Enablers and Barriers to Effective Mainstreaming of Climate Change Adaptation into Local Government Development Plans: A Comparative Analysis of Lusaka City and Mambwe District, Zambia

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ABSTRACT

Local governments occupy a pivotal role in climate change adaptation (CCA) planning, yet the conditions that enable or hinder effective mainstreaming of CCA into local government development plans remain poorly understood, particularly in developing countries. This study investigates the enablers and barriers to effective CCA mainstreaming in local government development plans in Zambia and assesses the extent to which mainstreaming has occurred. A comparative case study design was employed, examining Lusaka City Council and Mambwe Town Council as representative cases of urban and rural municipalities, respectively. Primary data were collected through semi-structured interviews with twelve (12) key informants purposively selected on the basis of their roles in local climate adaptation planning, while secondary data were drawn from district development plans, spatial development frameworks, annual reports, and budgets. Interview data were transcribed and coded using Atlas.ti software, and document analysis was guided by Kivimaa and Mickwitz's (2006) environmental policy integration indices of inclusion, consistency, weighting, reporting, and resources. Findings reveal that CCA has been mainstreamed into development plans in both municipalities, albeit at different levels, approximately 60 per cent in Lusaka and 30 per cent in Mambwe. Information capacities emerged as the most influential capacity arrangement, followed by resource capacities, while external networks and partnerships also played a significant enabling role. The study concludes that both formal and informal capacity arrangements substantially influence the degree to which CCA is mainstreamed into local government development planning. The findings underscore the need for targeted capacity building, improved inter-departmental coordination, and stronger external partnerships to advance CCA mainstreaming in Zambian municipalities, with implications for local governance in comparable developing-country contexts. This research contributes empirical evidence on subnational climate governance in Sub-Saharan Africa and provides actionable insights for strengthening local climate adaptation planning in developing countries.

Keywords: Climate Change Adaptation; Mainstreaming; Local Government; Development Plan; Capacity Arrangements.

1. INTRODUCTION

Climate change represents one of the defining developmental challenges of the twenty-first century, with its consequences disproportionately affecting developing countries that have contributed least to its causes. While mitigation efforts dominate global discourse, adaptation to the inevitable impacts of climate change has increasingly been recognized as an essential complementary strategy. Climate change adaptation (CCA) has been defined as "the process of adjusting to existing or anticipated climate and its impacts" with the aim of moderating harm or exploiting potential opportunities (IPCC, 2014). Since the Intergovernmental Panel on Climate Change (IPCC) third assessment report of 2001, adaptation has grown into a central concern of climate policy at all governance levels (Bassett and Fogelman, 2013), and it is now institutionalized across geopolitical scales and reinforced by bottom-up planning processes in local governments (Preston et al., 2015). Adaptation policy is by nature cross-cutting, multi-disciplinary, and multi-sectoral, requiring substantial collaboration and cooperation across levels of government (Bauer and Steurer, 2014; Moloney and Fünfgeld, 2015), with its primary goals being to minimize vulnerability and to build adaptive capacity (Vogel and Henstra, 2015).

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Local governments occupy a unique position in the climate change adaptation landscape. Both the Paris Agreement and the United Nations Sustainable Development Goals (SDGs) formally recognize the significance of local governance in CCA (UNFCCC, 2015; Scott and Moloney, 2022). Because the impacts of climate change are highly context-specific, local governments are considered essential actors in CCA (Mfitumukiza et al., 2020; Scott and Moloney, 2022). Their statutory functions including land use planning, infrastructure management, spatial development frameworks, building regulation, emergency management, and integrated development planning provide direct levers for embedding adaptive responses into the built and natural environment (Scott and Moloney, 2022; Vogel and Henstra, 2015; Hetz, 2016). The proximity of local officials to affected communities enables rapid assessment of place-level climate risk exposure and sensitivity (Vogel and Henstra, 2015). Nevertheless, local actors do not operate in isolation; they are guided and constrained by multi-level governance structures, financial arrangements, and competing policy priorities, which frequently limit their autonomous climate action (Nalau et al., 2015; Scott and Moloney, 2022).

Against this backdrop, a debate has emerged regarding whether CCA is best addressed through dedicated climate action plans or through mainstreaming that is, the integration of climate change concerns into existing development planning, policies, and decision-making processes (Uittenbroek et al., 2013; Cuevas, 2016). Mainstreaming has been described as the process of integrating climate change and adaptation into development planning, programmes, projects, and sectoral decision-making at national, sectoral, and sub-national levels (Lebel et al., 2012). Vincent and Colenbrander (2018) and Reid and Huq (2014) argue that because climate change is a cross-cutting concern, mainstreaming it into integrated development planning is more effective than addressing it through siloed sectoral plans. This approach creates synergy effects across policy sectors, improves administrative and budgetary resource efficiency, results in more effective adaptation measures, and promotes policy innovation (Runhaar et al., 2018; Rauken et al., 2015). Moreover, mainstreaming ensures that development gains are not undermined by climate risk while simultaneously building adaptive capacity and resilience (Vincent and Colenbrander, 2018).

The conceptual basis for assessing mainstreaming effectiveness is grounded in the environmental policy integration (EPI) literature, which emphasizes the inclusion of environmental goals within already-established policy domains (Uittenbroek et al., 2013). Kivimaa and Mickwitz (2006) developed four criteria for measuring the degree of environmental policy integration: inclusion, consistency, weighting, and reporting. Inclusion refers to whether the problem has been acknowledged in policy discourse; consistency denotes a shared understanding of the issue among stakeholders; weighting describes the relative priority given to climate goals vis-à-vis competing objectives; and reporting captures mechanisms for ex-ante and ex-post evaluation and feedback (Mickwitz et al., 2009). A fifth criterion, resources, has also been applied to assess whether the necessary financial and human inputs have been committed (Kivimaa and Mickwitz, 2006). Mainstreaming may further be understood along horizontal and vertical dimensions with horizontal integration involving cross-sectoral coordination within government, while vertical integration refers to the alignment of climate policies across multiple levels of governance (Mickwitz et al., 2009; Rauken et al., 2015). Nunan et al. (2012:265) caution, however, against "mainstreaming overload," where integrating too many cross-cutting concerns into sector policies introduces practical and conceptual challenges that undermine coherence and paralyses implementation.

Despite consensus on the value of mainstreaming, its implementation remains constrained by a range of capacity barriers. Cuevas et al. (2015) categorize these into three capacity domains: institutional, information, and resource capacities. Institutional capacity encompasses the laws, organizational structures, leadership arrangements, and inter-departmental coordination mechanisms involved in the mainstreaming process. Key institutional factors include local autonomy, the presence of climate change champions, organizational fragmentation, and the political priority accorded to CCA relative to other development concerns (Cuevas et al., 2015; Measham et al., 2011; Pasquini et al., 2015). Information capacity relates to the availability, quality, credibility, and communication of climate knowledge among policymakers, planners, and communities (Mogelgaard et al., 2018; Moser and Ekstrom, 2010). Resource capacity refers to the human and financial resources required to initiate and sustain adaptation initiatives; resource constraints frequently compel local governments to favour short-term, reactive measures over long-term strategic CCA planning (Cuevas et al., 2015; Ekstrom et al., 2011). Beyond formal capacity arrangements, informal networks and social factors also shape the enabling environment for CCA mainstreaming. Civil society organisations (CSOs), non-governmental

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organizations (NGOs), research institutions, and international networks provide critical support through capacity building, knowledge exchange, and resource mobilization (Chu et al., 2016). Cultural values and belief systems similarly influence how climate risks are perceived and how adaptation options are prioritized (Moser and Ekstrom, 2010; Nielsen and Reenberg, 2010).

While the literature on CCA mainstreaming has grown substantially in developed country contexts, empirical investigations in developing countries particularly sub-Saharan Africa remain limited (Pasquini et al., 2013). The enabling conditions for municipalities to incorporate climate adaptation into their policies and procedures have not been adequately identified, especially for smaller towns and districts (Pasquini et al., 2015). Zambia provides a compelling case to its planning framework formally accommodates climate change integration across all levels of governance (MLNREP, 2016; Vincent and Colenbrander, 2018), yet the capacity of local authorities to effectively mainstream CCA remains understudied. This study therefore aims to explore the conditions necessary for effective CCA mainstreaming in local government development plans in Zambia and to assess the extent to which such mainstreaming has been achieved. It is guided by the following research questions: (i) What role do local governments play in CCA mainstreaming? (ii) To what extent is CCA mainstreamed in development plans? (iii) What barriers and enablers shape CCA mainstreaming? (iv) Which capacity arrangements most influence CCA mainstreaming at local government level? and (v) Which sectors are more mainstreamed with CCA initiatives, and why? The study offers empirical evidence that can inform local governance practice and national climate policy in Zambia and comparable developing-country contexts.

1.1 Conceptual Framework

The conceptual framework of this study is depicted in Figure 1, which maps the roles of formal and informal capacity arrangements as either enablers/conditions or barriers/obstacles in the mainstreaming of Climate Change Adaptation (CCA) into development plans and policies. Consistent with Moser and Ekstrom (2010), barriers are viewed as manageable obstacles that may be overcome by coordinated strategies, changes in viewpoint, and the reallocation of resources. Based on the work of Cuevas et al. (2015), the framework delineates these into three categories of Formal Capacity Arrangements: institutional, informational, and resource capacities. To encompass processes that extend beyond formal organisational limits, two Informal Capacity Arrangements are included, namely; social/cultural elements and external/informal networks. Significantly, as highlighted by Uittenbroek et al. (2013), these components are situated along a continuum; based on their functional context throughout the policy process (understanding, planning, and managing), they may present as structural barriers or evolve into strategic opportunities. The depth of Effective CCA Mainstreaming is ultimately determined by the interaction of these enablers and barriers (Mickwitz et al., 2009), which is empirically assessed across five key policy dimensions: inclusion, consistency, weighting (prioritisation), reporting/evaluation, and resource allocation.

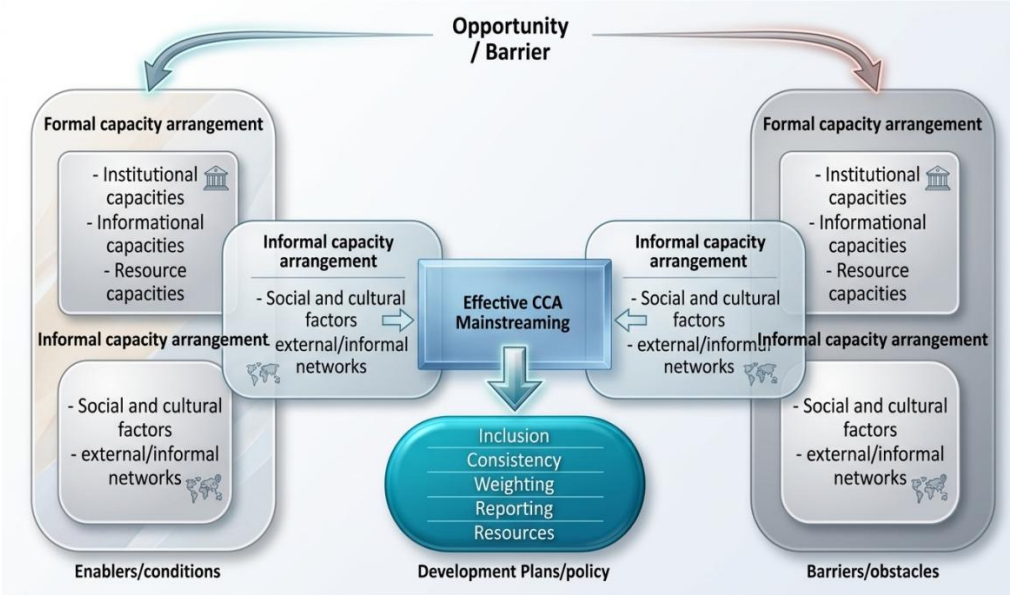


Figure 1: Conceptual framework

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2. METHODOLOGY

CCA mainstreaming in local government development plans. The two local governments selected, Lusaka City Council (LCC) in Lusaka Province and Mambwe Town Council (MTC) in Eastern Province were chosen through a deliberate, criteria-based selection process informed by informal consultations with experts in local administration and climate change adaptation. From Zambia's 97 rural and five urban/metropolitan municipalities, selection was guided by three criteria directly linked to the study's focus on CCA mainstreaming: (i) the municipality must possess a district development plan incorporating an Integrated Development Plan (IDP) and/or a Spatial Development Framework (SDF) as evidence of an existing mainstreaming process; (ii) the municipality must have a recognized climate change champion or leader actively driving the CCA agenda; and (iii) both municipalities must face similar climate change hazards to enable meaningful comparison. LCC was selected as the urban case on account of its status as Zambia's capital and largest city, with established institutional structures, diverse sectoral departments, and active international climate partnerships. MTC was selected as the rural case, representative of the resource-constrained majority of Zambia's local authorities. The deliberate urban–rural contrast directly serves the study's objective of examining how governance scale, institutional complexity, and resource endowment shape the enabling conditions for CCA mainstreaming.

Primary data were collected through semi-structured interviews with twelve (12) key informants, purposively selected on the basis of their positions in the local climate adaptation planning process. Participants included Heads of Planning and Engineering Departments, representatives from the Provincial Physical Planning Department, personnel from the Ministry of Local Government and Rural Development responsible for climate adaptation, the District Agricultural Officers, the District Forestry Officers, members of the District Disaster Management Committee, and representatives from the Eastern Water and Sanitation Company and Lusaka Water and Sanitation Company. Although the research design required face-to-face interviews, in-person interviews could not be conducted due to cost and time constraints; online interviews were therefore conducted instead and were recorded with the informed consent of respondents for the purposes of analysis and reporting. Secondary data were obtained from key planning documents, specifically the Lusaka Comprehensive Urban Development Plan (2010–2030) and the Mambwe Integrated Development Plan (2020–2025), supplemented by annual reports, budgets, and spatial development frameworks.

Interview recordings were transcribed and analysed using Atlas.ti software, through which responses were coded and categorized against the capacity domains of institutional, information, and resource arrangements as operationalized from the conceptual framework (figure 1). Thematic analysis was applied to identify patterns across codes and to examine correlations between capacity types and mainstreaming outcomes in both councils. Document analysis was guided by Kivimaa and Mickwitz's (2006) environmental policy integration indices that includes inclusion, consistency, weighting, reporting, and resources where each scored on a zero-to-two-point scale, and where two denotes full satisfaction of the criterion, one denotes partial satisfaction, and zero denotes no satisfaction. This scoring framework enabled a systematic, comparative assessment of the extent of CCA mainstreaming across the planning documents of both municipalities.

3. RESULTS

3.1. Lusaka City Council

Lusaka, Zambia's capital with approximately 2.5 million residents, faces significant climate risks including flooding, water shortages, and cholera outbreaks linked to inadequate sanitation. Climate projections indicate temperatures could rise by up to 3°C above current levels by 2040, with intensifying wet season flooding (FRACTAL, 2017; 2018; Taylor et al., 2021).

Lusaka City Council (LCC) operates with 4,789 staff and includes a Department of City Planning with an Environmental Planning Section and a District Disaster Management and Mitigation Unit (DDMMU), but lacks a dedicated Climate Change Expert, Resilience Officer, or Sustainability Officer.

3.2 Mambwe Town Council

Mambwe District, located in Eastern Province, is a rural jurisdiction dependent on agriculture, forestry, and wildlife-based tourism. The district faces severe dry spells and floods threatening food security, and climate-induced disruptions to tourism (Habitat for Humanity Zambia, 2020).

Mambwe Town Council (MTC) operates with only 187 staff members, with CCA responsibilities nested within the physical planning department. Over 80% of land falls under traditional authority administration, which constrains effective spatial planning jurisdiction.

3.3 Level of CCA Mainstreaming in Development Plans

CCA mainstreaming in both municipalities was assessed using a five-criterion qualitative content analysis framework scored on a three-point scale: 2 (satisfies fully), 1 (satisfies in part), and 0 (does not satisfy). The criteria; Inclusion, Consistency, Weighting, Reporting, and Resources are described in Table 1 (adapted from Chipili, 2022; Runhaar et al., 2018).

Table 1: CCA Mainstreaming Assessment Criteria and Scoring Rubric

Criterion	Description	Score 2 (Fully Satisfies)	Score 1 (Satisfies in Part)	Score 0 (Does Not Satisfy)
Inclusion	Extent to which CCA is explicitly referenced in vision, objectives and strategies	CCA explicitly named across multiple strategic sections	CCA implicitly referenced or limited to one section	No reference to CCA
Consistency	Coherence of CCA/environmental objectives with broader sector goals	All development approaches integrate environmental/CCA objectives	Some sectors integrate CCA objectives; others do not	No alignment between CCA and sector objectives
Weighting	Prioritisation of CCA relative to other development objectives	CCA objectives explicitly ranked/prioritised with resource allocation criteria	Some form of project-level prioritisation considers environmental impact	No ranking or prioritisation of CCA objectives
Reporting	Presence of monitoring and evaluation mechanisms for CCA	Dedicated M&E framework with CCA-specific indicators	General M&E framework partially applicable to CCA	No M&E provisions for CCA actions
Resources	Allocation of financial and human resources for CCA implementation	Dedicated CCA budget lines and designated personnel	Partial resource provisions for CCA (integrated with other activities)	No resource allocation for CCA

Criteria derived from Runhaar et al. (2018)

Mambwe's IDP addresses CCA implicitly through ecological sustainability and agricultural resilience objectives, but lacks explicit adaptation measures, institutional frameworks, monitoring mechanisms, or dedicated budget allocations.

Lusaka's Urban Development Plan demonstrates higher CCA integration, with all seven development approaches incorporating sustainability and resilience strategies and environmental-friendly objectives applied cross-sectors. However, neither municipality's development plan includes a dedicated CCA monitoring framework, resulting in a zero score on the Reporting criterion for both.

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Table 2: CCA Mainstreaming Scores: Mambwe Town Council and Lusaka City Council

Criterion	Mambwe Score	Lusaka Score	Maximum Score
Inclusion	1	2	2
Consistency	1	2	2
Weighting	0	1	2
Reporting	0	0	2
Resources	1	1	2
TOTAL	3 (30%)	6 (60%)	10 (100%)

Note: 2 = Satisfies fully; 1 = Satisfies in part; 0 = Does not satisfy.

As shown in Table 2, Lusaka scored 6 out of 10 (60%) and Mambwe scored 3 out of 10 (30%). Both municipalities scored zero on Reporting, confirming systemic deficits in CCA monitoring and evaluation consistent with other sub-Saharan African local governments (Uittenbroek et al., 2013; Runhaar et al., 2018).

3.4 Enablers and Barriers to Mainstreaming: Formal Capacity Arrangements

Formal capacity arrangements were the primary determinants of mainstreaming effectiveness, encompassing institutional capacity (governance structures, leadership, legal frameworks, inter-agency coordination), information capacity (climate data access and communication), and resource capacity (financial resources and human capital).

3.4.1 Institutional Capacity

Institutional capacity encompasses governance structures, political leadership, legal mandates, and inter-agency coordination. Significant differences were found between the two municipalities across all dimensions.

In Mambwe, CCA mainstreaming is driven primarily by the planning department, with political leadership limited to reactive responses during flood events. Officers reported a sense of institutional inertia on climate planning in the absence of top-level leadership support.

In Lusaka, CCA planning is jointly led by the Environmental Planning Section and Community Development Office, with the mayor's office providing political leadership. While past mayors demonstrated strong climate engagement, current administration involvement is perceived as insufficient due to the absence of a dedicated Climate Change Expert or Resilience Officer. Approximately 50% of staff reported poor inter-departmental coordination, partially bridged by a Technical Working Group (TWG).

In Lusaka, water and food security are most mainstreamed, while in Mambwe, forestry and agriculture receive the most CCA attention. Table 3 provides a comparative summary.

Table 3: Institutional Capacity Findings: Comparative Analysis

Institutional Capacity Dimension	Lusaka City Council	Status	Mambwe Town Council	Status
Mandate and autonomy	Sufficient mandate for planning decisions; constrained by lack of CCA laws	(+)	Limited mandate; 80%+ land under traditional authority	(-)
Administrative leadership	Administratively driven; Environmental Planning Section leads CCA	(+)	Limited administrative drive; planning department lacks leadership support	(-)
Political leadership	Historically strong (past mayors); currently insufficient	(+/-)	Reactive; leadership active only during flood emergencies	(-)

Organisational structure	Complex (4,789 staff); lacks dedicated Climate Expert or Resilience Officer	(-)	Simple (187 staff); no climate-dedicated post in structure	(-)
Inter-departmental coordination	50% silos reported; TWG partially bridges gap; good inter-departmental links	(+/-)	Limited; DMT provides informal multi-sectoral coordination	(-)
Legal framework for CCA	No dedicated CCA legislation; IDP guidelines allow implicit mainstreaming	(-)	No dedicated CCA legislation; restricted to sensitisation activities	(-)
Community participation	Meaningful community involvement in development planning	(+)	Significant Ward-level community participation	(+)
Most mainstreamed sectors	Water security, food production, biodiversity	—	Forestry/biodiversity, agriculture	—

Note: (+) = Enabler; (-) = Barrier; (+/-) = Mixed.

3.4.2 Information Capacity

Information capacity — the availability, quality, and effective communication of climate data — emerged as the principal barrier to mainstreaming in both municipalities.

Neither municipality generates its own climate data. In Mambwe, data is sporadically sourced from the national meteorological department while a local station remains underutilised. Senior officers were unable to clearly differentiate adaptation from mitigation, conflating most CCA activities with disaster risk reduction. IDP guidelines make no explicit mention of CCA mainstreaming procedures, contributing to conceptual ambiguity among planners.

Lusaka relies on external institutions such as the Meteorological Department, University of Zambia, and Kenneth Kaunda Airport with the FRACTAL project enabling collaboration with climate scientists from Cape Town and UK universities. Key challenges include lack of ward-level data disaggregation and incomplete Meteorological Department digitisation archives for long-term trend analysis.

A novel finding was the role of social media (Facebook, Twitter, Instagram, TikTok) in raising community and decision-maker awareness of climate hazard impacts — an emergent information pathway not captured in existing frameworks. Table 4 provides a comparative overview.

Table 4: Information Capacity Findings: Comparative Analysis

Information Capacity Dimension	Lusaka City Council	Status	Mambwe Town Council	Status
Availability of climate data	No self-generated data; relies on external institutions (Met Dept, UNZA, FRACTAL)	(-)	No self-generated data; sporadically accesses national Met Dept	(-)
Credibility and reliability of data	Relatively reliable through FRACTAL and university partnerships; gaps in Met Dept digitisation	(+/-)	Very limited; no systematic data collection; meteorological station underutilised	(-)
Spatial scale of data	Not disaggregated to ward level; limits spatial planning effectiveness	(-)	No ward-level data; general national data only	(-)
Awareness of decision-makers	Adequate awareness among technical officers; mayor-level champions historically present	(+)	Limited awareness; officers conflate adaptation and mitigation	(-)

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Communication of climate information	Limited; met dept not included in DDCC structure; who interprets data for policymakers unclear	(-)	Very limited; no systematic communication channels for CCA information	(-)
Long-term planning data	Inadequate; data gaps limit long-term trend analysis	(-)	Very limited data for long-term planning	(-)
Emerging information pathways	Social media identified as emerging awareness-raising tool	(+)	Not identified	(-)

Note: (+) = Enabler; (-) = Barrier; (+/-) = Mixed.

3.4.3 Resource Capacity

Resource capacity — financial resources, human capital, and technological infrastructure — revealed significant deficits in both municipalities, though differing in severity.

In Mambwe, no designated CCA funding exists; the central equalization fund and CDF are primarily directed toward service delivery. CCA activities are restricted to community sensitisation, with officers pragmatically integrating resilience elements into capital infrastructure projects — for example, ensuring road rehabilitations include adequate storm drainage for flood management.

Lusaka has six environmental planners but lacks a dedicated Climate Officer for data collection and analysis. Financial decision-making platforms (DDCC and CDF) lack CCA-knowledgeable representatives. Officers have benefited from capacity building with UNZA and the University of Cape Town, including short courses in Resilience Action Planning (RAP). Table 5 summarises resource capacity findings across both municipalities.

Table 5: Resource Capacity Findings: Comparative Analysis

Resource Capacity Dimension	Lusaka City Council	Status	Mambwe Town Council	Status
Availability of CCA funding	Relatively limited; no dedicated CCA budget line; relies on sector budgets	(-)	Very limited; no dedicated CCA fund; central equalization fund primary source	(-)
Stability of funding	Unstable; central government transfers delayed or irregular	(-)	Unstable; delayed central government transfers; CDF not CCA-focused	(-)
Human resource capacity	Six environmental planners but no dedicated Climate Change Officer; training undertaken with UNZA and UCT; councillor climate training conducted	(+/-)	Very limited; no climate expert; environmental planner role not CCA-specific; workshop training on IDP climate screening conducted	(-)
Climate incentives/subsidies for residents	Not available	(-)	Not available	(-)
Technology for climate data management	Limited; Met Dept digitisation challenges	(-)	Limited; meteorological station underutilised	(-)
CCA representation in financial decision-making	No CCA-designated representative in DDCC or CDF structures	(-)	No CCA-designated representative in financial decision platforms	(-)

Note: (+) = Enabler; (-) = Barrier; (+/-) = Mixed.

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3.5 Informal Capacity Arrangements

Beyond formal structures, informal capacity arrangements such as social and cultural norms, informal working groups, and external collaborative networks were identified as emerging but under-studied determinants of mainstreaming effectiveness.

3.5.1 Social and Cultural Factors

In Mambwe, social and cultural factors were not explicitly identified as direct influences. However, the District Multi-sectoral Team (DMT), activated during IDP formulation, provided an informal cross-institutional platform representing a potential entry point for advancing CCA dialogue.

In Lusaka, over 50% of respondents held the perception that CCA planning is the exclusive domain of environmental planners, inadvertently siloing adaptation responsibilities and limiting cross-departmental collaboration. CCA has not been embedded into the daily routines of either municipality, though the TWG provides an enabling informal mechanism for interdepartmental knowledge exchange.

3.5.2 External Collaborative Networks

External collaborative networks encompassing private sector, CSOs, NGOs, international development partners, and research institutions emerged as a key differentiator between municipalities.

Mambwe's external network is limited to COMACO, which promotes sustainable agricultural practices and provides community mobilisation and funding support, and BIOCARBON Partners on forest conservation.

Lusaka benefits from an extensive network including the Global Covenant of Mayors, ICLEI Africa, One Planet City Challenge, UN-Habitat, WaterAid, GIZ, JICA (which facilitated the Urban Development Plan formulation), UNZA, and the University of Cape Town. This breadth of partnerships provides access to technical expertise, climate data, and international best practice knowledge. Table 6 presents a comparative overview.

Table 6: External Collaborative Networks: Comparative Analysis

Network Type	Lusaka City Council	Status	Mambwe Town Council	Status
Private sector engagement	Business community engaged through Mayoral campaigns (e.g. tree planting drives)	(+)	Limited; COMACO provides market incentives for sustainable farming	(-)
International development partners	UN-Habitat, WaterAid, GIZ, JICA, WWF, FRACTAL consortium	(+)	None identified	(-)
International city networks	Global Covenant of Mayors, ICLEI Africa, One Planet City Challenge (OPCC)	(+)	None identified	(-)
CSO/NGO advocacy	Active; NGOs advocate for marginalised communities in informal settlements	(+)	Absent; no CCA-focused CSO advocacy documented	(-)
Research institution partnerships	UNZA, University of Cape Town, UK universities (via FRACTAL)	(+)	None active; meteorological station present but underutilised	(-)
NGOs on sustainability	Multiple active organisations	(+)	COMACO and BIOCARBON Partners; limited scope	(-)

Note: (+) = Enabler; (-) = Barrier.

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4. DISCUSSION

The findings of this study reveal the multidimensional nature of CCA mainstreaming challenges and opportunities at the local government level in Zambia. Drawing on the comparative analysis of Lusaka City Council and Mambwe Town Council, this section critically discusses the results in relation to existing theoretical and empirical literature, examining each capacity dimension identified in the conceptual framework.

4.1 Level of CCA Mainstreaming: Early Stages with Structural Deficits

The finding that both municipalities are at early stages of CCA mainstreaming, Lusaka at 60% and Mambwe at 30%, confirms a pattern well-established in the global literature on sub-Saharan African local governments. Uittenbroek et al. (2013) and Runhaar et al. (2018) document that local governments have yet to fully adopt CCA mainstreaming, with integration remaining partial and concentrated in the early stages of planning cycles, namely vision formulation and strategic objective-setting. This study corroborates these findings as both municipalities integrated CCA most meaningfully at the inclusion and consistency levels, while failing entirely on the reporting criterion and achieving only partial scores on weighting and resources.

This finding aligns with the observation by Scott and Moloney (2022) and Pieterse et al. (2016) that early advocacy for CCA in terms of sustainability and resource efficiency rarely translates into actionable implementation, monitoring, and evaluation. The absence of dedicated reporting mechanisms in both development plans is particularly alarming, as monitoring and evaluation are essential for adaptive learning and plan revision in response to changing climate conditions. The zero score on Reporting reflects a broader governance accountability deficit that extends beyond CCA and is endemic to local government development planning in Zambia more broadly.

The differential between Lusaka (60%) and Mambwe (30%) underscores the importance of institutional scale, organisational complexity, and external network access in driving mainstreaming. However, it also reveals that scale alone is insufficient despite its larger workforce and international partnerships. Lusaka's mainstreaming remains partial, constrained by gaps in climate expertise within its organisational structure and the non-disaggregation of climate data to ward level. This suggests that a qualitative transformation in how CCA is institutionalised not merely the acquisition of more resources is required to achieve genuine mainstreaming.

4.2 Institutional Capacity: The Centrality of Leadership and Governance Structures

Institutional capacity was found to be a decisive enabler or barrier to CCA mainstreaming in both municipalities, consistent with the theoretical proposition advanced by Nalau et al. (2015), Runhaar et al. (2018), and Pasquini et al. (2015) that governance structures, political champions, and administrative leadership are fundamental prerequisites for localising climate adaptation. The study identified four critical institutional dimensions: political leadership, administrative drive, organizational structure, and inter-agency coordination.

The near-absence of proactive political leadership in Mambwe represents a major institutional barrier. Key informants described climate change as 'remote and murky' on the municipal governance agenda, displaced by immediate service delivery priorities. This aligns with Hetz (2016) and Scott and Moloney (2022), who observe that municipal mandates encompassing aesthetics, infrastructure, waste management, and parking create agenda crowding that marginalizes long-term adaptive planning. In contrast, Lusaka's historically engaged mayors demonstrate how political champions can catalyze CCA action, mobilizing business community support and legitimizing environmental initiatives. This finding resonates with the emphasis in the climate adaptation literature on the role of policy entrepreneurs or issue champions in driving climate action within bureaucratic systems (Ekstrom et al., 2011; Vogel & Henstra, 2015).

A critical structural deficit found in both municipalities is the absence of a dedicated climate change position in the organizational structure. Lusaka's six environmental planners operate without a designated Climate Change Officer, Resilience Officer, or Sustainability Officer. This finding confirms the argument of Uittenbroek et al. (2013) that without institutionalized roles and responsibilities for CCA, mainstreaming remains dependent on individual initiative rather than structural mandate. The absence of such a position creates a 'responsibility

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vacuum', where CCA planning is informally delegated to planners whose formal job descriptions do not specifically require expertise in climate adaptation.

The issue of inter-departmental coordination reveals an important distinction between the two cases. While Lusaka has taken steps to establish a Technical Working Group (TWG) to bridge coordination gaps, 50% of the key informants still reported departmental siloing that limits the effectiveness of CCA mainstreaming. This corroborates Rauken et al. (2015) and Cuevas et al. (2015), who identify horizontal mainstreaming, the integration of CCA across multiple policy sectors within the same governance tier as a significant challenge. In Mambwe, the District Multi-sectoral Team (DMT) represents a nascent but underutilized platform for horizontal CCA dialogue. Both cases highlight the necessity of moving beyond siloed, sector-specific CCA planning toward genuinely integrated, multi-sectoral approaches.

The traditional land tenure constraint in Mambwe (over 80% of land under traditional authority) reveals a unique governance challenge not commonly addressed in the mainstream CCA mainstreaming literature. The interplay between formal local government authority and traditional governance structures creates jurisdictional ambiguities that limit the municipality's capacity to implement spatial CCA interventions across the majority of the district. This finding points to the need for theoretical frameworks on CCA mainstreaming to account for plural governance systems, particularly in rural African contexts.

4.3 Information Capacity: The Principal Barrier to Mainstreaming

The findings unambiguously confirm that information capacity is the principal-level barrier to CCA mainstreaming in both municipalities. Neither Mambwe nor Lusaka generates its own climate data, and both face challenges of data accessibility, spatial disaggregation, and effective communication of climate information to decision-makers. This finding is consistent with the extensive literature on information barriers to CCA planning, including Pasquini et al. (2015), Ekstrom et al. (2011), Cuevas et al. (2015), and Runhaar et al. (2018), all of whom identify access to relevant, high-quality climate information and the capacity to understand and apply it as foundational enablers of effective mainstreaming.

The conceptual confusion between adaptation and mitigation identified in Mambwe is particularly significant. When senior officers are unable to differentiate these concepts conflating tree planting and disaster risk management with climate change adaptation. This signals a fundamental knowledge deficit that compromises the quality and relevance of CCA integration in planning documents. This aligns with findings by Ayers et al. (2014) and Klein et al. (2007), who note that the absence of local climate knowledge and expertise creates a conceptual barrier that precedes and compounds all other mainstreaming challenges.

The spatial disaggregation challenge is an important empirical contribution of this study. In Lusaka, despite access to relatively robust climate data through the FRACTAL project, data is not available at ward level the operational spatial unit for development planning and community engagement. This mismatch between the spatial resolution of available climate data and the spatial scale at which CCA interventions must be implemented represents a practical barrier to evidence-based planning that has received limited attention in the existing literature. Future research and investment in downscaled climate projections to the sub-district or ward level are therefore a priority for enabling effective CCA mainstreaming in African municipalities.

The role of social media as an emerging information pathway for climate change awareness is a novel finding that extends the theoretical framework of information capacity. While the reviewed literature does not systematically address the role of digital media in local government CCA planning, key informants in Lusaka identified platforms such as Facebook, Twitter, Instagram, and TikTok as significant tools for disseminating information about climate hazard impacts and their spatial distribution across city wards. This finding suggests that future frameworks for information capacity in CCA mainstreaming should incorporate digital communication channels as potential enablers of public awareness and political pressure for adaptive action.

The exclusion of the Meteorological Department from formal planning structures neither the District Development Coordinating Committee nor the planning standing committee in Lusaka includes a meteorological representative and this represents a structural information barrier. This exclusion means that the

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entity best positioned to interpret and communicate climate data to policymakers is formally absent from planning decision-making platforms, creating a critical gap in the translation of scientific knowledge into adaptive policy.

4.4 Resource Capacity: Financial and Human Capital Constraints

Resource capacity constraints were found to be pervasive in both municipalities, though they manifest differently. In Mambwe, the most acute constraint is the absence of any dedicated CCA funding, resulting in mainstreaming activities being limited to community sensitization. In Lusaka, the challenge is less about total resource availability and more about the absence of dedicated climate expertise within the organizational structure and the fragmentation of climate-relevant funding across multiple sector budgets without coordination.

The finding that CCA planning in Mambwe is operationally restricted to sensitizations reflects the broader challenge identified by Hetz (2016), Nalau et al. (2015), and Vogel and Henstra (2015), municipalities in low-resource contexts are caught in a 'capacity trap', where the absence of dedicated funding inhibits the development of climate planning capacity, which in turn makes it difficult to access or justify CCA-specific funding. Breaking this cycle requires innovative financing mechanisms such as the climate-proofing of capital infrastructure budgets, utilization of the Constituency Development Fund for resilience investments, or catalytic funding from international development partners as well as capacity building that equips officers to design and cost CCA initiatives.

The pragmatic approach of integrating CCA into capital infrastructure projects (e.g., incorporating stormwater drainage into road rehabilitation) identified in Mambwe represents a resource-efficient mainstreaming strategy consistent with the theoretical premise that mainstreaming CCA is more resource-efficient than standalone adaptation (Klein et al., 2007; Ayers et al., 2014). However, this approach is constrained by centralized procurement processes that do not consistently integrate climate resilience standards at the point of project design.

The deficit of technical human capital particularly the absence of a dedicated Climate Change Officer in both municipalities is a finding of significant policy relevance. Across the literature, the appointment of dedicated sustainability or resilience officers has been identified as one of the most effective structural interventions for advancing CCA mainstreaming (Uittenbroek et al., 2013; Runhaar et al., 2018). In the Zambian context, this structural gap reflects a broader national human resource deficit in climate change planning that cannot be resolved at the municipal level alone and requires national policy intervention through the Ministry of Local Government and Rural Development (MLGRD).

4.5 Social and Cultural Factors: Norms, Identity, and Informal Networks

The study's findings on social and cultural factors contribute original empirical evidence to a dimension of CCA mainstreaming that has received relatively limited empirical attention in the sub-Saharan African local government context. The dominant finding in Lusaka that a professional norm has emerged which positions CCA planning as the exclusive domain of environmental planners represents a culturally embedded institutional barrier that is both subtle and pervasive.

This professionalization norm is particularly problematic given the inherently cross-sectoral nature of climate change adaptation. Effective CCA mainstreaming requires the engagement of planning, housing, infrastructure, public health, agriculture, and finance departments simultaneously (Rauken et al., 2015; Cuevas et al., 2015). By implicitly assigning CCA to a single department, the norm both limits the breadth of adaptation planning and reduces the incentive for other departments to develop climate literacy. This finding reinforces the argument of Runhaar et al. (2018) that the informal 'rules of the game', norms, routines, and beliefs are as important as formal institutional structures in determining mainstreaming outcomes.

The existence of the TWG in Lusaka and the DMT in Mambwe illustrates the potential of informal working groups to compensate for structural gaps in formal coordination mechanisms. These platforms create spaces for cross-departmental knowledge exchange that formal hierarchies do not always facilitate. Their effectiveness is, however, limited by the absence of formalized mandates, clear Terms of Reference, or dedicated resources.

Strengthening these informal mechanisms and institutionalizing them within formal planning cycles could significantly enhance both horizontal mainstreaming and interdepartmental CCA capacity.

4.6 External Collaborative Networks: A Critical Differentiator

The striking contrast between Lusaka and Mambwe in terms of external collaborative networks is among the most policy-relevant findings of this study. Lusaka's membership in global city networks (Global Covenant of Mayors, ICLEI Africa, One Planet City Challenge) and its partnerships with international research institutions, development organizations, and NGOs provide access to financial resources, technical expertise, and best practice knowledge that fundamentally differentiate its mainstreaming capacity from Mambwe's.

This finding supports the theoretical argument by Nalau et al. (2015) and Cuevas et al. (2015) that access to external networks and knowledge transfer mechanisms is a decisive enabler of CCA mainstreaming, particularly in resource-constrained contexts. The FRACTAL project exemplifies how research-practice partnerships can build technical capacity providing evidence-based climate data, enhancing the skills of municipal planners, and facilitating connections with international climate science communities. Similarly, JICA's facilitation of the Lusaka Urban Development Plan demonstrates how international development partners can qualitatively improve the CCA content of local development planning documents.

The role of CSOs and NGOs as civil society pressure mechanisms deserves particular attention. In Lusaka, CSOs have functioned as advocacy agents for marginalized communities in informal settlements, populations disproportionately exposed to climate hazards by amplifying their voices in planning processes. This finding aligns with Chu et al. (2016), who identify community-based advocacy as a driver of municipality responsiveness to climate risks. The absence of such civil society engagement in Mambwe explains, in part, the reduced urgency with which CCA is treated on the municipal governance agenda.

For Mambwe, the presence of COMACO and BIOCARBON Partners, while limited in scale, represents an opportunity that has not been fully leveraged. These organizations operate at the intersection of livelihoods, sustainability, and natural resource management precisely the domains most relevant to rural CCA. The study finds that integrating these organizations more formally into the IDP process could enhance community-level climate resilience and provide an entry point for mobilizing adaptation resources from international conservation and sustainability funding streams.

5. CONCLUSION AND RECOMMENDATIONS

5.1 Key Conclusion

The study concludes that both formal and informal capacity arrangements substantially influence the degree to which climate change adaptation (CCA) is mainstreamed into local government development planning. An empirical comparison of an urban and a rural municipality in Zambia shows that CCA integration remains at an early stage and is structurally weak. Lusaka City Council recorded a 60% mainstreaming score, supported by broad international networks, technical partnerships with academic institutions, and stronger formal planning capacity. Mambwe Town Council, by contrast, achieved 30%, its progress is severely constrained by limited jurisdiction over traditional land tenure, major funding shortfalls, and the absence of spatial data at a lower scale level. Information capacity was the main obstacle in both municipalities. Technical planners often confuse adaptation with mitigation, while neither council produces its own ward-level climate projections. Both also received 0% for reporting, revealing a systemic gap in municipal monitoring and evaluation frameworks.

These results indicate that effective subnational climate governance cannot depend solely on formal directives, instead, successful integration necessitates the conversion of disconnected departmental silos into collaborative, multi-sectoral structures that utilize informal networks and digital information channels to address resource limitations. The fundamental relevance of this study resides in delivering implementable insights for subnational climate governance in Sub-Saharan Africa, notably by underscoring the imperative to weave indigenous diverse governance systems into rural spatial planning. While this research delivers significant empirical validation, its broader relevance is restricted by its cross-sectional framework and its focus on a comparative review of just

two case studies in Zambia. Further, the reliance on twelve key informants across both municipalities, coupled with the absence of ward-level disaggregated climate data, points to minor methodological boundaries that future studies can expand upon.

5.2. Policy Recommendations

1. Establish Dedicated Climate Structures: Municipalities should formalize dedicated climate change focal positions or units to eliminate responsibility vacuums and anchor long-term institutional memory.
2. Strengthen Interdepartmental Coordination Mechanisms: Local governments should establish formal interdepartmental coordination committees or technical working groups for CCA, ensuring that climate considerations are systematically integrated across all sectoral plans. These mechanisms should include clear mandates, regular meeting schedules, and documented decisions to overcome the departmental siloes identified as a major barrier in both municipalities.
3. Develop Comprehensive Local Climate Change Adaptation Plans: Municipalities should develop standalone local climate change adaptation plans that complement their integrated development plans, spatial development frameworks, and master plans. These plans should be grounded in locally generated climate data and should include specific, measurable adaptation targets aligned with national climate policy commitments and the Paris Agreement.
4. Integrate Climate Adaptation into Budgetary Processes: Climate adaptation should be explicitly integrated into annual municipal budgeting processes, with specific budget lines for CCA activities. Both national government and international development partners should provide dedicated climate finance mechanisms accessible to local governments, particularly rural councils with limited own-source revenues, to address the resource capacity constraints identified in this study.
5. Expand Localized Data Access: National meteorological agencies and research partners should prioritize downscaling climate projections to the sub-district or ward level to bridge the gap between macro-level data and spatial planning needs.
6. Implement Systematic Capacity Building Programs: Structured capacity-building programs should be implemented to address the identified knowledge gaps in CCA mainstreaming, including training on climate risk assessment, adaptation planning tools, and monitoring frameworks. These programs should be institutionalized rather than project-based to ensure continuity, and should address the challenge of staff turnover and knowledge loss that significantly hampers mainstreaming effectiveness.
7. Strengthen Collaborative Partnerships and Knowledge Networks: Local governments should actively cultivate and formalize partnerships with national and international organizations, research institutions, and NGOs that can provide technical assistance, funding, and knowledge exchange. Lusaka's experience with the Global Covenant of Mayors demonstrates the value of international networks, and similar opportunities should be actively pursued by smaller municipalities like Mambwe through regional networks and government-facilitated partnerships.
8. Institutionalize M&E Mechanisms: Local authorities must develop explicit climate adaptation indicators and reporting frameworks to overcome the zero-score deficit observed in current planning documents.

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Ethical Considerations

This research was conducted in accordance with ethical principles for research involving human participants. Ethical approval was obtained from the relevant institutional research ethics committee prior to data collection. All participants provided informed consent after being fully briefed on the research purpose, procedures, potential risks and benefits, confidentiality measures, and their right to withdraw at any time without consequences. Participant identities have been protected through anonymization in all reports and publications. Interview recordings and transcripts are stored securely with access restricted to the research team. The research posed minimal risk to participants and aimed to contribute knowledge that may benefit climate adaptation planning in Zambia.