories (GPC), the Global Reporting Initiative (GRI), the Carbon Disclosure Project (CDP), the Global Covenant of Mayors Common Reporting Framework (GCoM CRF), and the Low-Carbon City Framework Track (as detailed in Guidelines for Low-Carbon and Climate-Resilient Urban Planning, 2022). However, given the financial constraints many cities face and the dependence of low-carbon initiatives on adequate funding (NLCCM); Wong et al. (2022), local authorities tend to adopt unique reporting practices (Niemann & Hoppe, 2018).

In this study, three reporting guidelines were identified as underpinning the preparation of low-carbon city disclosures for Petaling Jaya City Council (MBPJ), Shah Alam City Council (MBSA), and Hang Tuah Jaya City Council (HTJ). These guidelines are the GRI, GCoM CRF, and LCCF. The GRI is among the most widely adopted global standards for reporting economic, environmental, and social impacts (Global Reporting Initiative (GRI), 2020; Niemann & Hoppe, 2018). Organizations may choose to fully adopt the GRI standards or use selected content elements. The GCoM CRF provides a globally harmonized reporting language that incorporates local context and encourages transparency in public reporting. Meanwhile, the LCCF is a national framework that offers assessment tools and guidance tailored to Malaysia's transition to a low-carbon future.

The presence and extent of each guideline's application were identified based on explicit statements in local authorities' reports, the nature of disclosed information, or participation in relevant low-carbon programs. In particular, this study employed the GRI Reporting Principles for Defining Report Content as the basis for comparative analysis. The comparison across the three local authorities was conducted based on key GRI content elements, namely stakeholder inclusiveness, sustainability context, materiality, and completeness. Table 3 illustrates how each of the three local authorities aligns with these principles in their reporting practices.

Table 3. Comparison between the three local authorities for the GRI reporting principles for defining reporting content.

No.	Content and definition	MBPJ	MBSA	HTJ
1.	**Stakeholders' Inclusiveness** Shall identify its stakeholders and how it has responded to their reasonable expectations and interests. Reasonably expected to be significantly affected by the organization's activities.	Not specifically mentioned	Mentioned on Key Player (Internal) and Collaboration Partners (External)	Specifically mentioned the key partners/ Collaboration
2.	**Sustainability Content** The underlying question of sustainability reporting is how an organization contributes, or aims to contribute in the	Strategies, Planning, and Performance	Strategies (Game Plan), Action, Target.	Actions, Benefits

No.	Content and definition	MBPJ	MBSA	HTJ
	future, to the improvement or deterioration of economic, environmental, and social conditions at the local, regional, or global level.			
3.	*Materiality* • Potentially merits inclusion in the report • Reflecting the organization's economic, environmental, and social • Social impacts or influencing decisions of stakeholders, • and missions and competitive strategies. • organization's influence on upstream entities, such as suppliers, or downstream entities, such as customers • Have a direct or indirect impact • Organization vision • Compliance with international standards and agreements.	i. Using LCCF elements to disclose information. ii. Performance iii. Strategies and planning information	i. Using LCCF elements to disclose information. ii. Financial implication iii. Gameplan, action and sub-action. iv. The report shows how the sub-action will support with Key Direction of NLCCM.	i. Using LCCF elements to disclose information ii. Benefits iii. Theme and action.
4	***Completeness*** Sufficient to reflect the environment, economics, and social aspects, and enables stakeholders to access the reporting organization's performance during the reporting period. *Topic boundaries:* impacts occur for material topics *Time:* Time refers to the need for the selected information to be complete for the period specified by the report.	Topic boundaries: - Time: Performance for the current reporting year	Topic boundaries: - Time: Each sub-action is categorized under the implementation time frame (short term, medium term or long term)	Topic boundaries: Time: Each action is categorized to be completed in 1ˢᵗ 5 years (2020-2025) Or 2ⁿᵈ 5 years (2026-2030)

For GCoM CRF, the comparative analysis was conducted based on explicit reporting statements. Among the three local authorities examined, two, Petaling Jaya City Council (MBPJ) and Hang Tuah Jaya City Council (HTJ) indicated that they referred to the GCoM CRF in their reporting practices. Example 1 and Example 2 illustrate how each of these local authorities demonstrated compliance with the GCoM CRF, as reflected in MBPJ's Annual Report and HTJ's Climate Change Action Plan, respectively.

Example 1: Statement of Compliance to GCoM by MBPJ.

Key Performance Indicator (KPI):

Preparation of Climate Action Plan for Petaling Jaya

Strategy:

Preparation of Climate Action Plan and Risk Management collaboration with GCoM and UTM.

(Petaling Jaya City Council Annual Report 2023, page 18)

Example 2: Statement of Compliance to GCoM by HTJ.

Hang Tuah Jaya has joined the Global Covenant of Mayors (GCoM), a coalition of cities and local governments from around the world committed to advancing climate resilience and lowering greenhouse gas emissions. Committing to GCoM requires the Municipality to advance four goals:

i.   Reducing greenhouse gas emissions.

ii. Prepare for the impact of climate change.

iii. Increase access to secure, affordable and sustainable energy.

iv. Track progress through these objectives.

The Covenant provides specific structures for cities to adhere to in reporting and planning, and supplies platforms for municipalities to communicate and share best practices.

(Hang Tuah Jaya Climate Action Plan 2030, page 13)

The application of the LCCF as a reporting guideline was identified through the analysis of thematic information disclosures and specific statements made by the respective local authorities. For both Petaling Jaya City Council (MBPJ) and Hang Tuah Jaya City Council (HTJ), the structure and thematic presentation of their reports and action plans aligned with the four core LCCF elements: Urban Environment, Urban Transportation, Urban Infrastructure, and Buildings. The strategies reported by these two local authorities correspond to each of these LCCF dimensions, indicating a clear effort to align their disclosures with the national framework. Additionally, HTJ expanded its reporting scope by including social elements that go beyond the standard LCCF structure. This adaptation reflects an effort to contextualize the low-carbon city agenda within the jurisdiction's broader social development goals. As local authorities differ in context and operational focus, variations in reporting approaches are expected and understandable (Niemann & Hoppe, 2018). In contrast, Shah Alam City Council (MBSA) made a clear reference to the LCCF as a guiding framework for its low-carbon programs. However, the disclosure of specific strategies and action plans was not clearly mapped to the individual elements of the LCCF, resulting in a less structured alignment with the framework. Table 4 and Table 5, and Example 3 provide a comparative overview of how the three local authorities referenced and applied the LCCF as a guideline in their reporting practices.

Table 4. Summary LCCF Elements and Focus Area for LCC Initiatives Implemented by MBPJ.

	Direction	**Focus Area**			**Mission 1.1****	**Mission 1.2****	**Mission 1.3****
Element of LCCF	Environment	1	Urban environment*		√		
		2	Urban infrastructure*		√		
		3	Urban transportation*		√	√	
		1	Building*	Energy management	√		
		1	Building*	SPAH	√		
	Liveable City	1	Efficient public transport				√
			Land use integrated with the transportation system				
		2					√

Note: * Elements of LCCF.
          **Mission 1.1: Low-Carbon City; Mission 1.2: Attractive and Green City Images.
          Mission 1.3: Sustainable Transportation.

Table 5. Summary of LCCF elements and strategies for LCC initiatives implemented by HTJ.

Theme: Low-carbon city		Strategies
Element of LCCF + Society	Environment	Shifting to the green economy
	Transportation	Sustainable public transport and logistics
	Infrastructure and building	Climate-responsive infrastructure
	Society	Sustainable community

Example 3: Statement of Strategies for LCC Initiatives Implemented by MBSA.

> *The LCCF document is used as a reference for this program. A total of 19 mayors and Heads of the Council of various municipalities have pledged support to LCC2030.*
>
> *(Section 3.1.1 Low-Carbon Cities Initiatives, page 3-4)*

Most local authorities referenced national frameworks such as the LCCF or NLCCM, while fewer cited international frameworks like GRI. The selective and inconsistent use of these reporting guidelines highlights a lack of standardization across local authorities. This inconsistency undermines the comparability and credibility of sustainability disclosures. To improve reporting quality, stronger national guidance and targeted capacity-building initiatives may be required to support the consistent adoption of reporting frameworks.

4.3. Content Elements

Fundamental elements of low-carbon city reporting should encompass both content elements and qualitative characteristics. However, the multiple dimensions involved in sustainability reporting often lead to interpretive challenges and varied understandings of the information disclosed (Fousa Amo & Ganu, 2020). Relying on a single reporting guideline may not provide a comprehensive view and can limit the potential value of the information presented (Dumay, Guthrie, & Farneti, 2010). As a result, local authorities may choose to adopt multiple frameworks to enhance the credibility of their disclosures. While this approach increases reporting depth, it also contributes to the diversity of content elements and reporting practices.

Based on the analysis, all three local authorities disclosed low-carbon city initiatives using different content structures. Although there are similarities in some elements, each report also contains unique aspects that distinguish it from the others. Two out of the three local authorities explicitly structured their reports and action plans according to the Low Carbon Cities Framework (LCCF), which recommends categorizing strategies into four focus areas: urban environment, urban transportation, urban infrastructure, and buildings. However, the third local authority adopted a more comprehensive approach by presenting six distinct strategies, or "game plans," that align indirectly with the LCCF focus areas but reflect a broader, context-specific perspective. Table 6 provides a comparative overview of the content elements related to low-carbon city initiatives for MBPJ, MBSA, and HTJ.

Table 6. Comparison of content elements for the LCC initiatives between local authorities.

No	Content Element	MBPJ	MBSA	HTJ
1.	**KPI to be achieved**	√		
2.	**Strategies or Game Plan**	√	√	√
3.	**Action** *to be executed that aligns with the determined strategies*		√	√
4.	**Sub-Action** *that supports each action*		√	
5.	**Planning** *to be executed, which aligns with the determined strategies*	√		
6.	**Performance** *of planning that had been executed as of the end of the year*	√		
7.	**A program** *to be implemented for each sub-action*		√	
8.	**Key Player/ Department involved** (*The department in charge of the respective sub-action/ program*)		√	√
9.	**Operational Target**		√	
10.	**NLCCM** (*To mark each action support item under NLCCM*)		√	
11.	**Collaboration** (*Involvement of external parties/stakeholders*)		√	
12.	**Term / Timeline** *actions to be executed (Long, medium or short term)*		√	√
13.	**Approach** (*3M approach for low-carbon cities initiatives proposed by NLCCM*) (*Measure, Manage, Mitigate*)		√	
14.	**Financial Implications** *for each program.*		√	
15.	**Benefits** (*Mitigation or adaptation*)			√

While the variety of reporting elements can enrich the information presented, it also raises concerns about report fatigue and information overload, as suggested by de Villiers et al. 2014, as cited in Niemann and Hoppe (2018). However, given the public sector's integral role in advancing the sustainable development agenda, often more directly than the private sector (Andrades et al., 2024), local authorities face increasing pressure to be transparent and accountable to the communities they serve (Adams, Muir, & Hoque, 2014; Andrades et al., 2024). In this context, sustainability reporting functions as a critical platform through which public sector entities can communicate their environmental and social impacts (Williams, 2015) as cited in Andrades et al. (2024)).

The content elements disclosed by the three local authorities examined in this study reveal notable variation, reflecting differences in institutional priorities and reporting practices. Although all three outlined strategies related to low-carbon initiatives, only MBPJ and MBSA clearly aligned their disclosures with the focus areas prescribed in the Low Carbon Cities Framework (LCCF).

The findings also indicate that certain elements, such as key performance indicators (KPIs), are emphasized by one local authority (e.g., MBPJ), but omitted or underreported by others (e.g., MBSA and HTJ). This variation highlights both innovative approaches and inconsistencies in reporting practices.

These observations align with Niemann and Hoppe (2018) findings, which emphasize that local authorities often produce uniquely structured reports due to the absence of standardized reporting guidelines. While reliance on a single framework may limit the comprehensiveness of disclosures (Jorgensen, Mjos, & Pedersen, 2021), integrating and cross-referencing multiple frameworks can improve consistency and comparability. The lack of standardization ultimately affects the quality and transparency of sustainability reporting and hinders meaningful comparison across local authorities.

To enhance reporting effectiveness, engagement with stakeholders and the adoption of standardized reporting guidelines are essential. These efforts would not only build trust and clarity but also ensure alignment with national goals for low-carbon development.

4.4. Dissemination of Strategies

Sustainability reporting should include meaningful and adequate information, detailing both actions taken and planned, rather than focusing solely on policies or performance data (Bursa Malaysia Securities Berhad, 2018). For the low-carbon cities agenda to be effective and credible, it must be properly disclosed and communicated. This involves not only the reporting of outcomes but also the processes behind them, including organizational involvement, political commitment, and dissemination strategies (Bryan, 2022; Williams, 2015). From a public sector perspective, public sector accountants are expected to play a critical role in providing information and advice on sustainability reporting, particularly regarding ongoing efforts and emerging issues. Furthermore, there is a growing need to emphasize the requirements and expectations of sustainability reporting in the public sector (Accountants Today, 2022).

Based on the analysis, all three local authorities disclosed strategies related to the implementation of low-carbon city programs within their respective jurisdictions.

Compliance with frameworks such as the GRI, GCoM CRF, and LCCF requires local authorities to report their implementation strategies in a structured and transparent manner. In the reports analyzed, the term "strategy" is used interchangeably with "game plan" or "action."

In terms of dissemination, all three local authorities included similar structural elements in their reporting, such as a general statement of intent, specific actions or sub-actions, and the identification of key actors or stakeholders responsible for implementation. These reported strategies are summarized and compared in Table 7.

Table 7. Analysis on strategies dissemination elements by MBPJ, MBSA and HTJ.

No.		MBPJ	MBSA	HTJ
1.	**Term used**	Strategy	Game Plan	Action
2.	***General statement on strategy.*** *General statement on the presence of the implementation strategy for the low-carbon cities agenda.*	General statement explained. Example: ***Theme:*** Low-Carbon City. ***Mission:*** Environment. ***Statement:*** Preparation of Climate Action Plan and Risk Management collaboration with GCoM and UTM.	General statement explained. Example: ***Statement:*** Strengthening Energy Policy and Incentives Framework	General statement explained. Example: ***Theme:*** Green Economy ***Statement:*** The green economy covers infrastructure, buildings, and society.
3.	Sub-action on each strategy	Exhibited as Planning Example: Attending GCoM Sharing Session dan Climate Action Plan at City Level	Exhibited as Action and Sub-action Example: *Action 1:* Establish Energy Policy and Regulatory Framework *Sub Action 1.1:* Develop a Strategic Action Plan for Shah Alam for reducing energy consumption.	Exhibited as Action. Example: Element Infrastructure *Action:* Conduct a feasibility study on industry symbiosis
4.	Key player or commitment by a specific department/role to implement the strategies.	Not specifically mention the key player.	Exhibited as 'Key Player'. Example: *Sub Action 1.1:* Develop a Strategic Action Plan for Shah Alam for reducing energy consumption *Key Player:* Department of Engineering (Shah Alam City Council)	Exhibited as 'Responsible Department'. Example: *Action:* Conduct a feasibility study on industry symbiosis. *Responsible Department:* Corporate Green Tech.

The analysis reveals that each local authority presents varying levels of information related to its implementation strategies. One notable observation is the limited use of diverse dissemination channels, such as websites, social media, and visual summaries, indicating that communication efforts are not fully optimized to engage a wider range of stakeholders.

These variations may stem from the adoption of different reporting frameworks or guidelines, which, while offering flexibility, allow local authorities to interpret and implement dissemination strategies differently. In addition to strategic actions, other elements such as targets, key performance indicators (KPIs), and achievements were identified. However, not all local authorities disclosed these elements consistently, likely due to constraints such as resource limitations, technical capacity, or institutional priorities.

The variation in how strategies are communicated reflects a lack of standardized reporting quality. These inconsistencies undermine the comparability and reliability of sustainability reports, ultimately reducing their usefulness to stakeholders. Moreover, when roles, responsibilities, and actions are not clearly disclosed, it hinders meaningful stakeholder engagement and weakens transparency. Therefore, national-level guidance or a unified framework is needed to standardize sustainability disclosures across local authorities, particularly in the context of the low-carbon cities agenda.

4.5. Stakeholders' Inclusiveness

Effective stakeholder engagement is critical to the success of low-carbon city initiatives. In addition to stakeholder involvement, the integration of strategic planning and the mainstreaming of sustainability within the budgeting process are also key contributors to the effectiveness of sustainability reporting (Bryan, 2022). However, current sustainability reporting practices are often perceived as lacking the critical information required to meet investor expectations for funding assessments. Therefore, transparency and active stakeholder participation are essential components of accountability systems, particularly in data validation, performance measurement, and information communication (Abhayawansa, Adams, & Neesham, 2021).

As stakeholders have become increasingly informed and demanding, organizations are expected to identify their key stakeholders and respond to their needs, expectations, and interests (Global Reporting Initiative (GRI), 2005). The involvement of stakeholders in public sector organizations is particularly significant. According to Kaur and Laudia (2019, as cited in Andrades et al. (2024)), the public sector plays a more direct role in national sustainable development compared to the private sector. Moreover, the public sector holds a moral obligation to provide services in the public interest (Fusco & Ricci, 2019, as cited in Andrades et al. (2024)). While stakeholders' engagement is important, it should be embedded in both the planning and implementation phases of low-carbon city initiatives. Local authorities are therefore expected to identify their stakeholders and document the nature and extent of engagement throughout the implementation and participatory processes.

In this study, all three local authorities disclosed stakeholder inclusiveness in either their annual reports or climate action plans. These disclosures were identified using specific terminology such as key player, collaboration, responsible department, and key partner. Table 8 illustrates the terms used to represent stakeholder inclusiveness and their respective categories.

Table 8. Summary of reporting on stakeholders' inclusiveness for MBPJ, MBSA and HTJ.

No.		MBPJ	MBSA	HTJ
1.	Term used Term used to represent stakeholders' inclusiveness	Not specifically mentioned.	Key players and collaboration	Responsible department and key partner
2.	Type of stakeholders: 2.1 Internal	Not specifically mentioned.	Sub Action 2.2: Provide the best incentives such as capacity building, energy certification, a grant for building owner who implement energy efficiency, and renewable energy in their building. **Key player:** Department of Engineering, Department of Planning	Theme: Green Economy Element: Infrastructure Action 1: To conduct a feasibility study on industry symbiosis. **Responsible Department:** Corporate Green Tech
	2.2 External	Planning: Climate Action Plan for Petaling Jaya Strategy: Preparation of Climate Action Plan with GCoM and Universiti Teknologi Malaysia.	**Collaboration:** Sustainable Energy Development Authority, Malaysian Green Tech Corporation, UiTM, Private Sector, Selangor State Government, Non-Government Organization, (Department of Town and Country Planning of Ministry of Local Government Development, also known as PLANMalaysia, UiTM, MSU, KDU, Unisel	**Key Partner:** Sustainable Energy Development Authority, Tenaga Nasional

From the analysis, each local authority presented various disclosures regarding the stakeholders' inclusiveness. These variations may be attributed to the use of different reporting frameworks or guidelines, which introduce flexibility that allows local authorities to interpret and apply the involvement of stakeholders differently. The information on stakeholders' inclusiveness may vary due to institutional capacity and expertise, which influence the choice of reporting format. Authorship is determined by local authorities and is based on the needs of disclosure (Niemann & Hoppe, 2018). Thereby, findings show differences in reporting practices executed by local authorities due to institutional readiness (Amran & Ooi, 2014), such as administrative capabilities, financial resources, and staff capabilities, which optimize the disclosure and transparency of reporting. Moreover, the cause of variation in disclosure on stakeholders' inclusiveness may be attributed to the local authorities' perceived relevance and value of this engagement. Therefore, the disclosure on stakeholders' inclusiveness acts as a mechanism of value creation, which enhances legitimacy, resulting in more meaningful engagement.

The findings indicate that variation in reporting stakeholders' inclusiveness weakens the quality of disclosure in terms of credibility and completeness of reporting. Thus, it may reduce reporting effectiveness, including a lack of participation in planning and policy implementations for low-carbon city initiatives.

4.6. Financial Indicator

Disclosure of material information, especially in relation to financial matters, is highly valuable to stakeholders, as it supports informed decision-making when evaluating new investment opportunities aligned with low-carbon targets (PLANMalaysia, 2023). Financial disclosures enhance the investment prospects of a local authority's jurisdiction, especially for individuals or organizations seeking to invest in "green" or sustainable initiatives (Bellringer, Ball, & Craig, 2011). However, limited access to high-quality financial information remains a common challenge for investors and stakeholders. In addition, discrepancies in financial data and difficulties in comparing sustainability-related information continue to present barriers to effective stakeholder evaluation (Bursa Malaysia Securities Berhad, 2018).

The analysis revealed that two out of the three local authorities did not disclose any financial or finance-related information in their reports or action plans. Shah Alam City Council (MBSA) was the only authority to include financial information, specifically highlighting the financial implications associated with each action under its low-carbon city initiatives. However, while financial implications were mentioned, no actual financial figures were presented in MBSA's Climate Change Action Plan. Example 4 provides a summary of MBSA's game plan, detailing each action, sub-action, key players, collaborative partners, and associated financial implications.

Example 4: Summary of Game Plan, Action, Sub-Action, Key Player, Collaboration, and Financial Implication.

Game Plan: Strengthening Energy Policy and Incentive Framework

Action: Establish Energy Policy and Regulatory Framework

Sub Action: Develop Strategic Action Plan for Shah Alam for reducing energy consumption

Key Player: Department of Engineering (Shah Alam City Council)

Collaboration: SEDA, MGTC, UiTM, MSU

Financial Implications: Essential

Example 4 shows that only a few reports disclosed cost-related information, investment value, or funding sources related to low-carbon initiatives. As such, the reporting on low-carbon city initiatives does not to the extent of disclosing how the strategies have implications on financial matters. The lack of financial disclosure limits the ability of stakeholders, particularly investors, to evaluate project feasibility and return on impact. Enhancing financial transparency would support policy credibility and private-sector engagement.

4.7. Causes of Variation in Reporting

The observed variation in sustainability reporting practices among local authorities can be attributed to several underlying factors. First, institutional capacity plays a significant role; local governments with well-established sustainability units or dedicated low-carbon teams tend to produce more structured and comprehensive reports. Local authorities with advantages in terms of data management, administrative structure, and disclosure of reporting requirements are more likely to produce a more advanced setup, consistent, comprehensive, and aligned reporting requirements. This finding is consistent with Niemann and Hoppe (2018), which indicates that the reporting on sustainability is varied and most of the time determined by the discretion of local authorities and their interpretation of disclosure needs. As observed in this study, local authorities that lacked dedicated sustainability units often provided only minimal disclosures or omitted key performance indicators.

Second, resource constraints, including limited staffing, budget, and digital infrastructure, can hinder the ability to gather data, engage stakeholders, or adopt standardized reporting frameworks such as GRI or LCCF. These constraints are particularly evident in smaller or less urbanized jurisdictions, where sustainability reporting may not be prioritized due to competing service delivery demands. Local authorities with limited resources and expertise may struggle to report financial implications on the sustainability agenda, specifically low-carbon city initiatives, as suggested by Bellringer et al. (2011), who found that reporting quality is often linked to internal technical expertise and governance support.

Third, political leadership and jurisdictional priorities also influence the extent and nature of disclosure. Authorities with proactive leadership and public-facing sustainability agendas tend to report more transparently, aligning with Niemann and Hoppe's (2018) findings that local political will and agenda-setting shape both the content and tone of sustainability communications.

From the stakeholders' perspective, these variations can have both positive and negative implications, such as fostering trust through transparency in reporting or weakening engagement due to a lack of consistency and actionable data. Stakeholders were only provided with information on current actions and implementation (Joseph & Taplin, 2012; Manes-Rossi, 2020). Therefore, standardization has become imperative rather than discretionary, especially for policy coherence and capacity building.

5. CONCLUSION

This study aimed to assess the comprehensiveness, compliance, and variation in sustainability reporting by local authorities, specifically on low-carbon city initiatives. The findings confirm that while there is growing engagement with sustainability disclosure, significant inconsistencies remain in the use of reporting guidelines, the depth of content, stakeholder inclusiveness, and financial transparency. The analysis revealed differences in the type of report used, the reporting framework adopted, stakeholder engagement strategies, and financial disclosures. Each local authority presented its LCC initiatives differently, based on the unique needs and institutional capacities of its respective jurisdiction. These variations were influenced by factors such as institutional capacity, resource availability, and political leadership; each of which affects the quality and utility of sustainability reports.

Although all three local authorities demonstrated a commitment to reporting LCC initiatives, they differed in the format and structure of their disclosures. In some cases, elements are aligned partially with global reporting guidelines. Stakeholder engagement was reported either directly or indirectly, though often lacking depth or clarity. Notably, financial data and performance updates essential for tracking progress and ensuring accountability were often absent. This undermines stakeholders' ability to assess impact and support future initiatives. As accountability requires that public institutions provide meaningful answers to those affected by their actions, improving the quality of disclosure is vital.

This study recommends that local authorities maximize the use of existing reporting guidelines, whether through annual reports or climate action plans, to enhance the quality of low-carbon city disclosures. In the absence of a

coherent and standardized reporting framework, consistent adherence to recognized sustainability guidelines can help reduce information asymmetry and promote greater transparency and accountability. Financial disclosure, in particular, plays a crucial role in enabling stakeholders to assess the viability and effectiveness of low-carbon initiatives. From the stakeholder perspective, trust is built not only through engagement but also through the provision of clear, accurate, and relevant information. Furthermore, the lack of disclosure on the status or continuity of previously implemented initiatives makes it difficult for users to evaluate the impact or success of those efforts. Providing updates on program outcomes would greatly benefit stakeholders by allowing them to track progress and assess the value of publicly funded activities.

These findings reinforce the relevance of stakeholder theory in the public sector's sustainability, where trust and transparency depend on both inclusiveness and information quality. Moreover, they contribute to the broader discourse on accountability frameworks and public sector reporting literature, highlighting the need for structured, stakeholder-responsive disclosure practices in local governance.

To build on these findings, future research should consider expanding the sample to include a larger number of local authorities to enhance generalizability and provide a comprehensive understanding of the reporting practices, challenges, and trends across the country. In addition, conducting stakeholder interviews, including local officials, community members, and funders, would provide valuable insights to triangulate report content and better understand the perceived impact of disclosures. Finally, further studies could investigate the relationship between sustainability reporting practices and policy or funding outcomes, offering empirical evidence on how transparent reporting contributes to local development and climate governance effectiveness.

Given the broad range of strategies involved in low-carbon city initiatives, the development of a coherent, standardized reporting framework is crucial. Such a framework would improve the comparability, completeness, and strategic alignment of disclosures across jurisdictions. Local authorities are therefore encouraged to adopt best practices in sustainability reporting that meet stakeholder expectations and align with recognized standards. This will also help highlight persistent challenges such as limited community participation, low awareness, and inadequate financing issues that warrant attention in future policy and academic discourse.

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