Climate change and facilities management in commercial real estate: Stakeholder understanding, operational impacts, and decision-making in Ghana

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ABSTRACT

Climate change has gained global attention due to its effects on every aspect of society. This has led sectors worldwide to take action to address it. Effective sustainable facilities management practices are crucial in addressing climate change. Using institutional theory, the study examines understanding, perceptions, and support for climate change mitigation and adaptation in the commercial real estate sector, focusing on facilities management practices. The study adopted a qualitative research design using semi-structured interviews. The interview guide included questions that centred on stakeholders' understanding, perceptions, and support for climate change in facilities management practices. The target population comprised facilities management professionals, experts, and regulators. A purposive sample of 8 participants was selected and interviewed using a combination of face-to-face and online methods. The data were analysed thematically using MAXQDA Pro 2025. Participants demonstrated a high level of understanding and awareness of climate change. Stakeholders supported climate action, as evidenced by the adoption of sustainable initiatives in facility management operations. Despite these efforts, stakeholders were unable to effectively translate their understanding of climate change into actionable strategies to mitigate its impacts and adapt commercial facilities. The study contributes to existing knowledge by highlighting stakeholders' understanding and awareness of climate change, as well as their support for climate action in facilities management within the commercial real estate sector. The findings highlight the need for capacity-building initiatives to strengthen FM professionals' technical understanding of climate change and translate this knowledge into effective climate-responsive practices, thereby promoting sustainable facilities management operations.

Keywords: Adaptation, Climate Change, Commercial Real Estate, Facilities Management, Mitigation, Perceptions, Support, Understanding

I. INTRODUCTION

Climate change is one of the major challenges of the 21st century, largely attributed to anthropogenic activities such as energy consumption, industrialisation, and rising greenhouse gas emissions (Yang & Ge, 2020; Palermo et al., 2020; Ucal & Xydis, 2020; Khan et al., 2023). It affects multiple systems of societal life, including infrastructure, economic activities, and human well-being (Almaaitah et al., 2021; Intergovernmental Panel on Climate Change [IPCC], 2014; Lan et al., 2022). The built environment both contributes significantly to climate change and suffers from its impacts. Buildings account for a substantial share of global energy consumption and carbon emissions, with the operational phase being the most environmentally intensive stage of the building life cycle in terms of energy, water use, and other services (Hauashdh et al., 2024). Commercial facilities are also highly vulnerable to climate-related impacts such as rising temperatures and flooding, which can undermine infrastructure performance, increase operational costs, and reduce occupant comfort (Shahid et al., 2017; Hurlimann et al., 2018; Leal Filho et al., 2024). Therefore, there is an urgent need for both mitigation and adaptation strategies. Mitigation aims at reducing greenhouse gas emissions, while adaptation involves adjusting systems and operations to minimise the adverse impacts of climate change (Jiang et al., 2020; IPCC, 2014). This highlights the crucial role of facilities management (FM) in addressing climate change, especially within the commercial real estate sector.

Facilities management primarily involves the design, development, management and operation of built infrastructure and other related activities to provide a safe and conducive environment (Kidido et al., 2024; Alhassan et al., 2023; Tannor et al., 2022; Nortey et al., 2025). Effective FM improves energy efficiency and reduces greenhouse gas emissions. However, some studies from the Global North have highlighted gaps in relation to climate action within the commercial real estate sector. These gaps include stakeholder awareness, limited engagement, and insufficient participation in climate-related initiatives, which hinder effective climate action in the built environment (Hurlimann et

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al., 2018; Warren-Myers et al., 2020b). Evidence such as limited technical capacity, inadequate funding for climate change initiatives, and weak regulatory frameworks further compounds these challenges in developing economies such as Ghana. Although some studies have explored climate change action in the broader built environment (Alhassan et al., 2025; Amoah et al., 2018; Yakubu, 2019; Opoku *et al.*, 2022), there is limited empirical evidence on climate change action within FM operations specifically in the commercial real estate sector aimed at addressing the impact of climate change. The study aims to examine climate change awareness, operational implications, and decision-making within facilities management in Ghana's commercial real estate sector.

1.1 Research Objective

i. To assess stakeholders' understanding of climate change in Ghana's commercial real estate sector.
ii. To examine the perceived effects of climate change on facilities management practices in the commercial real estate sector.
iii. To examine the extent to which climate change considerations are incorporated into facilities management decision-making in the commercial real estate sector.

II. LITERATURE REVIEW

2.1 Theoretical Review

2.1.1 Institutional Theory

Institutional theory (Meyer & Rowan, 1977) suggests that organisations seek legitimacy by adopting formal structures rather than prioritising efficiency. Butler (2011) extends this by showing how institutional and stakeholder pressures shape climate-related operational strategies in FM within the commercial real estate sector. Although regulations and socio-cultural expectations demand climate-responsive practices, climate awareness among FM professionals does not automatically translate into effective mitigation and adaptation. DiMaggio and Powell (1983) identified institutional isomorphism, in which organisations gain legitimacy through coercive, mimetic, and normative pressures that reinforce climate compliance. However, Meyer and Hollerer (2014) criticised the theory for promoting homogenisation and a disconnect between formal policies and actual practices, where sustainability may be adopted symbolically. The theory nonetheless provides a useful framework for exploring stakeholders' understanding, perceptions, and support for climate action in FM operations within the commercial real estate sector.

2.2 Empirical Review

2.2.1 Stakeholders in Climate Change Mitigation and Adaptation

Studies show that stakeholders are crucial in shaping processes, particularly in climate change, sustainability, and environmental protection (Nissanka *et al.*, 2024). According to Rainey (2006), a stakeholder is an individual or group directly or indirectly affected by products, programs, processes, or systems but not benefiting as an economic participant. This group can include individuals with the power to control resource use or those whose livelihoods are affected. The term 'stakeholder' refers to any party that can influence or is affected by a process.

Studies highlight the crucial role of stakeholder engagement and participation in developing and implementing climate change policies. For instance, Nikas et al. (2018) recognise the crucial role that inclusive stakeholder involvement plays in shaping effective climate change mitigation and adaptation strategies. Balaz et al. (2021) reported that stakeholder involvement is essential in both technical and societal decision-making, helping uncover preferences and achieve socially acceptable, fair, and effective climate policies. In the built environment, Nirmul and Scott (2020) assessed building owners' and investors' perspectives on resilience in the context of climate change. The study argued that the success of mitigation actions depends on stakeholders' ability to anticipate, prepare for, and communicate risk. Leitch et al. (2019) used a decision support framework (CoastAdapt) developed in Australia to help stakeholders adapt to climate change, especially rising sea levels. The study reported that stakeholder involvement ensured decisions met user needs, provided trustworthy and relevant information, and supported social learning. These studies offer insights into stakeholders' role in climate action, underscoring their relevance to comprehensive climate strategies. This justifies the role of relevant stakeholders in change mitigation and adaptation. However, Warren-Myers et al. (2020b) reported that a significant proportion of key stakeholders do not seek climate change information. This suggests low awareness and limited participation.

2.2.2 Climate Change Understanding and Awareness Among Stakeholders

Knowledge of climate change is critical to effective mitigation and adaptation. Leal-Filho et al. (2024) noted that climate pressures and advances in climate science have prompted public and private organisations to develop Global Climate Services to support informed responses. Awareness also influences policy and operational decisions: Hinkel et al. (2018) argued that it is crucial in the built environment for predicting mitigation strategies, identifying vulnerability,

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and initiating early adaptation. Hallegate (2009) reported a major global rise in climate awareness, which has heightened concern among built environment professionals and increased demand for climate-related information.

Despite this, awareness often fails to translate into actionable knowledge. Adams and Prakash (2024) explained that available climate science is often unusable for real-world infrastructure decision-making. Sector-specific studies support this: Okello et al. (2015) found low awareness among senior management in Ireland's seaport sector despite adaptation measures in organisational strategies, while Nissanka et al. (2024) identified low awareness among built-environment stakeholders. Mkonda (2022) further reported that many adaptation plans lack input from critical stakeholders, particularly in marginalised areas, which affects the adaptation process and can lead to controversy.

Overall, a disconnect persists between awareness and practical responses in operational and infrastructure decision-making. Facilities managers may be aware of climate risks but lack actionable, context-applicable tools or data, and awareness varies significantly across sectors (Okello et al., 2015). Low participation by key stakeholders, especially from marginalised groups, also reduces the effectiveness of awareness-based adaptation (Mkonda, 2022). Facilities managers possess the strategic capability to facilitate stakeholder engagement, yet their role in creating awareness and participatory planning, and research on sectoral awareness among them, remain underexplored.

2.2.3 Effects of Climate Change on Facilities Management Practices

Climate change can significantly affect facilities management (FM) operations in the commercial real estate sector by increasing maintenance needs, damaging building infrastructure, disrupting essential services, and changing energy and water demand. Extreme heat may strain heating, ventilation, and air-conditioning (HVAC) systems, while heavy rainfall and flooding can damage building components, drainage systems, and electrical installations. Water scarcity and extreme weather may also disrupt routine maintenance and the continuity of FM services. Van Valkengoed and Steg (2019), Hennink et al. (2017), and Shaw et al. (2014) highlighted the relationship between climate hazard awareness, risk perception, and adaptive behaviour. However, the operational implications for commercial buildings require further empirical investigation.

Nirmul and Scott (2020) identified institutional inertia, market demand, and short-term profit orientation as barriers to investment in climate resilience, which may increase repair costs, equipment failures, and operational downtime. Bohensky et al. (2016) and Maharjan (2020) emphasised the importance of stakeholder knowledge in adaptation planning for identifying operational vulnerabilities. However, the reviewed studies provide limited direct empirical evidence on how climate change affects day-to-day FM operations, including maintenance, building services, energy and water management, and service delivery. This gap highlights the need to examine these operational effects and their implications for building performance, maintenance costs, and FM service continuity.

2.2.4 Stakeholders Consideration and Support for Climate Change Mitigation and Adaptation

According to the IPCC (2014), climate and weather-related disasters have doubled in the last two decades. IPCC (2014) further predicted an increase in the frequency and severity of disasters in the coming decades. Therefore, urgent action is needed to address climate change impacts. For example, in a study exploring local stakeholders' perceptions of and influence on climate in Nepal, Maharjan (2020) emphasises the urgent need to strengthen adaptive capacities. The study noted that local communities are already using traditional knowledge to mitigate the impacts of climate change. It concluded that communities benefit significantly from stakeholder support, including enhanced adaptive capacities, increased resilience, effective public policies, and sustained livelihood support. Stakeholder involvement has also been central to the success of adaptation strategies. Gopfert et al. (2019) developed a framework to assess and support the joint institutionalisation of climate adaptation and mitigation in city administrations across Germany and Tanzania. The study focused on organisational structures, visions and goals, actors, and technological tools. It was reported that committed stakeholder participation influences local climate policies, politics, and practical climate interventions.

III. METHODOLOGY

3.1 Research design

A qualitative research approach was considered suitable and adopted for the study. According to Levitt et al. (2021), qualitative research provides opportunities to facilitate in-depth examination of human experiences and organisational processes within their natural settings. Using a qualitative research approach helped provide meaningful insights with regard to the attitudes and support for climate change mitigation and adaptation in FM operations within the commercial real estate sector in Ghana, specifically in Accra.

3.2 Study area

Accra was chosen as the data collection point because it is the country's political, economic, and administrative centre and is home to numerous ultra-modern commercial facilities.

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3.3 Study population

The population of the study comprised FM professionals, FM experts, academia, and regulators. These participants played critical roles on the supply side of FM operations in the commercial real estate sector.

3.4 Sample and sampling procedure

For data collection, eight (8) participants were purposively selected. These participants were selected because they were considered to have rich, relevant, and practical knowledge in relation to the topic under study. Specifically, the facilities management professionals were selected because they were directly involved in the day-to-day operations of these facilities. Therefore, given their positions and responsibilities, they understood the day-to-day operational issues in these facilities. This put them in the spotlight to share practical, real-world information on climate change mitigation and adaptation practices for these commercial properties. The key inclusion criteria were: participants must be involved in FM-related operations, research, or consultancy for at least 5 years; FM professionals must manage commercial properties or real estate; and the properties must be operational and commercial.

3.5 Data collection instruments

Eight participants were interviewed using a semi-structured interview guide, which Adams (2015) considers suitable for obtaining detailed, experience-based narratives reflecting individual and organisational perspectives. The interview schedule was designed around the key theme of factors shaping attitudes and support, in line with the study's objective.

Content validity, which assesses the extent to which instrument items capture the constructs under study (Lynn, 1986), was used to validate the guide. Its questions focused on the factors influencing stakeholders' attitudes and support towards climate change mitigation and adaptation within FM operations in the commercial real estate sector. Two professional facilities managers and an FM expert reviewed the guide for clarity and relevance, and a pilot interview with three facilities managers responsible for commercial properties in Kumasi helped refine its comprehensiveness and usability. Six interviews were conducted in person and two virtually, each lasting approximately 30 to 40 minutes. All interviews were audio-recorded with participants' consent, transcribed, and anonymised to ensure confidentiality. The data were analysed using thematic content analysis.

3.6 Data analysis

Interview transcripts were imported into MAXQDA Analytics Pro 2025 and analysed using content analysis (Prasad, 2019) to extract meaning, context, and intention from message content. Thematic analysis followed Braun and Clarke's (2021) stages of data familiarisation, code generation, theme development, review, and definition. A two-stage coding strategy was adopted, beginning with deductive coding guided by interview themes, followed by inductive coding to refine the data and extract further insights. This process established patterns and relationships that explain how stakeholders behave towards climate action (mitigation and adaptation) and what influences these behaviours. MAXQDA's Summary Grid and Summary Table supported cross-case comparison, sub-code organisation, and pattern identification, while reflexive memos supported interpretation. Trustworthiness was ensured through Lincoln and Guba's (1985) criteria of credibility, transferability, dependability, and confirmability, achieved through prolonged engagement with the data, peer debriefing, reflexive memoing, and a clear audit trail within MAXQDA.

New codes and recurring patterns began to stabilise after the fifth interview. Following the three-level saturation model of Guest et al. (2020), the study adopted a base sample size of 6 interviews and a run length of 3. No new codes or sub-themes emerged after the sixth interview was transcribed and analysed, indicating data saturation. Interviews nonetheless continued to the eighth participant to confirm thematic saturation and deepen contextual interpretation of the existing themes (Hennink et al., 2017). This enhanced the credibility and comprehensiveness of the findings.

3.7 Ethical consideration

Ethically, the researchers obtained informed consent from participants before conducting the interviews. Confidentiality and anonymity were ensured by using pseudonyms to replace personal details of participants and their respective organisations.

IV. FINDINGS & DISCUSSION

4.1 Findings

Stakeholders' understanding and perceptions of climate change significantly influence their support for climate action. This study explores climate change mitigation and adaptation initiatives in FM operations within the commercial real estate sector. It qualitatively explored and presented stakeholders' understanding, perceptions, and support for climate change mitigation and adaptation initiatives in FM practices within the commercial real estate sector.

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4.1.1 Characteristics of the participants

The study assessed participants' current designations, years of experience, and sectors of operation. This is because, in qualitative studies, a participant's demographics can affect the information they provide. Participants had different designations, considerable years of experience in the field, and operated in different sectors of the commercial real estate industry (Figure 1).

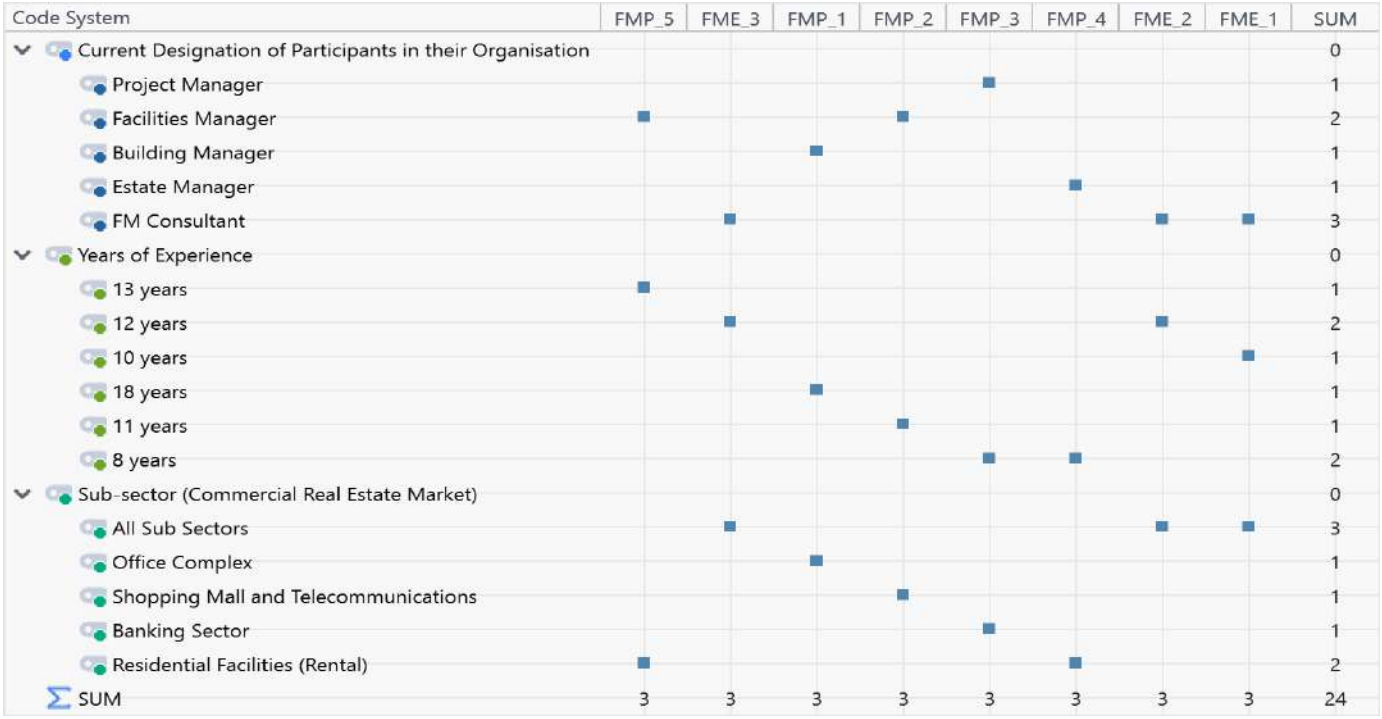


Figure 1

Current designation, years of experience and sectors of respondents

Participants responsible for FM operations held designations such as project manager, facilities manager, building manager, and estate manager (Figure 1). Some were also FM consultants operating across several sectors of the commercial real estate industry. Regardless of designation, all participants performed FM-related functions within their organisations and therefore had sufficient exposure to FM operations. Their experience ranged from 8 to 18 years, exceeding the minimum criterion of 5 years (Figure 1). This depth of experience in managing commercial facilities enriched the information provided and lent credibility to the interview results. Participants also worked across various sub-sectors, including office, retail centres, telecommunications, banking, and residential property rental, while the two FM consultants and one academic operated across several sub-sectors (Figure 2). This indicates adequate representation of the major sub-sectors of the commercial real estate industry and suggests inclusivity in the study's outcomes.

4.1.2 Stakeholders' Understanding of the Concept of Climate Change

The study explored participants' understanding of climate change. The results indicate that participants largely understood climate change. Participants presented their ideas based on their understanding of climate change. These ideas centred on key themes such as changing weather patterns over time, temperature increases (global warming), and environmental conditions (Figure 2). These themes emerged from the deductive coding. Specifically, some participants understood climate change to be a long-term shift in weather patterns, characterised by higher temperatures and changing rainfall. Participants largely attributed climate change to imbalances caused by anthropogenic activities.

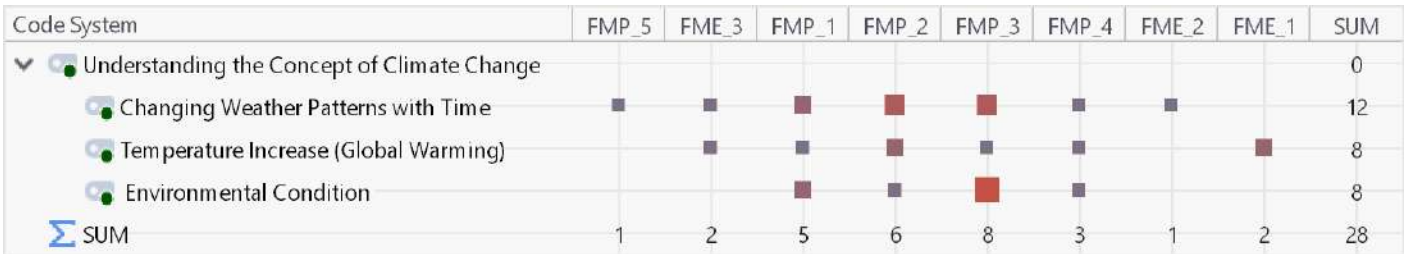


Figure 2

Understanding of the concept of climate change

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Changing weather patterns with time: Participants primarily understood climate change to be a change in weather patterns over time. For instance, '*Changing weather patterns with time'* was strongly emphasised in relation to the meaning of climate change from the interviews conducted (Figure 2). Some key indicators associated with this pattern included rainfall and high temperatures. A participant discussed it in relation to changing weather patterns:

> *"When I hear 'climate change,' I think about changing weather patterns with time, higher temperature and sometimes high or low rainfall"* (FMP5:15/01/2025)

This participant explained that climate change involves changes in weather patterns over time. The participant noted that climate change is associated with rising temperatures and changing rainfall patterns. This suggests that some participants have a basic understanding of climate as changing weather patterns, a major aspect of climate change. Temperature increase (global warming): Although higher temperatures are associated with changing weather patterns, this component, which is critical to explaining climate change, was missing from some participants' explanations. This limited the comprehensiveness of some participants' explanations (Figure 2). For instance, a participant explained it, but focused on high temperatures:

> *"We are seeing higher temperatures. The high temperature we are experiencing, the hotness of the sun. The weather is changing and becoming warmer"* (FMP_4:13/01/2025).

One participant linked climate change solely to rising temperatures associated with global warming, citing rising average temperatures and the intensity of sunlight as examples. Similarly, some participants described climate change as an increase in temperature with little emphasis on timing. This suggests a limited understanding of the temporal aspects of the concept. Other participants understood climate change as encompassing changes in the natural environment and ecosystems. They indicated that it concerns how environmental conditions change over time, leading to phenomena such as flooding and carbon monoxide pollution (Figure 2). A participant with a focus on environmental conditions explained this:

> *"So, my general understanding of climate change is that it involves changes in weather patterns and environmental conditions. This is associated with some of the fumes, such as carbon monoxide from the vehicles"* (FMP_2:05/01/2025).

Although participants mentioned changes in weather patterns, this section focused on the environmental dimension of the comment. It indicates that the participants understood climate change as changes in weather patterns and their associated effects on the environment and ecosystems.

4.1.3 Effects of Climate Change on Facilities Management Practices

Climate change can affect how FM operations are planned and implemented. This is because facilities are part of the environment and interact with other elements, such as weather. This study explores the effects of climate on FM practices. Participants identified several effects of climate change on FM practices. These include operational challenges, effects on building fabric, rising operational costs, flooding, user comfort, maintenance challenges, operational transformation, evolving tenant preferences, and regulatory requirements and compliance (Figure 3). They also explained how these impacts affect their FM operations.

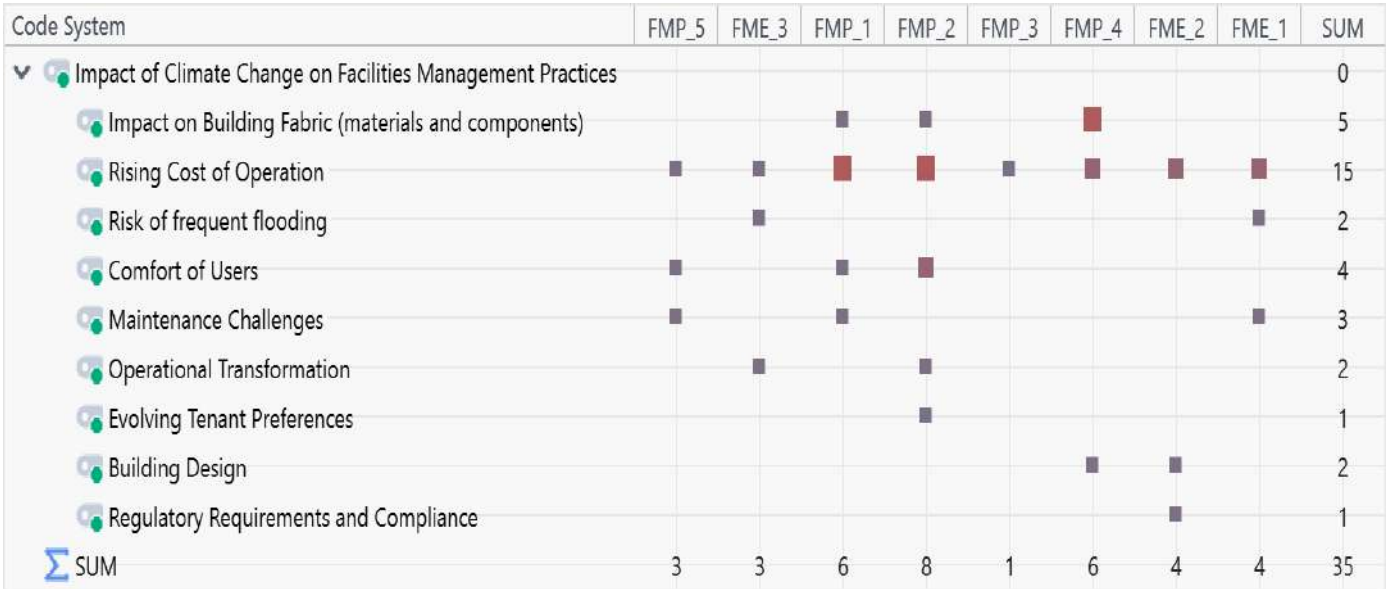


Figure 3

Effect of climate change on facilities management practices

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Operational challenges: Participants identified operational challenges as a major effect of climate change on FM operations in the commercial real estate sector. They acknowledged that climate change generally influences FM operations. This has shifted FM practices from traditional approaches to prioritising resilience and adaptation to reduce its effects. Participants repeatedly highlighted operational challenges as a major impact of climate change on FM operations in this sector (Figure 3). A participant explained operational challenges in the context of construction materials:

> *"Our operations are affected by climate change, and the materials we use for construction are also impacted. If the weather is warm, we need more electricity to cool the room; some rooms have light even during the day because of how we designed the building, and it affects our energy consumption"* (FMP 4: 13/01/2025).

The participant explained that changes in weather patterns, such as rising temperatures and shifting rainfall, directly affect the day-to-day FM operations of commercial facilities. This has increased energy demand for cooling and the risk of flooding. They also added that changing weather patterns have influenced the choice of construction materials and other construction activities. Effect on building fabric: According to the results, climate-induced changes, such as increased temperature and changing rainfall patterns, affect building fabric (materials and components) (Figure 3). This technically constitutes hard facilities management. Some of the participants noted that heating affects the durability of building materials and the choice of construction materials. This was discussed in relation to building materials:

> *"The materials we use for construction are also impacted by climate change. If the weather is warm, we need more electricity to cool the room; sometimes some rooms have light even during the day because of how we designed the building, and it affects our energy consumption"* (FMP _4:13/01/2025*).*

This participant explained that climate influences their choice of construction materials. This is because the design and materials used result in a high energy demand for cooling. They also indicated that climate change adversely affects the construction materials and systems used in FM operations. This finding indicates that climate change negatively affects building materials and components of commercial facilities.

Rising cost of operation: High energy consumption for cooling needs associated with climate change affects FM practices. Participants indicated that rising temperatures resulting from climate change have increased demand for air conditioning (Figure 3). They noted that this led to higher energy consumption and associated costs. Participants consistently reported rising operating costs as a major effect of climate change on FM operations in the commercial real estate sector (Figure 3). Participants discussed this effect in terms of high energy consumption in the operation of commercial facilities:

> *"It affects how we operate our facilities in terms of cost and others. Generally, I will say that climate change affects how we operate our facilities, especially the weather affects cooling and heating costs". (FMP_5:*16/01/2025*).*

This comment highlights that climate change affects how participants operate their facilities, including related costs. It also links high demand for cooling energy to rising temperatures. This suggests that rising temperatures increase operating costs for commercial facilities. *Risk of frequent flooding:* Participants noted that changing rainfall patterns (particularly high rainfall) frequently caused flooding and moisture-related issues. This affected FM operations in this sector (Figure 3). A participant explained these risks in relation to the high rainfall pattern and its associated risk of flooding:

> *"Our properties are getting flooded due to the effects of climate change because rainfall patterns are changing. Flooding and moisture issues have become more frequent. These and some other issues affect FM operations"* (FME_3: 9/01/2025).

This comment highlights that commercial facilities experience flooding and moisture-related problems due to increased rainfall, which affects FM operations. It suggests these facilities are prone to flooding and face a higher risk because of climate change, poor city planning, and weak regulatory enforcement. User comfort was another major climate-related effect on FM operations. Because users are central to FM, their comfort is critical to the success of FM operations in any organisation. Participants indicated that climate-induced changes affect user comfort in commercial facilities (Figure 3). Rising temperatures, for instance, cause heat-related discomfort, while flooding creates a nuisance for property users. This was explained by a participant from the perspective of complaints from users:

> *"Because sometimes, users complain about the heat and the high cost of operating our rented properties"* (FMP_2:05/01/2025*).*

This participant highlights users' concerns about thermal discomfort and the high cost of operating rented spaces. This comment further highlights the need for more energy-efficient, user-focused FM to reduce costs and improve comfort. Maintenance challenges: Effective maintenance management is critical to efficient FM practices. Participants indicated that high temperatures lead to greater air-conditioning use and other cooling needs. In addition, increased air-conditioning use accelerated wear and tear on air conditioners and other cooling equipment in commercial facilities (Figure 3). It was also observed that climate change affects system and material choices, particularly in retrofitting situations. Therefore, pressure on HVAC systems necessitates a shift toward preventive maintenance, which is widely

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recognised as challenging in sub-Saharan Africa. A participant explained this impact in relation to wear and tear of equipment and servicing challenges:

> *"So, the temperature is always hot, and it's getting hotter and hotter. That means the more people use the AC, the more it's going to be on, the more it is used; wear and tear comes. This means we have to make sure our servicing is on point to prolong the lifespan of this equipment" (FMP_ 5:*16/01/2025*).*

This participant observed that the frequent use of air conditioners results in the deterioration of HVAC equipment used to provide cooling needs in commercial facilities. However, the participant also reiterated the need to keep this equipment in good working condition. This suggests that climate change influences maintenance activities and strategies in the commercial real estate sector. Evolving tenant preference: Participants identified evolving tenant preferences as one effect of climate change on FM practices (Figure 3). They explained that climate change effects, such as rising temperatures and changing rainfall patterns, affect stakeholders' FM activities in commercial facilities. This has led to prioritising environmental considerations and sustainability in FM activities. Although limited references were made to evolving tenants' preferences, they still had a major effect because of their impact on the environment. This was explained in the context of environmental consciousness:

> *"Now, even getting tenants, for example, some tenants want people who have these environmental things in mind. Turning to this, as part of these long-term plans, sustainability goals are also in mind. Reduction of energy consumption and all that". (FMP_2:*05/01/2025*).*

This comment highlights that tenants are becoming more climate-conscious, as they increasingly ask questions about the environmental friendliness of the commercial properties they seek to occupy. The participant further discussed long-term plans to ensure sustainability, with specific emphasis on reducing energy consumption in commercial properties. This underscores a growing emphasis on environmental considerations in leasing decisions, largely known as green leasing.

Building design: According to the study results, climate change is shaping the design of commercial facilities to meet the energy needs of buildings in this sector. Some participants highlighted that most existing buildings are designed in ways that result in high energy consumption and associated costs for FM operations in the commercial real estate sector (Figure 3). A participant discussed this impact in relation to the link between building design and energy consumption in commercial facilities:

> *"How we designed the building affects our energy consumption. If the weather is warm, we need more electricity to cool the room, sometime some rooms have light even during the day" (FMP_4:* 13/01/2025*).*

This explanation suggests that the design of the building in relation to the weather affects energy consumption. For instance, changing weather patterns and rising temperatures in this part of the world increase heating needs in commercial facilities. As a result, these facilities require energy to meet cooling needs, ultimately increasing operating costs. This suggests that a facility's design, whether commercial or residential, strongly influences operating costs. Regulatory requirement and compliance: ***p***articipants noted that climate change has led FM practices in commercial facilities to align with sustainability regulations, codes, and standards (Figure 3). This was explained by a participant in the context of aligning industry operations with the regulatory framework:

> *"Because it's now affecting everyone globally, FM operations in the commercial industry must align with and comply with regulatory requirements. So, these smart buildings are coming up because now globally we are looking at how we can preserve our environment for the future. So, one key impact is the regulatory requirements and compliance". (FME_2:*05/01/2025*).*

This facilities management expert argued that climate change's effects on FM operations in the commercial real estate sector have compelled organisations to align their FM practices with regulations. In doing so, stakeholders are exploring how to reduce the environmental impacts of FM operations. Participants noted that this can be achieved by aligning FM operations with regulations and complying with those that promote sustainability practices, such as environmental conservation.

4.1.4 Consideration of Climate Change in FM Decisions

Climate change and facilities management are considered critical in organisational decision-making. This section explores whether stakeholders involved in FM operations in the commercial real estate sector consider climate change mitigation and adaptation in their decision-making. Participants largely indicated that some efforts have been made to consider climate change in decision-making; however, more is needed. The results indicate that this increasing integration is driven by a commitment to sustainability and ESG principles, institutional frameworks, stakeholder consideration, environmental stewardship, and operational adaptation (Figure 4).

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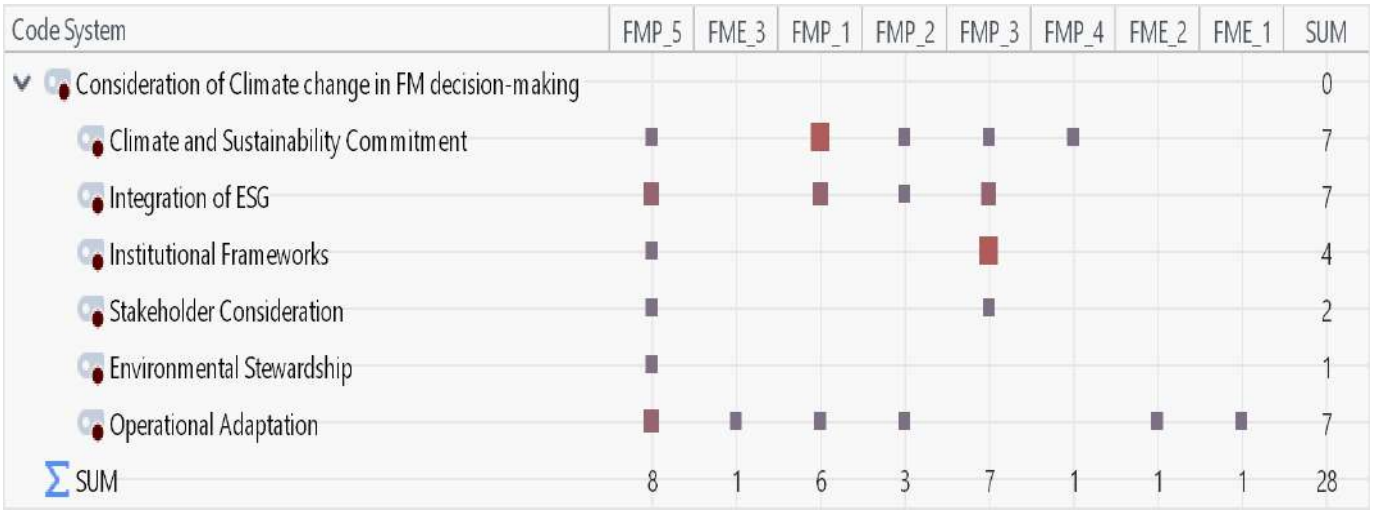


Figure 4
Consideration of climate change in FM decisions

Participants acknowledged that industry stakeholders consider climate change in FM decision-making (Figure 4). They indicated that organisations are deeply committed to climate and sustainability issues, making sustainability a strategic priority across decision-making processes. This commitment was one of the most widely expressed indicators that climate change is considered in FM decisions (Figure 4). Participants discussed their commitment to climate change and sustainability with respect to waste segregation and EDGE certification:

> *"We are trying to introduce waste segregation in the buildings that we manage. But for now, we look at energy conservation. How do we conserve energy? How do we conserve water consumption? One of our buildings we are trying to certify; we are trying to be EDGE certified. So, to qualify for that, you need to make sure that your energy, water, and carbon footprint consumption are under a certain percentage. So far, so good. So, we are intentional about it" (FMP_5:*16/01/2025*).*

This participant observed that stakeholders in the commercial real estate sector are making efforts to integrate sustainability initiatives into their FM operations at the strategic level. Some specific areas include waste segregation, energy and water conservation, and obtaining EDGE certification. Integration of Environmental Social and Governance (ESG): To achieve sustainability, participants indicated that organisations are increasingly considering and integrating Environmental, Social, and Governance (ESG) principles into their operations (Figure 4). They identified it as a major initiative and added that organisations are integrating it by adapting their activities to align with these principles. This is attributed to the idea that climate change is linked to ESG, underscoring its importance for sustainability. A participant with specific reference to the establishment and operation of an ESG unit, explained this:

> *"We have an ESG unit, a unit that is basically focused on ensuring sustainability and reducing the environmental and social impact of the business we do. So, basically, I mean, the support from stakeholders is there" (FMP_3:*9/01/2025*).*

This participant explained that organisations are committed to sustainability and are integrating sustainability initiatives into their FM operations. This is evident in the establishment of dedicated units and a sustainability committee focused on environmental, social, and governance (ESG) considerations. This underscores the growing attention to the need to consider sustainability in FM decisions within the commercial real estate sector. Institutional frameworks: As evidence of climate change consideration in decision-making, participants reported that organisations are aligning their FM practices with various sustainability frameworks and relevant alliances within the commercial real estate sector. They noted that some organisations adhere to various climate compacts and frameworks in their FM operations (Figure 3). A participant with specific emphasis on international frameworks explained this:

> *"So, in decision-making, we are very, very interested in climate issues, and, as you may know, we are very committed to sustainability. The Bank has signed up to various climate compacts and solutions to better serve our customers. Let me put it in this perspective. If you look at the various frameworks that have emerged from the United Nations Environment Programme and the Net Zero Banking Alliance, we are deeply involved in all of this, and we try, as much as possible, as an institution, to apply these frameworks to everything we do. So, we have an ESG unit, which is basically focused on ensuring sustainability and reducing the environmental and social impact of the business we do. So, basically, I mean, the support from stakeholders is there". (FMP_3:*9/01/2025*).*

This FM professional explained that organisations at all levels are considering climate change issues in their decision-making. This involved joining several international compacts and frameworks to guide their FM operations in line with sustainability principles. Also, as part of implementing and complying with these frameworks, some

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organisations have established ESG units dedicated solely to achieving sustainability. This suggests that organisations in the commercial real estate sector consider climate change issues in their FM operations. Stakeholder consideration: In terms of FM decision-making, participants reported that organisations are actively integrating climate change into their FM processes (Figure 4). This is driven by both internal operational efficiency and broader stakeholder engagement. A participant explained stakeholder consideration in relation to the provision of a sustainable work environment to meet the expectations of stakeholders:

> *"We are a family institution. So, whatever we do, we must make sure that our working conditions are favourable to both our internal customers and our external customers. So, in decision-making, we are very, very interested in climate issues, and, as you may know, we are very committed to sustainability" (*FMP_3: 9/01/2025).

This comment highlights that organisations are addressing the needs and expectations of facilities users and other stakeholders. This is reflected in the organisation's efforts to prioritise the needs of both internal and external customers. This shows that organisations are supporting climate change in their decisions by considering stakeholders and their expectations. Environmental stewardship: As evidence of climate change consideration in FM decision-making in commercial facilities, organisations are focusing on environmental stewardship. Some participants noted that this is being done through initiatives such as waste segregation, energy conservation and reduced water consumption (Figure 4). They indicated that organisations are also pursuing EDGE certification for their buildings, which requires meeting specific targets for water, energy, and carbon footprint. Therefore, commercial facility managers are working to reduce carbon emissions through FM operations. A participant explained environmental stewardship in relation to environmental preservation efforts:

> *"In addition, because we are turning our attention towards addressing and reducing carbon emissions and adjusting our operations to manage the effects of climate change, we consider it at all levels of our decision-making in our organisation. Because if we don't work towards it, it will affect the patronage of our facilities and our operating costs" (*FMP_5: 16/01/2025).

The participant explained that organisations are taking proactive measures to minimise their carbon footprints and reflect support for climate change. In addition, managers of commercial facilities are working to secure EDGE certifications for their buildings to reduce energy, water, and carbon footprints. This commitment stems from a recognition that reducing carbon emissions and adapting commercial facilities to climate change impacts ensure effective, environmentally friendly service provision and lower-cost operations.

Operational adaptation: According to participants, one of the major considerations in FM decision-making is operational adaptation to climate change (Figure 4). Participants noted that organisations are adapting their operations to sustainability principles, which is driven by the growing importance of climate change. This involves conscious efforts to conserve energy and water, with some organisations pursuing EDGE certification to validate their reduced environmental footprint. A participant discussed this in the context of FM operations gradually adapting to climate change impacts.

> *"The way climate change is affecting our activities is making it a serious topic in my organisation. Also, since it is linked to this ESG concept, it has become very important in what we do and what we are going to do in future. We actually plan and take steps within our organisation to address it. Some attempts have been made to come up with a roadmap, but it has yet to see the light of day. But this has not stopped, so we are doing what we can. So basically, we consider climate change and FM in our decision-making" (FMP_*2: 05/01/2025).

This shift reflects a global focus on environmental preservation and is changing how things are done. This includes adopting smart building technologies and improving insulation and reflective materials to reduce heat gain. While some organisations have attempted to develop comprehensive roadmaps for addressing climate change, the immediate focus remains on integrating these considerations into daily decision-making within facilities management.

4.2 Discussion

4.2.1 Understanding of the Concept of Climate Change

The study provides useful insights into stakeholders' understanding, perceptions, and support for climate action in the commercial real estate sector. Stakeholders generally demonstrated a fundamental understanding of climate change, which corroborates Leal-Filho et al. (2024) and Hallegate (2009), who suggest that climate change awareness has increased due to greater exposure to climate impacts and risks. However, stakeholders could not effectively apply this knowledge to address climate change, creating a knowledge-application gap. This extends existing literature (Adams & Prakash, 2024), which argues that high levels of understanding or awareness often do not translate into structured decision-making and action.

Participants commonly associated climate change with changes in weather patterns and rising temperatures, which aligns with existing literature on general awareness among built environment professionals. However, the lack of focus on the temporal dimension of climate suggests only a partial understanding of the concept. This aligns with

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previous studies emphasising the gap between awareness and actionable knowledge (Nissanka et al., 2024; Okello et al., 2015) and highlights the need to strengthen knowledge so it can be translated into practical applications for mitigation and adaptation.

4.2.2 Effects of Climate Change on Facilities Management

Participants showed a strong recognition of climate change as a critical issue. This is shown in their ability to demonstrate that climate change significantly affects their FM operations. Specific effects identified by these participants include increased energy use, operational challenges, flood risk, and impacts on building fabric and user comfort. This finding corroborates Nirmul and Scott's (2020) finding that stakeholders' capacity to anticipate and respond to climate risks is crucial for successful mitigation and adaptation. The perceived increase in operating costs, particularly related to energy needs, reflects broader concerns in the built environment about climate-induced financial burdens. In addition, identifying risks of flooding and deterioration of building components or fabric corroborates other studies (Leal-Filho et al., 2024), which find that infrastructure resilience and performance are directly affected by climate change variability.

Most importantly, market and institutional expectations are shifting, driven by changing tenant preferences and regulatory compliance. This supports Lukito et al. (2019)'s assertion that societal and stakeholder expectations have increasingly driven climate change concerns. This suggests that climate change is not only an environmental issue but also a market and regulatory-driven issue. This is reflected in growing interest in sustainable buildings and environmental performance.

4.2.3 Consideration and Support for Climate Change Mitigation and Adaptation

The findings indicate growing support for mitigation and adaptation in FM decision-making. Participants highlighted initiatives such as waste segregation, energy conservation, ESG integration, adherence to international frameworks, and the pursuit of sustainability certifications. These reflect increasing organisational commitment to sustainability and resonate with Gopfert et al. (2019), who suggested that organisational structures and stakeholder participation are critical to advancing climate action. Including stakeholder expectations in FM decision-making also reiterates stakeholders' role as a key driver of sustainability outcomes (Balaz et al., 2021; Nikas et al., 2018), aligning with studies that highlight the importance of multi-stakeholder collaboration in climate change mitigation and adaptation (Bohensky et al., 2016; Maharjan, 2020).

Despite this support, climate action initiatives remain gradual and sometimes fragmented, as comprehensive strategies and roadmaps are still being developed. This reiterates the awareness-action gap identified in previous studies (Akinola et al., 2020; Hurliman et al., 2018). Challenges impeding support include resistance to change, moderate stakeholder understanding and awareness, and misalignment between policy expectations and operational realities. This corroborates McCallum et al. (2014) and Dieckmann et al. (2021), who argue that policymakers and other actors are misaligned in their perceptions of climate threats.

V. CONCLUSION & RECOMMENDATIONS

5.1. Conclusion

The study finds that FM professionals and experts demonstrate a reasonable level of understanding and awareness of climate change, strongly recognising its impacts on operations. These participants perceive major operational, financial, and environmental challenges. They also demonstrated their support for climate action by adopting emerging sustainable initiatives. However, gaps remain in translating understanding and awareness among FM professionals and experts into structured, comprehensive climate strategies for FM practice.

5.2 Recommendations

Capacity-building initiatives are needed to improve technical understanding of climate change and to demonstrate how these skills apply in FM operations. To achieve sustainability, the FM sector within commercial real estate should integrate climate considerations into strategic planning and develop and implement clear policies and roadmaps. Stakeholders must also foster collaboration to improve the effectiveness of climate change initiatives. Finally, ESG and sustainability certifications improve environmental performance and market competitiveness when treated as practical tools and implemented effectively.

The study is qualitative and involved a relatively small sample of FM professionals and experts within Accra's commercial real estate sector, which may limit the generalisability of the results. Quantitative research with a larger sample across different geographical contexts could validate these findings. The study also focused only on FM professionals and experts in academia and practice, without considering demand-side perspectives such as end users. Further studies could include policymakers, tenants, regulators, and other key actors to provide a more holistic

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understanding of climate change mitigation and adaptation in relation to FM operations. To reduce the knowledge-action gap, future research should also develop practical tools and frameworks that bridge understanding and implementation.

Declaration of Interest

The authors declare that they do not have any known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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