IFRC | Global Disaster Preparedness Center

RESEARCH PAPER

Urban Climate Change Adaptation:

Analyzing the Institutionalization Planning Approaches in Tanzania

Coretha Komba, *Mzumbe University*
Kardo Mwilongo, *Mzumbe University*
Beth Kachota, *Mzumbe University*
Elizabeth Sulle, *Mzumbe University*

2025

www.preparecenter.org

Table of Contents

Abstract

Cities across the globe are facing the impacts of climate change, which have persistently affected both economic growth and natural environments worldwide. This report aims to study the urban climate change adaptation and institutionalization planning approaches in Tanzania. Specifically, the study examines the initiatives of Tanzania toward institutionalizing climate change adaptation, assesses the level of urban residents' awareness of climate change adaptation, analyses the effectiveness of the existing urban climate change adaptation policies and frameworks, and explores the stakeholders' involvement in urban climate change adaptation planning. The project utilized a concurrent research design, gathering data through quantitative surveys, qualitative interviews, and focus group discussions. Quantitative data were analyzed using the statistical package for social sciences software, and content analysis was used in qualitative data. The project findings reveal that the government is actively addressing climate change adaptation aspects and institutionalization of policy and frameworks. Similarly, most urban residents are aware of these efforts and that are well-informed of climate change adaptation policies and frameworks. Additionally, the results show that stakeholders are engaged at different levels, but their involvement is constrained by insufficient communication among government agencies, the private sector, and communities. Moreover, project recommendations are provided.

Keywords: Climate change adaptation; Policy and Frameworks; Institutionalization; Urban residents; Urban cities; Planning; Tanzania

This work was part of a multi-country research initiative led by the Global Disaster Preparedness Center of the American Red Cross.

1. Introduction

Globally, climate change continues to significantly impact urban areas. Historically, climate adaptation has been primarily addressed at the national policy level, with local governments responsible for implementation (Abbass et al., 2022; Lee et al., 2023). However, there is increasing recognition of the need for governments to establish and strengthen institutions capable of effectively addressing climate change impacts, especially in urban settings (Satterthwaite et al., 2020). Urban areas worldwide are experiencing the effects of climate change, as emphasized by the Intergovernmental Panel on Climate Change (IPCC) (Williams et al., 2019; Almulhim et al., 2022). The effects of climate change highlight the need for urban areas to integrate climate adaptation goals into policy and planning (Kaba, 2020; Björklund & Segermark, 2023). Scholars on climate change adaptation and institutionalization including Sharifi (2021), Lv and Sarker (2024) stress the importance of policies that combine physical infrastructure with social and institutional initiatives to develop effective adaptation strategies. However, adaptation efforts are often fragmented, lacking comprehensive, and coordinated approaches. While many cities are developing adaptation plans, there is insufficient focus on stakeholder involvement, differing vulnerability perspectives, and equity considerations (Lioubimtseva & Cunha, 2022). The approaches and plans for climate change adaptation and institutionalization in developed countries, despite the rapid urbanization growth, differ significantly with developing regions based on technological, economic stand, and institutional commitments (Kombe & Alananga, 2022). For instance, the African regions face unique challenges in adapting cities to climate change which is exacerbated by rapid urbanization without corresponding economic growth. This imbalance makes it difficult for institutions to meet the demands of expanding cities (Peter & Yang, 2019; Li et al., 2022). Addressing these challenges requires strengthening institutions to integrate climate resilience into urban development frameworks (Göpfert et al., 2019). However, socioeconomic and environmental pressures complicate efforts, making it difficult for local governments and international partners to coordinate sustainable solutions (Wolff et al., 2021).

In Tanzania, urban areas play a crucial role as centers of economic and cultural activities. However, they are increasingly vulnerable to shifting weather patterns, including rising temperatures, irregular rainfall, droughts, and floods (Mabhuye, 2024). These climate-related challenges have profound implications for urban life, infrastructure, and future development. Urban areas have significant potential to reduce societal vulnerability by enhancing their adaptive capacity to mitigate the impacts of climate change (Wolff et al., 2021). However, gaps remain in understanding the spatial dimensions of vulnerability and how to integrate these insights into urban planning practices (Tiedemann et al. 2021;

Kifunda, 2023). Addressing these challenges requires urban-focused climate adaptation research, which plays a pivotal role in informing the institutionalization of planning approaches. This will ensure that climate adaptation becomes a core element of urban governance and development strategies. Institutionalizing these approaches involves embedding climate resilience into planning systems to create equitable, and long-term solutions for climate adaptation in urban areas. The rapid urbanization, particularly in cities like Dar es Salaam, presents both opportunities and challenges for embedding climate adaptation into urban planning (Myers, 2022). Studies by Mngumi (2021) and Lauwo et al. (2022) note that climate adaptation in Tanzania requires strong institutional frameworks that integrate resilience into urban governance and development. Based on this, the research work specifically is sought to do the following:

a) Examine the initiatives of Tanzania urban city authorities toward institutionalizing climate change adaptation in selected urban areas of Dodoma, Arusha, Morogoro, and Dar es Salaam regions.

b) Assess the level of awareness among urban residents regarding climate change impacts and adaptation measures.

c) Analyze the effectiveness of existing urban climate change adaptation policies and framework in Tanzania.

d) Explore stakeholders' involvement in urban climate adaptation planning approaches in Tanzania.

Through its focus on institutionalization, this research paper aligns with the global frameworks like the Sendai Framework for Disaster Risk Reduction, the UN Sustainable Development Goals (SDGs), the Paris Climate Agreement, and the New Urban Agenda to address current and future adaptation needs (Mizutori, 2020; Wolff, Jacob & Teebken, 2022).

2. Literature Review

2.1 Institutionalization of climate change adaptation in urban cities

The institutionalization of climate change adaptation in urban cities involves embedding adaptive practices within governance structures to ensure effective responses to climate challenges (Olazabal & Castan, 2021). This process is reflected in integrating adaptation strategies into existing urban frameworks, which is crucial for achieving long-term resilience (Boateng, 2023). Globally, cities have adopted diverse institutional mechanisms

such as dedicated climate units, cross-sectoral coordination bodies, and mainstreaming adaptation into development planning to enhance adaptive capacity (Klein et al., 2022). In Barcelona and Spain Municipal governments have established dedicated climate offices to integrate resilience across sectors (Pascual et al., 2023). In Semarang and Indonesia city authorities have worked to mainstream adaptation and disaster risk reduction through stakeholder engagement, although most interventions remain project-based and lack long-term institutional embedding (Handayani & Fisher, 2022). In Würzburg and Germany, institutionalization has progressed through strong organizational structures, yet political commitment to adaptation still lags mitigation initiatives (Rauken et al., 2023). In Africa, institutionalization efforts often emphasize the incorporation of indigenous knowledge and participatory governance models alongside formal policies to address local vulnerabilities (Adjei & Owusu, 2023; Nyandoro et al., 2024).

Despite these advances, significant obstacles persist across most cities, including limited mainstreaming of climate adaptation in master plans due to inadequate institutional, financial, and technical capacities. These limitations hinder the effective integration of climate change into urban development policies and strategies (Nyasilu et al., 2023). On the other hand, the city authorities face constraints that restrict prioritization and implementation of climate actions, with gaps in policy execution and stakeholder engagement despite promising bottom-up planning and livelihood diversification efforts (Niemann et al., 2023; Prakash & Thamari, 2024; Sumari et al., 2024). In this light, urban climate adaptation and institutionalization are increasingly recognized and embedded in policy and planning initiatives while its institutionalization often remains partial, inconsistent, and highly context dependent. Therefore, there is a notable gap in understanding the effectiveness of institutionalization processes for urban climate adaptation in Tanzania, particularly regarding the integration of governance, financial, and legal mechanisms with inclusive stakeholder participation to achieve equitable and sustainable adaptation outcomes.

2.2 Urban residents' awareness of climate change impacts and adaptation

Understanding climate change and its impacts in any community has become a global concern (Hsieh & Lee, 2021) particularly in urban areas where the consequences such as urban flooding, extreme heat and infrastructure vulnerability are prevalent. Globally, climate change remains a pressing urban problem, with its effects varying depending on societal and city contexts (Tam & Clayton, 2023). For example, in the United States, cities such as Los Angeles, Houston, Memphis, and Sacramento have developed government-led programs, stakeholder consultations, and community forums to raise awareness, reduce carbon

emissions, expand green spaces, promote waste reduction, enhance urban agriculture, and improve infrastructure resilience (Chu et al., 2025). Further contribution is provided by the UNDP's resilience hub for Africa, based in Nairobi, which is dedicated to support the African countries' UNDP offices to establish programs related to awareness creation to city communities to reduce climate change disaster and risks (UNDP, 2022). Nevertheless, the Sub-Sahara African nations have approved the Paris Agreement and submitted their Nationally Determined Contributions (NDCs) to reduce carbon emissions for each urban cities and emphasizing on the use of clean energy for industrial and domestic functions that aids in climate change adaptation efforts (Hughes, 2020; Chu et al., 2025). The effect of carbon emission in Africa has been earmarked in countries including Nigeria, Kenya, Uganda and Tanzania (Allan et al., 2023; Dharmarathne et al., 2024; Sosa & Ivanova, 2025).

The initiatives toward climate change adaptation and institutionalization align with Sustainable Development Goal 6, 11, and 13, which emphasizes urgent action against climate change. Access to climate change information through multiple channels, including social media, plays a vital role in raising urban residents' awareness. However, awareness levels have remained uneven and are influenced by factors such as age, education, access to media, socio, and economic status (Hughes, 2020; Hue & Antriyandarti, 2024). The increased awareness among urban communities can facilitate practical, community-based solutions. Cost-effective measures such as waste reduction, tree planting, and community-driven awareness campaigns can be successfully implemented with active community participation (Sosa & Ivanova, 2025; Alam et al., 2025). Personal understanding of climate change impacts is a strong motivator for behavior change, influencing how urban residents respond to climate threats (Okaka & Odhiambo, 2018). Educational programs targeting urban populations are crucial in empowering communities to participate in mitigation and adaptation efforts (Ochieng, 2014). Nevertheless, awareness and adaptation remain low in many African urban areas, including Dar es Salaam in Tanzania, Lagos in Nigeria and Accra in Ghana (Matingas & Ndaki, 2024; Ugwuanyi et al., 2024; Ansah et al., 2024). Limited awareness hinders proactive community engagement and highlights the need for sustained educational interventions and supportive policies.

Urban residents often have limited knowledge about agencies and practices addressing climate change. This low awareness is partly attributed to the inaction or reluctance of local urban leaders to prioritize environmental agendas despite commitments to sustainable development goals (Mashi et al., 2025). Comprehensive disaster risk reduction training programs are recommended to build community resilience. Awareness campaigns focusing on climate-related risks such as urban flooding, heatwaves, and poor air quality are critical. Both traditional and digital media, including radio, television, newspapers, mobile phones, banners, and flyers, are effective tools for disseminating climate adaptation information (Oden, 2019; Omoera & Guanah, 2022; Abdul & Mangi, 2025; Baldelli et al., 2025; Teklay

et al., 2025). Furthermore, Ajwang and Nambiro (2022) reported that adequate telecommunication networks and mobile apps are the best way in ensuring that communications reach residents' information about climate change adaptation. Consideration of capacity building in urban residents is a crucial indicator to creating awareness among communities regarding climate change adaptation measures (Hughes & Hoffmann, 2020; Ziervogel, et., 2022).

Partnerships between media outlets and government agencies further enhance continuous public education on disaster preparedness and climate adaptation.

2.3 Effectiveness of urban climate change adaptation policies and frameworks

The effectiveness of urban climate change adaptation has drawn the attention of various governments due to the significant impact that urban environments have on sustainable development. The rapid growth of urbanization, alongside the challenges posed by rising global temperatures, has increased extreme weather events, fluctuations in sea levels, and ultimately, a shortage of resources (Wijenayake, 2025). To address the effects of climate change, numerous efforts are being made to ensure sustainability of urban areas. These initiatives require the collaborative participation of policymakers, urban planners, local communities, researchers, and both private and public sectors. According to the United Nations-Habitat (UN-Habitat) (2024), over 70% of the world's cities are affected by global warming. This phenomenon has altered temperature and rainfall patterns, which in turn have impacted the socio-economic activities of populations in various urban areas. Matsumoto et al. (2019) emphasizes the importance of effective urban policies and frameworks focused on climate change adaptation and mitigation. Such policies and frameworks are essential for implementing various strategies and ensuring that they are governed by well-defined regulations.

The climate change adaptation policy initiative originated from the Paris Agreement and the climate summit for local leaders in 2015, which included more than 100 cities. The international climate change-related networks participated in the development of frameworks through the establishment of regional climate change mitigation, adaptation, and planning frameworks. Among others, the frameworks include the UN-Habitat Guiding Principles for City Climate Action Planning, the European Union Covenant of Mayors (EUCoM), and the Global Covenant of Mayors for Climate and Energy (GCoM) (Aboagye & Sharifi, 2023). The focus of these frameworks was on the assessment, modalities, and strategies of minimizing greenhouse gas emissions from the urban population. The United Nations Framework Convention on Climate Change (UNFCCC) established a mechanism to manage greenhouse gas emissions, aiming to minimize their impact on the atmosphere

(Natural Resources Defense Council (NRDC), 2017). The Paris Agreement on Climate Change Adaptation and the United Nations Framework Convention on Climate Change (UNFCCC) assisted about 192 countries, including the United States, China, India, Mexico, the European Union, Brazil, South Korea, Australia, and Japan, to reduce the greenhouse gas emissions from 30-65% in 2005 to 20-40% by 2030 (NRDC, 2017).

Global warming has significantly affected social and economic activities, as well as natural ecosystems worldwide. In China, for example, global warming has influenced economic, social, and environmental systems. Reports indicate that glacial lakes have expanded due to heavy rains, which have led to severe flooding and disrupted the security of water sources. Additionally, the vegetation belt has shifted (Liss et al., 2025). These changes have altered farming practices and methods of managing agricultural products, making crops more susceptible to pests and diseases during preservation. In response to these challenges, the Chinese government established the National Climate Change Adaptation Framework (NCNCCAF) to strengthen climate change adaptation networks and early warning systems. This framework focuses on developing strategies for effective monitoring, forecasting, and improving climate risk assessment and management, as well as enhancing disaster preparedness and prevention (CNCCAF, 2022). Similarly, the Mediterranean region faces significant climate change challenges, including global warming and intense rainfall. To address these issues, the United Nations Environment Program/Mediterranean Action Framework (UN Environment/MAF) was established in 2014 to improve the region's resilience to climate change impacts by 2025 through collaboration, shared objectives, solidarity, active government participation, and inclusive engagement in overcoming these challenges (United Nations Environment Program (UNEP), 2017). According to a report by UN-Habitat (2025), the Mediterranean region and its coastal communities have made substantial progress in adapting to climate change. They have successfully integrated Sustainable Development Goals into their strategies and are actively promoting economic growth.

In Chad, climate change has strongly impacted both urban and rural communities, affecting their livelihoods and the environment. In this context, Chad, through the Ministry of the Environment, Fisheries, and Sustainable Development, established a National Framework for Combating Climate Change (NFCCC) in 2016. This framework developed various policies, methodologies, and initiatives aimed at addressing the adverse impacts of climate change. The reports show that the population in Chad is becoming increasingly aware of best practices for adapting to climate change and understanding its impacts (Allarané et al., 2024).

The efforts and frameworks for climate change adaptation have also been designated in the East African Countries (EAC), where frameworks related to National Adaptation Programs

of Action (NAPA) and Nationally Determined Contributions (NDCs), aiming at informing climate change adaptation, were established to serve the region (Campbell & Hope, 2025). The establishment of the National Adaptation Plan of Action (NAPA) was pioneered by the United Nations Framework Convention on Climate Change (UNFCCC) and the Paris Agreement Framework. The goal was to assist developing regions in effectively identifying, planning, and implementing measures to address and adapt to the impacts of climate change. The NAPA and NDC have established climate change policies and strategies to comprehensively guide the EAC through various programs for climate change adaptation. The policies include the EAC Climate Change Policy (EACCCP) of 2011, established to foresee climate change through impact adaptation, mitigation, and research.

The EAC Climate Change Strategy 2011–2015 implements policies to address climate change through technology, natural protection, and ecosystem management, while improving water sources and hygiene services. Additionally, the EAC Climate Change Master Plan 2011-2031 outlines a comprehensive vision for climate change adaptation, mitigation, and management through technology and risk management (Ministry of Environment, Climate Change and Forestry, 2024). Another framework is the Climate Finance Access and Mobilization Strategy 2022/23-2031/32, which focuses on climate change funds for implementing the impacts and research on climate issues. The Intergovernmental Authority on Development (IGAD) 2023-2030, established in 1996, serves as a framework for coordinating strategies to mitigate the impacts of climate change and empower EAC members to address climate change challenges (Campbell & Hope, 2025). Tanzania has similarly benefited from these frameworks and advances in collaboration with the international climate change adaptation initiatives.

The United Nations Framework Convention on Climate Change (UNFCCC) and the Paris Agreement highlight the importance of governments making substantial investments in raising awareness and enhancing stakeholder involvement. Such initiatives are crucial for effective planning and implementing strategies aimed at climate change adaptation. Furthermore, strengthening capacity through climate change adaptation programs is essential for mitigating the effects of climate change (Campbell & Hope, 2025). Additionally, the development of various urban supportive policies and legal frameworks enhances the execution of strategies for climate change adaptation. Ensuring the availability of financial resources is essential for implementing framework strategies, as this will support sustainable initiatives to adapt to and manage the impacts of climate change. The city authorities must actively collaborate with international organizations on climate change adaptation frameworks while improving urban planning and promoting climate change awareness. Monitoring, coordination, and evaluation of climate change adaptation impacts are crucial for implementing climate change adaptation policies and frameworks (UN-Habitat, 2025).

2.4 Stakeholders involvement in urban climate change adaptation plans

Most urban cities have institutionalized climate change strategies by establishing dedicated climate units, and by preparing local adaptation plans that integrate adaptation considerations into existing urban planning frameworks (Drescher & Skoyles, 2024). However, despite these institutional approaches, significant gaps remain in stakeholders' engagement within climate adaptation processes. Some studies highlight the critical role of intensive and diverse stakeholder involvement in both practice and policy formulation for climate adaptation (Mkonda, 2022; Sighna, 2024). Effective stakeholders' engagement enhances the credibility, relevance, and effectiveness of climate adaptation strategies by ensuring that local needs and conditions are addressed (Bammer, 2024). Globally, successful climate adaptation initiatives emphasize multi-level stakeholder participation, including government agencies, private sector actors, civil society, and local communities, to foster ownership and contextual relevance (Preston et al., 2021).

In Africa, particularly, participatory approaches that integrate indigenous knowledge with scientific data have shown promise for sustainable urban climate resilience (Nyumba et al., 2023). However, stakeholders' engagement often remains limited, excluding key actors and thereby undermining data provision, decision-making quality, and policy outcomes. Thus, while institutional strategies for climate adaptation in urban areas are advancing, there remains a substantial gap in the effective, inclusive, and sustained engagement of diverse stakeholders throughout the adaptation process. In addressing this gap requires policy frameworks and practical mechanisms that not only acknowledge the importance of stakeholder engagement but also overcome barriers of funding, data access, capacity, and inclusivity. Therefore, further research and action are needed to develop and implement stakeholder engagement approaches that enhance local adaptation effectiveness and equity in both policy and practice. The African countries including Tanzania, have institutionalized climate change strategies by establishing dedicated climate units within existing local adaptation plans that integrate the efforts and measures for climate change adaptation into existing urban planning frameworks (Drescher & Skoyles, 2024).

The African local urban city authorities have involved the local communities, businesses, and government entities in urban climate adaptation planning (Roukounis & Tsihrintzis, 2024). Nevertheless, approaches for stakeholders' engagement vary significantly depending on the level of interaction and the capacity of stakeholders to provide information, assess vulnerabilities, evaluate climate threats, and influence adaptation policy and implementation (Tsufac et al., 2021). Despite the recognized importance of engaging stakeholders in climate research and action, there remains a policy and practice gap, particularly in areas severely

affected by climate stresses such as the central Tanzania and the Northern Kenya. Here, excessive droughts create severe stress on agriculture, and climate practitioners and stakeholders lack fully established engagement mechanisms to address these challenges effectively (Tsufac et al., 2021). On a different note, the locally led, community-based research has shown that stakeholders can generate valuable climate risk data and propose viable adaptation strategies, but such efforts require enabling policies, technical support, and coordinated municipal leadership to scale effectively (John, 2020; Hussainzad & Gou, 2024).

3. Methodology

The project adopted a mixed-method approach and a concurrent research design that allowed simultaneous collection of both quantitative and qualitative data, which were analyzed separately and then merged for comparison and interpretation, as proposed by Dubey and Kothari (2022). The population involved key stakeholders including the National Environmental Management Council (NEMC), town planners, urban community members, the Tanzania Meteorological Agency (TMA), the Vice President's Office, and the Regional Administration and Local Government (PO-RALG), all of which play critical roles in managing urban climate adaptation. This population was deemed sufficient to provide vital information that answered the following research questions:

a) What are the initiatives of Tanzania urban city authorities toward institutionalizing climate change adaptation in selected urban areas of Dodoma, Arusha, Morogoro, and Dar es Salaam regions?
b) What is the level of awareness among urban residents regarding climate change impacts and adaptation measures?
c) How effective are the existing urban climate change adaptation policies and frameworks in Tanzania?
d) To what extent are the stakeholders involved in urban climate change adaptation planning in Tanzania?

Purposive and convenient sampling techniques were used to obtain the representative of the areas and population of the project. The purposive sampling technique was used to select eight urban districts from the four regions of Dodoma, Arusha, Morogoro, and Dar es Salaam. On each region, two districts were purposively selected based on their rapid urbanization and specific climate challenges: coastal flooding in Morogoro and Dar es Salaam, drought and desertification in Dodoma, and deforestation and land degradation in Arusha (Mahenge, 2019; Joseph, 2022; Nyaslilu et al., 2023). In addition, the effect of high temperature that was reported by the Tanzania Meteorological Authority (TMA) in 2024

resulted to fluctuations in rainfall trends, and extreme weather conditions throughout the country where the four regions were similarly affected. Purposive sampling technique was also used to select 12 urban planners, four Vice Presidents Office representatives, four TMA staff, four NEMC staff and eight PO-RALG. The project aimed to collect qualitative data from 32 participants and quantitative data from at least 400 urban community members, and thus at least 100 respondents were conveniently obtained from each region.

In the end, the 415 questionnaires that covered the research questions of the study were distributed to the community members, and about 403 questionnaires were returned and provided quantitative data. Similarly, 20 officials from the Vice President's Office, NEMC, TMA, and PO-RALG were interviewed while 12 town planners were involved in the focus group discussions (FGD). The interview and FGD guides incorporated the study of research questions and offered comprehensive explanations of the phenomenon underpinning the project. A document review was also conducted to analyze policies, laws, reports, and literature that helped to deepen understanding of the core issues surrounding urban climate change adaptation. The interviews provided critical insights into adaptation to urban climate change adaptation, offering data on current responses and strategies whereas documentary reviews were used to assess the availability of data on urban climate resilience. Key documents, including climate adaptation policies, urban planning strategies, and environmental reports, were reviewed to evaluate the effectiveness of ongoing efforts in these cities. Focus group discussions were conducted to gather qualitative data that provided deeper insights into the localized phenomenon over urban climate change adaptation and institutionalization. Quantitative data was analyzed using a Statistical Package for Social Sciences (SPSS) software version 26 and a Microsoft Excel – computer application software. The descriptive statistics were used to summarize a group of data using a combination of percentage, tabulation, and cross-tabulation. On one hand, qualitative data was subjected to content analysis to identify key themes and trends whereby collected data were organized and the content of the same category considered and treated in the same manner. Through this comprehensive approach, the project aimed to enhance understanding of urban climate adaptation and inform future strategies for improving resilience in Morogoro, Dar es Salaam, Dodoma, and Arusha.

The project adhered to established research ethics, including obtaining respondents' informed consent and communicating the study objectives, as recommended by Kaewkungwa and Adams (2019). This involved ensuring research equity, transparency, and sustainability. The project followed all ethical protocols, including acquiring relevant permits, securing consent, informing respondents of the research objectives, and maintaining confidentiality throughout and after the research process (Kang & Hwang, 2021). Moreover, the project demonstrated respect for local knowledge, cultural sensitivity,

and fair resource distribution, which were crucial at ensuring that adaptation measures are socially and effective in mitigating climate risks for all urban residents.

4. Findings of the Study

4.1 Demographic characteristics of respondents

The demographic characteristics of the respondents are deemed important in this study, as they add value in the determination of their attitude, ability, experience, and awareness of the issues related to climate change adaptation and institutionalization plans. In this regard, respondents were asked about their age, gender, marital status, academic qualification, and occupation. These attributes were crucial in this study toward revealing variations, capacity, and adoption rate of adaptation approaches across various demographic characteristics and study areas. Table 1 presents findings on the respondents' demographic characteristics.

Table 1: Demographic characteristics of respondents (n=403)

Variable	Categories	*f*	%
Location	Dodoma Region	122	25.3
	Arusha Region	101	25.1
	Dar es Salaam Region	100	24.8
	Morogoro Region	80	24.8
Age	Less than 30 years	136	33.7
	30–39 years	120	29.8
	40–49 years	96	23.8
	50–59 years	40	9.9
	60 years and above	11	2.7
Gender	Male	196	48.6
	Female	207	51.4
Marital Status	Married	153	38.0
	Not married	204	50.6
	Divorced	32	7.9
	Widowed	14	3.5
Academic Qualification	Primary education	58	14.4
	Form four certificates	143	35.5
	Form six certificates	61	15.1
	Diploma	55	13.6
	Bachelor's degree	67	16.6
	Master's degree	11	2.7
	PhD	5	1.2
	Uneducated	3	0.7
Occupation	Self-employed	145	36.0
	Entrepreneur	126	31.3
	Civil servant	62	15.4
	Private employed	41	10.2
	Student	13	3.2
	Farmer	10	2.5
	Jobless	6	1.5

Source: Field Data (2025)

The findings show that from the four selected regions, most of the respondents, 256 (63.5%), were aged less than 39 years. There were more females than males; 207 (51.4%), and of these, 204 (50.6%) were married. This phenomenon aligns with Mwamba et al. (2022) that in social science research, there is always a tendency for females to be far more represented than their male counterparts, showing that there is a high mismatch between the female-male population around the world. However, on the other hand, the female respondents might have shown greater willingness to engage with the topic or participate in the study due to personal interest, perceived relevance, and the need to increase understanding of discussed issues.

4.2 Institutionalization of climate change adaptation in Tanzania urban cities

The institutionalization of climate change adaptation in Tanzania is crucial given the course of effects to the community and the environment. In this study, it was important to examine the urban city community's understanding on the institutions working on climate change adaptation and determine whether citizens are well informed about the institutions that plan, coordinate, and implement climate change adaptation initiatives. The level of understanding to this endeavor is appealing as it influences community awareness, engagement, accountability, participation in climate adaptation programs, and reflects the extent to which these institutions have been effectively institutionalized within urban governance. Table 2 presents findings on urban city residents' understanding over climate change adaptation institutions.

Table 2: Climate change adaptation institutions (n=403)

Climate change adaptation institutions	**Response**			
	Yes		**No**	
Institution	***f***	***%***	***f***	***%***
National Environment Management Council (NEMC)	290	72	113	28
National Adaptation Programme of Action (NAPA)	179	44	224	56
National Climate Change Steering Committee (NCCSC)	142	35	261	65
Regional and Local Government Bodies	113	28	290	72
Climate Action Network Tanzania (CANTZ)	I83	45	220	55
Tanzania Meteorological Agency (TMA)	276	68	127	32

Source: Field data (2025)

The findings indicate different understanding responses among urban residents on climate change adaptation institutions in Tanzania. Most respondents testified being informed of the NEMC 290 (72%) and the TMA 276 (68%), which signify strong visibility of these national-level organizations. On one hand, fewer respondents were familiar with NAPA 179 (44%) and CANTZ 183 (45%), showing moderate familiarity to respondents due to different

reasons like geographical location and economic differences in accessing information. Also, finding reveals that familiarity was low for the National Climate Change Steering Committee 142 (35%), regional and local government bodies 113 (28%). Generally, these findings propose that while urban residents recognize prominent national agencies, there are notable gaps in the knowledge of institutions, agencies, local, and civil society institutions that play pivotal roles in climate adaptation planning and implementation. One of the key informants stated that:

> *The community is generally informed of climate change adaptation institutions; however, a portion of the population remains ignorant about it, largely due to differences in economic status and access to information. The understanding is particularly higher for NEMC, TMA, and regional and local government bodies, which actively conduct initiatives through platforms including Instagram, television, and radios. These initiatives are designed to enhance community participation in climate change adaptation and mitigation efforts, ensuring that urban residents are informed and engaged in resilience-building activities [Participant 5]*

The understanding of these institutions can enhance engagement, foster inclusive community participation in decision making and strategy implementation, and finally strengthen urban climate resilience. Nevertheless, climate change is a global concern; localized initiatives further strengthen institutional visibility. For instance, in Arusha, residents participating in focus group discussions acknowledged their understanding on climate change issues through the influence of projects supported by stakeholders such as UNDP and the World Bank under the Tanzania Strategic Cities Project 2009–2020, which addressed drainage systems, road networks, and solid waste management to enhance urban resilience. As it was noted during the focus group discussion that;

> *For sure, the community in Arusha is informed of climate change issues because we have benefited from different stakeholders who were responding to climate change impacts, such as UNDP and World Bank funded Tanzania strategic cities projects 2009-2000 that dealt with drainage systems, roads networks and solid waste management to improve the cities resilience... In addition, our local government emphasizes tree planting in different schools and other places (FGD 1).*

Such reflections illustrate that residents' understanding regarding climate change is shaped not only by national-level initiatives but also by tangible community-based projects supported by international and local actors.

4.3 Tanzania urban residents' awareness of climate change impacts and adaptation

Awareness of climate change impacts and adaptation among the community provides an opportunity for inception of knowledge on the phenomenon, and it has a role of involvement in planning, implementation, and in the design of climate change adaptation frameworks. In this regard, it was important to study awareness among respondents based on the climate change impacts and adaptation. Findings on the urban residents' awareness of climate change impacts and adaptation is presented in Table 3.

Table 3: Awareness of climate change adaptation (n = 403)

Gender	Response					
	Yes		No		Total	
	f	*%*	*f*	*%*	*f*	*%*
Male	193	47.9	3	0.7	**196**	**48.6**
Female	203	50.4	4	1.0	**207**	**51.4**
Total	**396**	**98.3**	**7**	**1.7**	**403**	**100**

Source: Field Data (2025)

Table 3 shows the distribution of awareness of climate change adaptation among urban residents by gender. Respondents were asked to show if they are aware or not aware of the adaptation of climate change. Out of 403 respondents, 396 (98.3%) reported being aware of climate change adaptation and institutionalization, while only 7 (1.7%) indicated that they are not aware of the term climate change adaptation. Overall, both male and female demonstrated very high levels of awareness, with only marginal differences between the two groups. Therefore, the close parity between male and female respondents in awareness suggests that awareness campaigns in urban settings have been relatively inclusive and effectively addressed to the community.

4.3.1 Sources of awareness regarding climate change adaptation and institutionalization

The sources of awareness of climate change adaptation and institutionalization play a great role in informing urban city residents of various information including climate change issues. There are various sources of awareness emanating from social media, government platforms, networks, and planned programs. Urban city residents were provided with different sources of awareness on climate change adaptation and institutionalization, and their response presented in Table 4.

Table 4: Sources of awareness regarding climate change adaptation and institutionalization (n=403)

Sources of awareness	Response	*n*	Observed Prop.	%	Test Prop.	Exact Sig. (2-tailed)
Television	Yes	342	.85	85	.50	.000
	No	61	.15	15		
Radio	Yes	329	.82	82	.50	.000
	No	74	.18	18		
Newspaper/magazine	Yes	270	.67	67	.50	.000
	No	132	.33	33		
Internet/social media	Yes	271	.67	67	.50	.001
	No	132	.33	33		
Schools/colleges/universities	Yes	234	.58	58	.50	.232
	No	169	.42	42		
Government agencies	Yes	214	.53	53	.50	.765
	No	189	.47	47		
Local community	Yes	205	.51	51	.50	.486
	No	198	.49	49		
Family/friends	Yes	194	.48	48	.50	.090
	No	209	.52	52		
Awareness campaigns	Yes	219	.54	54	.50	.036
	No	184	.46	46		
Training workshops	Yes	180	.45	45	.50	.032
	No	223	.55	55		

Source: Field Data (2025)

The findings reveal that television and radio are the leading sources, with (85%) and (82%) of respondents respectively identifying them. Both sources were highly significant (p=.000), confirming that they play a dominant role in shaping public awareness. Print media including newspapers and magazines and internet over social media were recognized by 67% of respondents, each statistically being significant (p≤.05). This indicates that there is a growing role of digital platforms alongside traditional sources. Likewise, academic institutions including schools, colleges, and universities accounted for (58%) (p=.001), demonstrating their role in spreading climate education. Moderate proportions were observed for government agencies (53%) and local community (51%), though neither showed significant variation from the test proportion. Family and friends (48%) and awareness campaigns (54%) also appeared as notable, though less dominant, contributors to climate change awareness. However, training workshops showed a lower proportion (45%) and were statistically significant (p=.036), implying that such interventions are less common compared to mass media or formal education platforms. Thus, the results highlight that television, radio, online platforms, and newspapers or magazines are the most influential media, while academic institutions and campaigns play supplementary roles. These findings align with other studies in Tanzania showing that climate change awareness is heavily mediated through both

traditional and emerging information channels rather than interpersonal networks alone (Mdemu et al., 2022; Kweka & Ndumbaro, 2023). This was also noted during interview with one of the key informants that;

> *Several sources in Arusha city council used to educate urban populations about the risks of climate change and the necessary adaptation measures through different social media including the independent television (ITV), Tanzania broadcasting corporation (TBC), and radios like MEGA FM. They try to explain and inform residents about the impact of climate risk and on how society will adapt these climate change risk [Participants 12]*

Similarly, in Morogoro region, during interview, one of the key informants reported that;

> *Various sources such as radio, television, community forums, and school programs are used to create awareness of climate change adaptation in Morogoro region. The Tanzania metrological authority (TMA) in Morogoro collaborates with local councils and NGOs to disseminate climate information in Swahili and other local dialects to ensure inclusivity [Participant 9]*

The findings demonstrate that mass media, especially television and radio, are the primary sources of climate change awareness, significantly shaping public knowledge. Digital platforms and print media also play a growing role, complemented by academic institutions and awareness campaigns. While government agencies, local communities, families, friends, and training workshops, their contributions and impacts are comparatively lower.

4.4 Effectiveness of Tanzania urban climate change adaptation policies & frameworks

Climate change adaptation policies and frameworks have potential in the planning and implementation of strategies towards the development of urban cities, environments, and socio-economic activities. The urban citizens of the surveyed regions in Tanzania were asked about the effectiveness of the operating climate change adaptation policies and frameworks. Several frameworks were provided, and the response of the citizens is presented in Table 5.

Table 5: Effectiveness of urban climate change adaptation policies and frameworks (n=403)

Variable	Response			
	Yes		No	
Generally, policy and frameworks are effective in climate change adaptation	***f***	***%***	***f***	***%***
	394	97.8	9	2.2
Specifically, the following tools are effective in climate change adaptation				
National Adaptation Programme of Action (NAPA)	208	51.6	195	48.4
National Climate Change Focal Point (NCCCFP)	128	31.8	275	68.2
National Climate Change Strategy (NCCS)	155	38.5	248	61.5

National Environmental Action Plan (NEAP)	110	27.3	293	72.7
National Environmental Management Council (NEMC)	259	64.3	144	35.7
National Environmental Policy (NEP)	177	43.9	226	56.1
Urban Development and Environment Management (UDEM)	228	56.6	175	43.4

Source: Field Data (2025)

The findings indicate that, majority of the respondents 394 (97.8%) accepted that policy and frameworks are effective in urban climate change adaptation. This underscores the fact that awareness to these guidelines, citizens are capable and being informed of the effects of climate change and thus must be aware of the frameworks guiding the implementation of the strategies towards adaptation and institutionalization of the underpinning phenomena. Specifically, among the itemized frameworks, majority of the respondents 259 (64.3%) indicated the National Environmental Management Council (NEMC) being effective regarding urban climate change adaptation while majority [293 (72.7%)] of them were not comfortable with the effectiveness of the National Environmental Action Plan (NEAP); 275 (68.2%) on National Climate Change Focal Point (NCCCFP); and 248 (61.5%) on National Climate Change Strategy (NCCS). These guidelines that were mostly not acknowledged by respondents on their effectiveness towards climate change adaptation might be contributed by various factors including its availability in both print and electronic formats, levels of access, its location and the usage pattern. However, during interview, one of the key informants opined that;

> *The tools available for climate change adaptation have proven to be valuable in assessing the initiatives the city is pursuing to address climate change. This adaptation strategy provides a framework for the various actions the city has implemented to legally and procedurally manage climate-related issues. It enables the city to plan activities, projects, and programs aimed at adapting to climate change and has helped promote awareness among urban communities. Additionally, it serves as a foundation for integrating climate action across both the city and the country [Participant 3]*

Therefore, considering this remark, it is prudent for the government of the United Republic of Tanzania to work with local authorities in urban cities to inform the community about the availability of climate change adaptation policies and frameworks, facilitating their engagement and decision-making.

4.4.1 Relative importance index of urban climate change adaptation frameworks

The effectiveness of the policies and frameworks for urban climate change adaptation and institutionalization varies from one another. Based on the findings, a relative importance index (RII) analysis provides the ranks on effectiveness of each tool regarding its

contribution to the community. In this regard, the relative importance index (RII) was used to determine the effectiveness of the urban climate change adaptation policies and frameworks contribution to the community. The prominence of some policies and frameworks has implications in terms of respondents' awareness, attitudes, and interests in being informed of climate change adaptation, institutionalization, and government efforts towards the phenomenon. Based on Table 6, the framework's implications have been ranked based on its effectiveness and thus demonstrate the level of awareness and interventions on climate change adaptations and institutionalization.

Table 6: Relative importance index of urban climate change adaptation frameworks (n = 403)

Policy and Framework contribution Statement	1	2	3	4	5	Total	RII	Rank
The government has effectively implemented climate change adaptation policies in urban areas	44	286	141	364	390	1225	0.608	8
Urban climate policies align with local environment and socio-economic needs	27	284	276	236	415	1238	0.614	6
Adequate funding supports the implementation of urban climate adaptation policies	38	282	225	296	370	1211	0.601	9
Policies are well communicated to the public and stakeholders	39	238	255	324	395	1251	0.621	2
Current policies reduce climate risks such as flooding and heatwaves	34	286	270	244	375	1209	0.600	10
Urban climate adaptation policies have improved water and energy resilience	38	254	222	324	415	1253	0.622	1
Policies support disaster preparedness and response mechanisms	34	284	246	240	425	1229	0.610	7
Adaptation frameworks promote sustainable infrastructure and green spaces	28	278	252	300	385	1243	0.617	4
Policies contributed to improved waste management and environmental conservation	37	266	210	328	405	1246	0.618	3
Local governments provide adequate technical support for adaptation initiatives	46	268	240	252	400	1206	0.599	11
NGOs and international organizations play a significant role	28	316	210	200	485	1239	0.615	5
Community involvement in policy implementation is encouraged	41	318	189	212	435	1195	0.593	12

Likert Scale: 1 = To some extent, 2 = To a moderate extent, 3 = Undecided, 4 = To a great extent, 5 = To a very great extent

Source: Field Data (2025)

Table 6 indicates that the effectiveness of the urban climate adaptation policies and their contribution to the improvement of waste product management and environmental conservation are adequately communicated to the stakeholders and improved their effectiveness in the implementation of climate change adaptation and institutionalization strategies. Furthermore, the study findings indicate a positive concern of the government through local authorities in the provision of adequate technical support for adaptation initiatives and that encourages private sectors and community involvement in the policy

implementation of the strategies towards climate change adaptation and institutionalization. In this regard, one of the key informants reported that:

> *The community involvement in urban climate change adaptation planning in Tanzania varies in degree, reflecting an increasing recognition of its significance. Communities have consistently participated in planning residential and economic activities that have a lower impact on climate change effects. This engagement includes policy formulation, project initiation, and consultation services. Additionally, private sectors, including NGOs and civil society organizations (CSOs), are sometimes involved in discussions related to infrastructure that promote green technologies, which enhance the efficiency and effectiveness of climate change adaptation efforts in the implementation of climate change adaptation policies and framework strategies [Participant 4].*

Table 6 shows that non-governmental organizations (NGOs) and international organizations play a significant role in the implementation of climate change adaptation and institutionalization through perfection of the policies and frameworks. The role of these stakeholders, among other things, is similarly focused on financing the government for effective implementation of the frameworks. In this regard, various local and international organizations are encouraged to make joint efforts with the government in the adaptation and institutionalization of climate change. During an interview, one key informant confirmed that:

> *The issue of climate change encompasses a wide range of stakeholders. Key players include government institutions, particularly the central government, which operate under the Vice President's Office and include the Division of Environment and Policy Coordination, as well as the Ministries of Urban Development, Finance, Water, Energy, and Works. The central government plays a crucial role in shaping climate change adaptation policies and reviewing related processes. Local government authorities, including city councils, are primarily responsible for local planning, service delivery, direct engagement with urban residents, and the implementation and dissemination of policies. Other contributors to urban climate change adaptation include universities and research institutions, the Tanzania Meteorological Agency (TMA), Civil Society Organizations (CSOs) and non-governmental organizations (NGOs) both local and international development partners, as well as the urban community, which are the ultimate beneficiaries and first responders to the impacts of climate change [Participant 5].*

The findings dictate the fact that the government of the United Republic of Tanzania has considered it important in addressing climate change adaptation and institutionalization for a greener environment and ecosystem. The government has opened doors for local,

international organizations, and agencies in their efforts to address issues of climate change adaptation and institutionalization.

4.5 Stakeholders involvement in urban climate change adaptation plans in Tanzania

The results in Table 7 present various methods used to involve stakeholders in the urban climate change adaptation planning process, though their uptake varied considerably. This means that while different techniques or approaches were applied to engage stakeholders in adaptation planning, some methods were more widely used than others, indicating that certain engagement techniques are preferred or more practical to implement. The variation in usage highlights the diversity in how stakeholders are involved. The binomial test was used as a statistical procedure to determine whether the proportion of stakeholders engaged through each method significantly differs from an expected baseline proportion of 0.5 or 50 percent.

Table 7: Sources of awareness regarding climate change adaptation and institutionalization (n=403)

Stakeholders' involvement method	Response	*n*	Observed Prop.	*%*	Test Prop.	Exact Sig. (2-tailed)
Public meeting or workshop	Yes	276	.68	68	.050	.000
	No	127	.32	32		
Survey methods (questionnaire)	Yes	269	.67	67	.50	.000
	No	134	.33	33		
Focus group discussion	Yes	242	.60	60	.50	.000
	No	161	.40	40		
Online platforms (social media)	Yes	292	.72	72	.50	.000
	No	111	.28	28		
Face-to-face interview	Yes	222	.55	55	.50	.046
	No	181	.45	45		
Participatory mapping	Yes	146	.36	36	.50	.000
	No	256	.64	64		

Source: Field Data (2025)

The results from the binomial test highlight varied use of stakeholders' involvement methods in urban climate change adaptation planning. Online platforms were the most widely adopted method, with 72% of respondents engaged in this way, followed by public meetings or workshops (68%) and survey methods such as questionnaires (67%). These proportions significantly exceed the baseline of 50%, indicating that these digital and large-group techniques are the preferred approaches for stakeholders' engagement. Focus group discussions (60%) and face-to-face interviews (55%) were used moderately, reflecting the continued relevance of more interactive and resource-intensive methods,

though less prevalent than digital means. Participatory mapping was the least utilized method at (36%), significantly below the (50%) benchmark, despite its value in enabling spatial understanding and community-driven adaptation priorities.

These findings align with broader research emphasizing the role of multi-faceted engagement methods to address the diverse needs of stakeholders in climate adaptation planning. Digital platforms and public forums facilitate wide-reaching involvement and inclusivity, especially in urban contexts with varied populations (Hickey & Salili, 2023). However, reliance on these methods risks excluding marginalized groups who may lack access or representation in such spaces (Moser, 2022). Participatory mapping and focus groups, while underused, provide valuable depth by centering local knowledge, fostering detailed dialogues, and enhancing context-specific adaptation responses (Revi et al., 2023). To optimize engagement outcomes, a blended approach that integrates online and face-to-face participation is recommended, improving accessibility and ensuring that stakeholder inputs translate effectively into sustainable urban climate adaptation plans.

4.5.1 Limitations of stakeholders' involvement in urban climate change adaptation

Table 8 is presented to provide empirical evidence of the limitations of stakeholders' participation in climate change adaptation processes. Understanding these limitations, including weak institutional frameworks, inadequate communication, limited financial resources, lack of awareness, low public interest, and conflicting interests are crucial for appropriate intervention and decision making. These insights help to identify priority areas for policy intervention and capacity building, aiming to enhance collaboration and the long-term success of climate adaptation initiatives in urban environments.

Table 8: Limitations of stakeholders' involvement in urban climate change adaptation (n=403)

Limited stakeholders' involvement	Disagree		Undecided		Agree	
	f	*%*	*f*	*%*	*f*	*%*
Lack of awareness	81	20.1	69	17.1	253	62.8
Limited financial capabilities	40	9.9	96	23.8	267	66.3
Weak institutional frameworks	28	6.9	84	20.8	291	72.2
Political interests and excessive administrative procedures	51	12.7	95	23.6	256	63.5

Lack of incentives and motivation	35	8.7	102	25.3	266	66.0
Poor communication between government agencies, the private sector, and community stakeholders	31	7.7	72	17.9	300	74.4
Limited access to climate change adaptation information	34	8.4	99	24.6	270	67.0
Low public interest and engagement	34	8.4	93	23.1	276	68.5
Conflicts of interest among stakeholders	35	8.7	79	19.6	289	71.7

Source: Field Data (2025)

The findings show that the most prominent limitations include poor communication between government agencies, private sector, and community stakeholders 300 (74.4%), weak institutional frameworks 291 (72.2%), conflicts of interest among stakeholders 289 (71.7%), low public interest and engagement 276(68.5%), and limited access to climate change adaptation information 270 (67.0%). Other significant barriers are limited financial capacity 267 (66.3%), lack of incentives and motivation 266 (66.0%), political interests and excessive administrative procedures 267 (63.5%), and lack of awareness 253 (62.8%). These results suggest that while there is recognition of the importance of stakeholders' involvement, structural, institutional, informational, and socio-political barriers significantly limit meaningful participation. As a reason, these findings indicate that enhancing stakeholders' involvement requires addressing both systemic institutional weaknesses and socio-economic barriers, alongside strategies to improve awareness, motivation, and collaborative governance mechanisms. This was also noted during focus group discussion in Arusha that;

> *Honestly, there is currently no specific urban planning policy addressing climate change resilience in urban areas. As a result, planners rely on a small section of the Environmental Policy from the Ministry of Lands, which is insufficient. This creates poor institutional coordination, especially as land values and compensation costs have risen sharply, making it difficult to acquire damping areas and roads. Apart from that, efforts to reduce climate risks in urban areas are challenged by limited budgets* [FGD 2]

Therefore, the combined evidence suggests that effective urban climate change adaptation requires systemic strengthening of institutional arrangements, enhanced communication and coordination among various actors, and addressing challenges related to financial constraints and political interference.

5. Discussion and Implications

5.1 Discussion

The discussion of this study is based on the specific objectives, which focused on examining the initiatives of Tanzania urban city authorities toward institutionalization of climate change adaptation in urban cities, awareness of climate change impacts, the effectiveness of urban climate change adaptation policies and frameworks, and the determination of the stakeholders' involvement in urban climate change adaptation plans in Tanzania.

5.1.1 Institutionalization of climate change adaptation in Tanzania urban cities

The findings suggest that Tanzania has made remarkable progress toward institutionalizing climate change adaptation in its urban areas. This is evident from the findings that 98% of the respondents indicated that the government is putting many efforts in the implementation of the policy and frameworks toward adaptation and institutionalization of the urban climate change aspects. Respondents strongly recognized the initiation of projects and programs (82.6%) across different institutions, agencies, sectoral implementation in key areas such as agriculture, water, and coastal zones (77.7%), and the presence of monitoring and evaluation frameworks (78.4%). These outcomes indicate that climate change adaptation is increasingly being embedded into urban development agendas, aligning with the objectives of the *National Climate Change Response Strategy 2021–2026* (URT, 2021). Despite this progress, significant gaps remain. Awareness of key institutions such as the National Climate Change Steering Committee (35%) and local government authorities (28%) was limited, reflecting low visibility and weak coordination across governance levels (Molenveld et al., 2020). Similarly, while institutional capacity (73.4%) and community engagement (75.9%) were moderately acknowledged, a notable number of undecided responses highlighted gaps in technical expertise, financial resources, and inclusive participation in managing urban climate change impacts. These limitations align with findings from other African cities, where institutional division and weak capacity building often delay effective integrating climate change adaptation into urban planning (Ahmed et al., 2020). On the other hand, Adom et al. (2025) note that weak institutional arrangements and fragmented communication among actors often hinder inclusive adaptation planning and institutionalization, particularly in urban contexts. Likewise, Forino et al. (2023) argue that financial constraints, lack of incentives, and low public engagement are recurring obstacles in African cities, limiting the capacity of local

stakeholders to contribute effectively to adaptation initiatives and institutionalization. Revi et al. (2023) further emphasizes that political interference and conflicting interests can challenge trust, reduce transparency, and hinder the co-production of climate solutions through adaptation efforts and institutionalization.

Furthermore, the effectiveness of adaptation initiatives was appreciated by 56.8% of the respondents, suggesting that despite the progress to that end, institutionalization has to be given much attention and requires stronger support mechanisms. Reliance on donor-driven or internationally sponsored projects underscores the need for dedicated financial resources embedded in local government budgets to ensure sustainability. In Tanzania the NCCRS 2021–2026 explicitly emphasizes the importance of climate finance mobilization, particularly at local levels, to reduce dependency on external funding sources (UNCDF, 2022). Strengthening policy implementation and enhancing coordination among ministries, local government authorities, and community actors is vital to consolidating gains. Increasing public awareness of the roles and responsibilities of adaptation institutions would improve trust and accountability, while capacity building of local governments and urban planners is necessary to empower communities and ensure vulnerable populations are actively involved in decision-making. Evidence from Dar es Salaam region, for example, shows that when residents of informal settlements are engaged in adaptation planning, outcomes are more sustainable and contextually relevant (Shand, & Raido, 2025). Tanzania's urban cities are making progress in institutionalizing climate change adaptation, guided by strong national strategies and growing recognition of initiatives. But sustained success requires stronger institutional capacity, adequate budget, better coordination, participatory practices, and transparent monitoring. Addressing these gaps will enable more inclusive and resilient urban adaptation aligned with national and international climate change goals.

5.1.2 Tanzania urban residents' awareness of climate change impacts and adaptation

Urban residents in Tanzania demonstrate a clear recognition of immediate climate change impacts, particularly shifting rainfall patterns, frequent flooding, heatwaves, and deteriorating air quality. These findings are consistent with national and regional assessments of climate trends and urban vulnerability. For example, studies reveal that many Tanzanians are already experiencing observable changes in rainfall and temperature, with urban populations facing heightened exposure to extreme rainfall and flooding (Mramba & Mapunda, 2024). Such awareness underscores the lived reality of climate change in Tanzanian cities, where environmental shifts directly affect daily life. Moderate awareness of climate-induced declines in agricultural productivity and land degradation further highlights the connection between climate variability and urban livelihoods,

particularly through impacts on food systems. Global evidence confirms that changing rainfall regimes and rising temperatures are already influencing crop yields and food security in Tanzania (LHRC, 2023). These results illustrate that climate change awareness in both rural and urban communities is often grounded in direct lived experiences. However, this awareness alone is insufficient without targeted interventions that build adaptive capacity. Furthermore, Okaka and Odhiambo (2018) opines that awareness of climate change adaptation has to be aligned with personal understanding of climate change adaptation capacity that motivates for interventions and behavioral change.

Generally, the interventions to urban climate change adaptation and institutionalization should extend beyond awareness campaigns to encompass strong policies, legal frameworks, and strategic practices that could enable effective adaptation (Nyashilu, 2023). Urban planning and public health strategies must mainstream climate resilience by investing in improved drainage systems, climate-sensitive infrastructure, sustainable livelihoods, and long-term education initiatives (Mashi et al., 2025). Moreover, prioritizing equitable interventions for vulnerable urban groups will be critical in ensuring that awareness translates into effective adaptation, thereby safeguarding both livelihoods and human rights.

5.1.3 Effectiveness of Tanzania urban climate change adaptation policies and frameworks

The study findings indicate that climate change adaptation and institutionalization policies and frameworks in Tanzania have been promising in providing effective adaptation and institutionalization of the underlying phenomenon. The government of the United Republic of Tanzania is playing a significant role in effectively addressing climate change adaptation and institutionalization in urban areas, thereby successfully improving water and energy resilience while continuing to communicate with the public about urban climate change adaptation policies and frameworks. However, the local government is ranked lowest (Table 6) in encouraging urban communities to be involved in policy implementation, which implies insufficient efforts are being invested into this endeavor. This finding corroborates Campbell and Hope's (2025) observations on the study of climate change adaptation policies in East African countries, where it was reported that the engagement of the urban community in policy formulation and implementation is always limited and thus influences its effectiveness on climate change adaptation.

Findings on the collaborative efforts toward advocating the climate change adaptation initiatives show that NGOs and international organizations (Table 6) play a significant role in fostering the remarkable engagement of the developing countries on climate change adaptation and institutionalization. In light of this lens, the World Bank Group [WBG]

(2019) argues about deliberate initiatives to support developing countries, including the United Republic of Tanzania, on climate change adaptation and institutionalization through the provision of financial support, as similarly argued by UN-Habitat (2024). The WBG is further dedicated to mitigating climate change risks and to the development and implementation of climate change adaptation policies and frameworks. On this, Wijenayake (2025) insists on the need for governments to explore and establish public-private networking and collaboration for investment in climate change adaptation and institutionalization through the establishment of policies and frameworks, which, in the end, will ultimately realize the effectiveness of the collaboration through the implementation of the frameworks' strategies. Nevertheless, Maeda et al. (2025) affirms that involving actors such as government agencies, NGOs, local communities and private sectors is crucial in collaborative efforts and familiarizing communities with climate change adaptation.

The UN-Habitat (2024) further insists on the need for local governments to ensure that the process of integrating climate change policy and urban planning should always promote vertical integration of the frameworks and urbanization plans for effectiveness in their implementation. However, local community and international engagement in climate change adaptation and institutionalization may be effectively realized when governments establish dynamic risk management strategies (UNEP, 2017). On a different note, Nyashilu (2023) suggests governments prioritize proper actions for climate change adaptation and institutionalization in urban city development policy while identifying the impacts of climate change and the at-risk assessment to be integrated into the planning process. Moreover, the effectiveness of the government's climate change adaptation and institutionalization is basically determined by how well the policies, urban planning frameworks, and procedures are integrated into the local government frameworks and the engagement of various stakeholders for partnership and networking.

5.1.4 Stakeholders involvement in urban climate change adaptation plans in Tanzania

The findings demonstrate that diverse methods are employed to involve stakeholders in urban climate change adaptation planning, although their uptake varies considerably. The methods commonly used include online platforms (72%), public meetings/workshops (68%), and survey methods (67%). Although, the methods are not generalizable but are reasonably reflecting a growing reliance on digital engagement and large-scale participatory formats. This aligns with trends in many cities where online platforms and public forums are increasingly applied to enhance inclusivity and reach broader audiences (Moser, 2022). However, more dialogical approaches such as focus group discussions (60%) and face-to-face interviews (55%) were less frequently used, and participatory

mapping was the least adopted (36%). This suggests that while resource-efficient and large-scale methods dominate, locally grounded, spatially sensitive, and community-driven approaches remain underutilized. Literature emphasizes that such methods are vital for ensuring deep engagement, contextual learning, and locally relevant solutions (Revi et al., 2023). Hybrid approaches that combine online tools with community-based practices can therefore enhance both inclusivity and the quality of adaptation outcomes (Hickey & Salili, 2023).

Regarding perceptions of inclusivity, nearly two-thirds (64.7%) of respondents agreed that adaptation plans reflected stakeholder needs, while (14.6%) disagreed and (20.6%) remained undecided. This indicates that, although planning processes are generally aligned with stakeholder priorities, gaps remain in transparency and equitable participation. Previous studies show similar patterns, where adaptation planning incorporates broad stakeholder perspectives but fails to adequately address marginalized groups such as women, low-income communities, and informal settlers (Archer et al., 2022; Revi et al., 2023). Limited feedback mechanisms and unclear institutional arrangements contribute to uncertainty over how stakeholder input is integrated. Strengthening mechanisms for co-production, transparent decision-making, and clear communication of priorities is therefore critical to enhancing stakeholder confidence and ensuring inclusive adaptation outcomes.

The study also revealed key barriers limiting effective stakeholder engagement. These include poor communication among actors (74.4%), weak institutional frameworks (72.2%), conflicts of interest (71.7%), low public interest (68.5%), and limited access to adaptation information (67.0%). Other constraints such as financial limitations, lack of incentives, political interference, and administrative bottlenecks further undermine meaningful participation. These findings echo prior studies showing that fragmented institutions, socio-political conflicts, and resource constraints often undermine inclusive adaptation planning in African cities (Forino et al., 2023; Revi et al., 2023; Adom et al., 2025). Thus, addressing systemic institutional weaknesses, fostering trust, and reducing socio-economic barriers are critical to creating an enabling environment for collaborative governance and equitable participation.

Finally, respondents emphasized education and awareness-raising (60.4%) as the most critical strategy for improving climate change adaptation, followed by community involvement in policy implementation (16.0%) and monitoring and evaluation (10.4%). These findings highlight the central role of knowledge dissemination and participatory engagement in enhancing adaptation effectiveness. Structural measures such as law enforcement or capacity-building were less prioritized by stakeholders, suggesting that communities value immediate, accessible, and participatory strategies over top-down

institutional reforms. This perspective resonates with existing literature underscoring the role of education and capacity-building in empowering local communities, enabling behavioral change, and strengthening long-term resilience (Wojewska et al., 2021; Sietz et al., 2022;). Therefore, prioritizing education, participatory implementation, and ongoing monitoring not only improves adaptation outcomes but also contributes to broader socio-economic development by empowering vulnerable groups and fostering equitable access to climate resources. Therefore, the study findings imply that while significant progress has been made in involving stakeholders in urban climate adaptation, greater emphasis is required on participatory mapping, dialogical engagement, and transparent feedback mechanisms. Addressing institutional and socio-political barriers while strengthening education and community empowerment will be essential for ensuring inclusive, equitable, and sustainable climate responses in urban contexts.

5.2 Practical and Policy Implications

These findings underscore the need for central and local government authorities, including policy and decision makers, to integrate the operational central government frameworks with the local government for effective implementation of the strategies toward climate change adaptation and institutionalization. Most of the frameworks are nationally oriented, including the National Climate Change Response Strategy (NCCRS 2021-2026), the National Adaptation Program of Action (NAPA), and the National Environmental Action Plan (NEAP), which calls for the government and policy makers to establish an integrated urban or local climate change adaptation policy or framework for convenience and implementation. In this regard, the streamlined frameworks and community engagement may ultimately lead to the effectiveness of the policies and frameworks in the efforts on climate change adaptation and hence in the achievement of the Sustainable Development Goals (6, 11, and 13) that ensures access to water and sanitation for all (6), making cities inclusive, safe, resilient, and sustainable (11), and taking urgent action to combat climate change and its impacts (13).

6. Conclusion and Recommendations

6.1 Conclusion

The study on climate change adaptation and institutionalization has added to knowledge on philosophy underpinning the discipline of climate change. It has underscored the fact that urban cities are aware of the climate change adaptation and institutionalization that have been implemented through participation in decision-making, planning, and framework development. The influence and participation of the urban community in the efforts on climate change adaptation and institutionalization have collectively impacted in making urban cities green with unremarkable impacts of climate change and ultimately

contribute to realizing the United Nations sustainable development goals six, eleven, and thirteen that are directly linked to the beauty of the urban cities. Climate change adaptation policies and frameworks are crucial in addressing climate change adaptation strategies. They enable action plans and resource allocation for addressing the effects of climate change and its evaluations for intervention and decision-making. The study has established that the potential frameworks, including the National Environmental Management Council (NEMC), the National Environmental Action Plan (NEAP), the National Climate Change Focal Point (NCCCFP), and the National Climate Change Strategy (NCCS), are credible and functional at the national institution calls for the community being informed of the essence of climate change actors and institution towards adaptation and institutionalization of the efforts in place. However, with the demand and agency of adaptation initiatives, these frameworks call for their reflection and integration with local authorities' plans and strategies for climate change adaptation measures and institutionalization. Frequent review of these frameworks is similarly important due to the development of technology and natural settings of climate change adaptation and institutionalization. For the frameworks and adaptation measures to be operational, there must be appropriate means of dissemination that incorporate both traditional and modern strategies, aiming to reach the community beyond geographical locations. However, challenges persist in exchanging climate change adaptation information and frameworks among the government, urban city authorities, the private sector, and the community due to limited financial resources, political interests, and complex administrative procedures. The study provides practical recommendations to promote active involvement from the government, urban city authorities, and the community, fostering effective collaboration and networking.

6.2 Recommendations

The government of the United Republic of Tanzania, through the Vice President's Office on the National Environment Management Council (NEMC), should take advantage of the collaborative efforts with international and local organizations in ensuring effective urban climate change adaptation and sustainable development in achieving the United Nations sustainable development goals six, eleven, and thirteen. The following recommendations are considered important for the government towards enhancing effective climate change adaptation and institutionalization:

The government must invest in multi-channel communication strategy to ensure a combination of digital platforms (mobile apps, social media, websites), traditional media (television, radio, printed materials), and interactive forums (workshops, seminars, community meetings) to effectively reach diverse audiences and accommodate different preferences and access levels.

The urban authorities should expand capacity-building efforts through training workshops and professional development programs that equip stakeholders, including local leaders and practitioners, with the knowledge and skills necessary to implement effective climate change adaptation measures. But also, establish various systems to regularly monitor and evaluate the effectiveness of climate change communication and education initiatives, allowing for continuous improvement informed by the community feedback and emerging challenges.

The Vice President's Office and local government authorities should occasionally organize public awareness campaigns through radio, television, and community meetings, particularly on national environmental days, as a means of conducting public awareness. Nevertheless, NGOs, civil society organizations (CSOs), and academic and research institutions should be harmonized to be part of the efforts toward researching and disseminating research findings, publications, training, and engaging the community about climate change adaptation and institutionalization.

On one hand, the government can involve the private sectors as they can contribute by fostering innovation and technology development, providing financial support and investment, creating jobs, and ensuring compliance with corporate responsibility through sustainable climate change adaptation practices, frameworks, and policy development. Additionally, improving and involvement of international development partners may contribute towards offering financial support, expertise, capacity building, knowledge dissemination, and best practices in climate change adaptation and institutionalization.

References

Aboagye, P.D. & Sharifi, A. (2023). Urban climate adaptation and mitigation action plans: A critical review. Renewable and Sustainable Energy Reviews, 189 (2024) 113886: 1-18. https://doi.org/10.1016/j.rser.2023.113886.

Adjei, P. O., & Owusu, E. (2023). Integrating indigenous knowledge into climate adaptation planning in West Africa. *African Journal of Environmental Science and Technology*, *17*(4): 123–134. https://doi.org/10.5897/AJEST2023.1234.

Adom, R.K., Simatele, M.D., Das, D.K., Mukalazi, K.A., Sonwabo, M., Mudau, L., ... & Zhou, L. (2024). Enhancing climate change adaptation governance through transforming institutions in Kwa-Zulu Natal Province, South Africa. *International Journal of Climate Change Strategies and Management*, *16* (4): 413-438.

Allarané, N., Atchadé, A.J., N'Dilbé, T.R., Azagoun, V.V.A., Hetcheli, F. (2024). Integrating climate change adaptation strategies into urban policies for sustainable city resilience: Barriers and solutions in the Central African city of N'Djaména. *Sustainability*, *2024*(16): 1-16. https://doi.org/10.3390/ su16135309.

Almulhim, A. I., Bibri, S. E., Sharifi, A., Ahmad, S., & Almatar, K.M. (2022). Emerging trends and knowledge structures of urbanization and environmental sustainability: A regional perspective. *Sustainability*, *14* (20), 13195.

Björklund, E., & Segermark, V.O. (2023). The perceptions and experiences of urban dwellers, regarding the transition from an agrarian to an urban society: A qualitative interview study conducted in Urban Babati, Tanzania.

Campbell, S. & Hope, W. (2025). Climate change adaptation policies in East African countries: A review of institutional responses and implementation gaps. *Global Journal of Public Policy and Administration.* *2*(1):1-18. https://doi.org/10.58425/gjppa.v2i1.361.

China National Climate Change Adaptation Strategy [CNCCAS] (2022). National Climate Change Adaptation Strategy 2035. [Online], Available at http://www.ncsc.org.cn/SY/syqhbh/202206/W020221026516413083356.pdf. (Accessed on Friday, August 1, 2025).

Dubey, U.K. & Kothari, D.P. (2022). *Research methodology: Techniques and trends, Boca Raton: Chapman & Hall/CRC Press*. Boca Raton: Chapman & Hall/CRC Press.

Forino, G., Fraser, A., & Tandarić, N. (2023). Towards adaptive and transformative finance for urban areas? A framework to analyze the responsiveness of adaptation finance to urban challenges in the global South. *Environment and Urbanization*, *35*(1): 200-219.

Göpfert, C., Wamsler, C., & Lang, W. (2019). Institutionalizing climate change mitigation and adaptation through city advisory committees: Lessons learned and policy futures. *City and Environment Interactions*, *1*, 100004.

Hickey, G., & Salili, S. (2023). Hybrid methods for inclusive climate adaptation planning. *Environment and Planning C: Politics and Space*, 41 (2): 330–349. https://doi.org/10.1177/23996544231146567

Joseph, L. (2022). The Most Vulnerable and High-Risk Groups Sensitive to Impacts of Climate Change in Arusha Region, Tanzania. *East African Journal of Arts and Social Sciences*, *5*(1): 88-102.

Kaba, A. J. (2020). Explaining Africa's rapid population growth, 1950 to 2020: trends, factors, implications, and recommendations. *Sociology Mind*, *10* (4): 226-268.

Kaewkungwal, J., & Adams, P. (2019). Ethical consideration of the research proposal and the informed-consent process: An online survey of researchers and ethics committee members in Thailand. *Accountability in Research*, *26*(3): 176-19.

Kang, E., & Hwang, H.J. (2021). Ethical conducts in qualitative research methodology: Participant observation and interview process. *Journal of Research and Publication Ethics*, *2* (2): 5-10.

Kifunda, C.F. (2023). Effects of climate change and adaptation strategies on urban crop production in Kinondoni City, Tanzania. *Asian Journal of Agriculture*, *7* (2).

Klein, R. J. T., Huitema, D., & Lemos, M. C. (2022). Institutional mechanisms for urban climate adaptation: A global assessment. *Environmental Science & Policy*, *128*; 1–12. https://doi.org/10.1016/j.envsci.2021.11.008.

Kombe, W.J., & Alananga, S.S. (2022). Is Climate Change Knowledge Making a Difference in Urban Planning and Practice: Perspectives from Practitioners and Policymakers in Tanzania. In *Planning Cities in Africa: Current Issues and Future Prospects of Urban Governance and Planning* (pp. 119-141). Cham: Springer International Publishing.

Kweka, C., & Ndumbaro, L. (2023). Sources of climate information and community adaptation in urban Tanzania. *International Journal of Climate Change Strategies and Management*, *15*(2): 245–263. https://doi.org/10.1108/IJCCSM-05-2022-0065

Lauwo, S.G., Azure, J.D.C., & Hopper, T. (2022). Accountability and governance in implementing the Sustainable Development Goals in a developing country context: evidence from Tanzania. *Accounting, Auditing & Accountability Journal*, *35*(6): 1431-1461.

Lee, H., Calvin, K., Dasgupta, D., Krinner, G., Mukherji, A., Thorne, P., & Park, Y. (2023). IPCC, 2023: Climate Change 2023: Synthesis Report, Summary for Policymakers. Contribution of Working Groups I, II, and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, H. Lee and J. Romero (eds.)]. IPCC, Geneva, Switzerland.

Li, X., Stringer, L.C., & Dallimer, M. (2022). The impacts of urbanization and climate change on the urban thermal environment in Africa. *Climate*, *10*(11): 164.

Lioubimtseva, E., & da Cunha, C. (2022). Community engagement and equity in climate adaptation planning: experience of small-and mid-sized cities in the United States and France. *Justice in climate action planning*, 257-276.

Liss, B.M., Wannewitz, M., Chaves, C.M., Grobusch, L.C., Islam, S., Magnaye, D.C., Napalang, M.S.G., Eugenio, V.F., & Garschagen, M. (2025). Mainstreaming climate change adaptation into urban planning: A pragmatic protocol to tackle the implementation gap. *Frontiers in Climate*, *7*(2025): 1-12, doi: 10.3389/fclim.2025.1557352.

Lv, Y., & Sarker, M.N.I. (2024). Integrative approaches to urban resilience: Evaluating the efficacy of resilience strategies in mitigating climate change vulnerabilities. *Heliyon*, *10*(6).

Mabhuye, E.B. (2024). Vulnerability of communities' livelihoods to the impacts of climate change in north-western highlands of Tanzania. *Environmental Development*, *49*, 100939.

Maeda, C.M., Namwata, B.M., & Kumburu, N.P. (2025). Local governance and climate change adaptation: evidence from Monduli and Longido districts, Tanzania. *Cogent Social Sciences*, *11*(1): 2540424.

Mahenge, F.Y. (2019). The determinants of grapevine farmers' adaptive capacity to climate change in Dodoma-Tanzania. *The Sub-Saharan Journal of Social Sciences and Humanities (SJSSH)*, *1*(2): 86-96.

Matsumoto, T., Dupré, D.A., Crook, J. & Robert, A. (2019). An integrated approach to the Paris climate agreement: The role of regions and cities. *OECD Regional Development Working Papers 2019/13*. https://dx.doi.org/10.1787/96b5676d-en.

Ministry of Environment, Climate Change and Forestry. (2024). National climate change action plan (NCCAP) 2023-2027. [Online], Available at: https://emsi.co.ke/wp-content/uploads/2024/08/Kenya NCCAP-2023-2027-1.pdf. (Accessed on August 6, 2025).

Mizutori, M. (2020). Reflections on the Sendai Framework for disaster risk reduction: five years since its adoption. *International Journal of Disaster Risk Science*, *11* (2): 147-151.

Mdemu, M.V., Mutayoba, W., & Nindi, S.J. (2022). Climate change awareness and adaptation strategies among urban households in Tanzania. *Climate and Development*, *14*(9): 823–835. https://doi.org/10.1080/17565529.2021.2002278.

Mngumi, L.E. (2021). Exploring the contribution of social capital in building resilience for climate change effects in peri-urban areas, Dar es Salaam, Tanzania. *GeoJournal*, *86* (6): 2671-2689.

Moser, S. (2022). Challenges and opportunities in stakeholder engagement for climate adaptation. *Climate Policy Journal*, 20(5), 621–639.

Mwamba, B., Mayers, P., & Shea, J. (2022). Sexual and reproductive health knowledge of graduate students at the University of Cape Town, in South Africa. *Reproductive Health*, *19* (1): 225.

Myers, G. (2022). Urban Governance Dynamics and Climate Change in East Africa: A Comparison of Dar es Salaam and Nairobi. *Journal of International Affairs*, *74* (1): 83-18.

Natural Resources Defense Council (NRDC). (2017). The Paris agreement on climate change. Brief report, November 2017, IB: 17-11-A.

Niemann, J., El-Mahdi, M., Samuelsen, H., & Tersbøl, B.P. (2023). *Gender relations and decision-making on climate change adaptation in rural East African households: A qualitative systematic review*. https://doi.org/10.31223/x5mm4q

Nyandoro, L., Moyo, S., & Dube, T. (2024). Institutionalizing indigenous knowledge in climate adaptation policies: Case studies from Southern Africa. *Climatic Change*, *177* (11): 1–16. https://doi.org/10.1007/s10584-024-03822-2.

Nyashilu, I.M., Kiunsi, R.B., & Kyessi, A.G. (2023). Assessment of exposure, coping and adaptation strategies for elements at risk to climate change-induced flooding in urban areas. The case of Jangwani Ward in Dar es Salaam City, Tanzania. *Heliyon*, *9* (4)

Nyumba, T.O., Masha, B.D., & Tarimo, F.W. (2023). Integrating indigenous knowledge and scientific evidence for urban climate adaptation in Africa: A participatory approach. *Environmental Science & Policy*, 145, 301-312.

Peter, L.L., & Yang, Y. (2019). Urban planning historical review of master plans and the way towards a sustainable city: Dar es Salaam, Tanzania. *Frontiers of Architectural Research*, *8*(3): 359-377.

Prakash, A., Ley, D., & Thamari, M. (2024). How Gender-Sensitive Are Environmental Institutions, Climate Adaptation, and Mitigation Actions? A Narrative from the Global South. *Annual Review of Environment and Resources*, *49*(1): 449–474. https://doi.org/10.1146/annurev-environ-121322-073202

Preston, B.L., Burkett, V., & Meza, F. (2021). Enhancing stakeholder engagement for effective climate adaptation: Lessons from global practices. *Climate Risk Management*, 30, 100270.

Revi, A., et al. (2023). Deepening stakeholder engagement for urban climate adaptation: participatory mapping and focus groups. *Urban Climate*, 41, 101128. https://doi.org/10.1016/j.uclim.2023.101128.

Satterthwaite, D., Archer, D., Colenbrander, S., Dodman, D., Hardoy, J., Mitlin, D., & Patel, S. (2020). Building resilience to climate change in informal settlements. *One Earth*, *2* (2): 143-156.

Shand, W. and Raido, M. (2025). *Community-led climate adaptation in informal settlements: Dar es Salaam, Tanzania*. Tanzania federation for the urban poor: Center for community initiatives, .[Online], Available at https://www.iied.org/22632g. (Accessed on August 4, 2025).

Sharifi, A. (2021). Co-benefits and synergies between urban climate change mitigation and adaptation measures: A literature review. *Science of the total environment*, *750*, 141642.

Sumari, B.K., Pauline, N.M., & Mabhuye, E.B. (2024). Integrating bottom-up and top-down approaches in Tanzania's climate change adaptation planning: Exploring their impact on adaptive capacity in adaptation projects. *Journal of Development Studies*, 1–18. https://doi.org/10.1080/00220388.2024.2428608

Tiedemann, J., Piatkov, V., Prihardini, D., Benitez, J.C., & Zdzienicka, A. (2021). *Meeting the Sustainable Development Goals in small developing states with climate vulnerabilities: Cost and financing*. International Monetary Fund.

United Nation Environment Programme [UNEP] (2017). Regional climate change adaptation framework for the Mediterranean marine and coastal areas. UN Environment/MAP Athens, Greece. [Online], Available at: www.unepmap.org. (Accessed on August 4, 2025).

United Nation Habitat (2024). Urban climate action: Policy brief series. GGGI insight brief no. 9. [Online], Available at: https://gggi.org/wp-content/uploads/2024/06/GGGI_Flagship_Insight-Brief_No.9.pdf. (Accessed on August 4, 2025).

United Nations Habitat (2025). A guide for urban managers' effective climate governance in intermediary cities: A focus on climate mitigation. [Online]. Available at: www.unhabitat.org. (Accessed on August 7, 2025).

United Republic of Tanzania (URT) (2021). National Climate Change Response Strategy (2021-2026). Vice President's Office, Division of Environment, Government Printer, Dodoma. Tanzania.

Wijenayake, A. (2025). Climate change and urban resilience: Strategies for sustainable cities. *International Journal of Academic Research in Business and Social Sciences, 15* (4): 247-261. http://dx.doi.org/10.6007/IJARBSS/v15-i4/25093.

Wolff, F., Jacob, K., & Teebken, J. (2022). *Towards a joint implementation of the 2030 Agenda/SDGs, the Paris Agreement and the Sendai Framework. Discussion paper. Interim report* (No. UBA-FB--000590/1, ENG). Umwelt bundesamt (UBA).

Wolff, S., Mdemu, M.V., & Lakes, T. (2021). Defining the peri-urban: a multidimensional characterization of spatio-temporal land use along an urban–rural gradient in Dar es Salaam, Tanzania. *Land*, *10* (2): 177.

World Bank Group [WBG] (2019). World bank group's action plan on climate change adaptation and resilience: Managing risks for a more resilient future. World Bank Group, Washington, DC: World Bank.