College of Development Studies

Center for Environment and Development Studies

Climate Change Governance in Addis Ababa City Administration, Ethiopia

Tigezaw Lamesgin Addis

A Dissertation Submitted to the Center for Environment and Development Studies, for Fulfillment of the Requirements for the Degree of Doctor of Philosophy in Environment and Development

July, 2023

Addis Ababa Ethiopia

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Statement of the Author

I have followed all ethical research principles in this Ph.D. research writing Process. I confirm that this dissertation is my own original work with the guidance and close direction of my supervisors and it has never been presented for degree in any other institution.

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Signed: 

Date of Submission: 13/7/2023

This Ph.D. dissertation has been submitted for examination with my approval as University Advisor.

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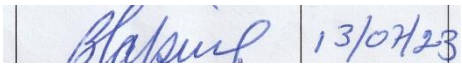
Signature 

Dissertation Approval Sheet

Addis Ababa University

School of Graduate Studies

This is to certify that the dissertation prepared by Tigezaw Lamesegin Addis entitled "**Climate Change Governance in Addis Ababa City Administration, Ethiopia**" has been submitted for the fulfilment of the requirement for the Degree of Doctor of Philosophy (Environment and Development Studies) compiles with the regulations of the University and meets the accepted standards with respect to originality and quality.

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Dedication

This dissertation is dedicated to my beloved mother Minitemariyam Guade who passed during concept paper presentation time for this PhD.

List of Papers

This dissertation is prepared based on articles based dissertation compilation guideline of Addis Ababa University and organized based on the following four papers.

Paper 1: Addis, T.L.; Birhanu, B.S.; Italemahu, T.Z. Effectiveness of Urban Climate Change Governance in Addis Ababa City, Ethiopia. Urban Science. 2022, 6, 64. https://doi.org/10.3390/urbansci6030064 (Published).

Paper 2: Addis, T.L.; Birhanu, B.S.; Italemahu, T.Z. Factors Affecting Climate Change Governance in Addis Ababa City, Ethiopia. Sustainability, 2023, 15, 3235. https://doi.org/10.3390/su15043235 (published).

Paper 3: Addis, T.L.; Birhanu, B.S.; Italemahu, T.Z. Institutional Interaction and the role of Actors in the Governance of Climate Change in Addis Ababa City, Ethiopia. HELIYON-D-2321923 (Under Review).

Paper 4: Addis, T.L.; Birhanu, B.S.; Italemahu, T.Z. Assessing Modes of Climate Governance in Addis Ababa City, Ethiopia. Frontiers in Sustainable Cities-1226085 (Under Review).

List of Acronyms and Abbreviations

AABFED	Addis Ababa Bureau of Finance and Economic Development
AACA	Addis Ababa City Administration
AACCSA	Addis Ababa Chamber of Commerce and Sectoral Associations
AAEPA	Addis Ababa Environmental Protection Authority
AAEPGDC	Addis Ababa Environmental Protection and Green development Commission
EPGDC	Environmental Protection and Green development Commission
ADB	Africa Development Bank
CCG	Climate Change Governance
CIFOR	Center for International Forestry Research
CRGE	Climate Resilient Green Economy
CSOs	Civil Society Organizations
CSA	Central Statistical Agency
CO2	Carbon Dioxide
GDP	Growth Domestic Product
ECSU	Ethiopian Civil Service University
ETB	Ethiopian Birr
ETF	European Training Foundation
FDRE	Federal Democratic Republic Of Ethiopia
FEPAE	Federal Environmental Protection Authority of Ethiopia
GHG	Green House Gases
GIS	Geographic Information System
GTP	Growth and Transformation Plan
IPCC	Intergovernmental Panel for Climate Change
LGA	Local Government Authorities
MLG	Multi Level Governance
Mt CO_2e	Million Tons Carbon Dioxide Equivalent
MUDHCo	Ministry of Urban Development, Housing and Construction
NGOs	Non-Governmental Organizations
PM_{10}	Particulate Matter with aerodynamic diameter of < 10 microns
SPSS	Statistical Package for Social Science
SWOT	Strength, Weakness, Opportunities and Threat
UGI	Urban Governance Index
UHI	Urban Heat Island
UN	United Nation
UNDP	United Nation Development Programme
UNDESA	United Nations Department of Economic and Social Affairs
UNECA	United Nations Economic Commission for Africa
UN-HABITAT	United Nation Human Settlement Programme
UNFCCC	United Nation Framework Convection for Climate Change
WB	World Bank
WHO	World Health Organization

Climate Change Governance in Addis Ababa City Administration, Ethiopia

General Abstract

In the face of mounting greenhouse gas emissions and vulnerability to climate change risks, instituting a viable climate change governance system has been one of the arduous challenges in the context of developing country cities like Addis Ababa City. The objective of this Ph.D. dissertation was to understand urban climate change governance practice in Addis Ababa City with a focus on existing practice, actor's involvements, contribution factors, institutional interactions, and policy tools. A mixed research design was employed whereby most of the study objectives were based on bulk of in depth qualitative data generated from experts, government officials, CSOs and the private sectors, which was also complemented by a range of secondary data. A survey of 232 respondents, who were environment experts at different levels, was conducted using questionnaires and analyzed using descriptive statistics and regression models. The results indicate that the city's current environmental policies, strategies, regulations, proclamations, laws, and its implementations are encountering significant obstacles due to weak accountability, insufficient regulation enforcement, and inadequate engagement of essential stakeholders, particularly civil society organizations and private sectors. These shortcomings are attributed to a deficient institutional framework and the absence of formal systems that enable private sectors, communities, and NGOs to collaborate in addressing climate change. Hence, the findings revealed that the current climate change governance practice in the city was found to be ineffective. On top of this, climate change governance is significantly hindered by lack of coordination, political will and leadership, inadequate finance and lack of policies, regulations. A study on climate governance modes in city has also revealed that climate change mitigation and adaptation measures are mainly implemented through provisioning and self-governance, while enabling and regulation are not widely used in climate governance practices. It is suggested that there is a need to give due attention to climate change and its response measures through an established strong accountability system to enforce regulation, rules, proclamations, laws, policies, and strategies in different sectors. The city government should create an enabling environment to attract non-state actors, in general, and NGOs, in particular, and should practice awareness creations, workshops, continuous trainings and capacity buildings at different levels.

Keywords: *Climate change governance; Coordination; Non-state actors; Mitigation; Addis Ababa*

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Chapter One: General Introduction

1.1. Background of the Study

Since the industrial revolution, anthropogenic activities are the major cause of the increasingly high threats of climate change (IPCC, 2018; Arora and Mishra, 2021). Cities and their inhabitants are the most vulnerable to climate change impacts due to their characteristics as immobile, socio economic hubs that shelter the majority of the world's human population (Eissa and Khalil, 2022). Climate change has been aggravated due to concentrated populations, high economic activities, congested transportation systems, and construction of buildings in cities (Romero-Lankao, 2018). Besides, since the majority of people live in cities, more than 78% of wastes are generated in cities (Van der Heijden, 2019). Studies indicated that cities generate the bulk of greenhouse gas (GHG) emissions (Marc et al., 2019). Even though cities cover less than 5% area, it produces more than 70% of the world's GHG emissions and responsible for up to 75% of global emissions of carbon dioxide from anthropogenic sources (Bulkeley, 2010; Dro˙zd et al., 2021).

The high GHG emissions in urban areas, coupled with the increasingly urban nature of the global population, makes reducing GHG in urban areas a crucial problem. Solving the current climate change in urban areas cannot be achieved only by depending on new technologies and more economic development, and it also requires taking into consideration new trends such as social organization (Jiboye, 2011; Hickmann and Stehle, 2019). In urban areas, governments are not the only source of decision making in environmental issues. New actors also participate in the decision making process to achieve effective adaptation and mitigation strategies (Armitage et al., 2012; Rosenzweig et al., 2018). According to Hughes et al. (2018), climate change solutions need new patterns, including political engagement, finance, and collaboration, and multilevel governance i.e., governing cities is a collective effort, requiring both horizontal and vertical coordination of actors.

During the world leaders' meeting of the 26th annual summit (COP26) held at Glasgow in 2021, the assessment of past performance revealed that the targets of a reduction in GHG emission had not been achieved (Arora- Kumar and Mishra, 2021). While around 23 countries signed the COP26 coal-to-clean- power transition agreement, the largest coal producers, including Australia, China, India and United States, were missing from the agreement. A total of 105 nations signed an agreement to minimize the source of methane,

but the agreement was not signed by the top three methane producing countries (China, India and Russia), which are responsible for about 35% of the methane in the atmosphere (Arora-Kumar and Mishra, 2021). The COP 27 conference also did not achieve what the scientific community deemed necessary. As the time frame for achieving the objective of limiting global temperature increase to 1.5C or less is rapidly diminishing, COP 27 made insufficient progress on the critical issue of mitigation, which involves reducing emissions (Atwoli et al., 2022). Studies in climate modelling show an urgent policy responses is needed (IPCC, 2018; 2021) but most countries' governmental climate action in place today aims to achieve a gradual reduction in GHG emissions (Arora- Kumar and Mishra, 2021; Rockström et al., 2017; Mitchell and Elisa, 2022).

The first successful international negotiation of the 2015 Paris agreement marked a milestone in global climate governance (Peterson, 2021). However, the practicality of the agreement was questioned, particularly due to the withdrawal of the United States, the world's second-largest emitter of GHGs (Xiaolong, 2021; Cheng et al., 2021). The COVID-19 pandemic also caused significant disruption to the response to climate change in cities and created a great challenge to meet the global goals defined in the Paris agreement (Tyfield and Yuille, 2022; Arora- Kumar and Mishra, 2021; Cheng et al., 2021; Kakderi et al., 2021).

Climate change solutions should include the cooperation of various institutions and actors at different levels, whether in the prevention of greenhouse gas emissions (mitigation) or adaptation to the impact of climate change (Lenhart et al., 2015; Poli et al., 2022). Both strategies involve many sectors and actors' interests. Hence, integration of climate adaptation and mitigation in different sectors like energy, urban planning, water management, agriculture, health, housing, and transportation need consensus among them during the decision-making process (Romero-Lankao, 2013; 2018). However, cities are still unable to realize their full potential of innovations toward more climate-resilient, inclusive, and socially just urban futures (Hughes et al., 2018; Sibiya et al., 2022). One of the problems is that the allocation of responsibilities and duties of governmental, private, and civil society organizations among countries and within a country in the formulation and implementation of policies and strategies (Jannes and Jorg, 2013; Marc et al., 2019).

Moreover, internationally, several multilateral organizations have reached agreements to reduce greenhouse gasses, ozone depleting gasses, and release of highly toxic persistence organic compounds. However, cities in both developed and developing countries still faced

challenges to govern climate change effectively. The challenges are due to lack of inclusive citizen participation, empowered local governance in both political and financial terms, institutional capacities, addressing coordination, establishing more effective planning and urban management practice, data measurement through evidence-based policy formulation and monitoring and lack of political support (Bulkeley, 2010; McCarney et al., 2011; Aylett, 2014; 2015; Cheng et al., 2021). Climate change is a hreat for all country cities which requires policy action at international, national, and local levels of governance. Climate change governance takes place through effective processes and strong institutions operating at various scales involving a range of actors with different levels of authority.

In developing countries, cities are key contributors to many of the environmental problems, such as air and water pollution. For many cities, waste is a significant problem. In addition, for major cities, transportation is a key problem due to its contributors to greenhouse gas emissions (McCarney et al., 2011; Hickmann and Stehle, 2019). Many cities in Africa are also more vulnerable to the impacts of climate change due to unplanned urbanization, lack of necessary risk-reducing infrastructure, services, and the failures in urban governance (Christopher, 2015; Loan, 2016; Averchenkova, 2019). According to Averchenkova (2019), in most cities of developing countries, urban governments do not fully deliver their responsibilities due to various existing institutional arrangements, such as shortage of resources, inadequate capacity and weak frameworks for engagement of actors and weaken urban governance.

Ethiopia is one of the African countries, which is affected by climate change (Gebeyehu, 2016; Simane et al., 2016; Abdela, 2022). Since 1995, Ethiopia has adopted a Constitution. This Constitution states that everyone has the right to live in a clean and healthy environment. It also emphasizes the participation of the people on environmental affairs. It shows that people at all levels are the main stakeholders whose decisions are a necessary requirement for any action that may affect them and their environment. Consequently, the Environmental Policy of Ethiopia was formulated in 1997. The overall aim of this policy is to improve and enhance the health and quality of life of all Ethiopians and to promote sustainable development. In addition to this, the policy includes the need for institutional arrangements from the federal level to the community level and the engagement of all stakeholders, such as government, NGOs, professional associations, community representatives, and private sectors (Damtie and Kebese, 2012). In line with the policy, several sectorial policies, regulatory

frameworks, proclamations, and guidelines that consider environmental issues for sustainable development were formulated.

Moreover, in 2011, Ethiopia has formulated ambitious national climate strategies. The Climate-Resilient and Green Economy Strategy (CRGE) seeks to transform the country into a carbon-neutral middle-income country by 2025. To achieve this aim, the CRGE has identified priority sectors, including transport, energy, buildings, forestry, livestock, soil, and industry. The CRGE is the main strategy of the country, aiming to implement several mitigation and adaptation activities (ADB, 2017). Based on CRGE strategy in the country, the ministry of urban development and infrastructure formulate and implement different strategies to manage cities and towns in sustainable way. The strategies include urban climate change resilience and green development strategy in 2014, urban solid waste management strategy in 2014, and urban green infrastructure development strategy in 2015.

Even though Ethiopia has developed various policies strategies, proclamations, regulation, and standard guidelines to address environmental issues, existing researches have shown that there are still challenges to effectively govern environmental issues in general and climate change in particular. Although, the environmental policy documents have included the principles of sustainable development, in practice, there are wide gaps between the policy intentions and the actual decision (Cesar & Ekbom, 2013). The factors contributed to the poor implementation of the policies and strategies include: focusing on quick economic achievement, lack of adequate infrastructure and skilled human resources, financial limitations, absence of functional linkages among and between various state and non-state actors (EPA, 2012; CAT, 2020).

Weak institutional capacity at local and national levels, poor coordination across sectors and ministries, and access to finance is the main barriers in Ethiopia (Damtie and Kebede, 2012; Danyo et al., 2017; CAT, 2020). Both the Impact Assessment proclamation (299/2002) and the Pollution Control Proclamation (300/2002) implementation have faced limitations. According to Ruffies et al. (2010), evaluation of the application of the Environmental Impact Assessment Law reveals that the process was more a result of donor requirements than that of political will.

As one of the cities in developing countries, Addis Ababa has been experiencing a decrease in the critical functions of its ecosystem services (WB, 2015; Ayele et al., 2022). Growth and

geographical expansion of the city's boundaries are not based on long-term environmental concerns (Woldesemayat and Genovese, 2021). Because of climate change in the city, frequent hot day, flood, and water shortage are becoming norms (Arisiso et al., 2017; Woreku et al., 2021).

Climate change governance is viewed as global climate change governance neglecting the local and cities aspects of governance, and limited to the implementation of globally or regionally initiated multilateral accords, which have been suffering from weak coordination systems at city level (Romero, 2018; Hughes et al., 2018). Hence, this study aims to examine based on the assumptions that the current GHG emissions causes, climate change impacts and its response actions are immense, not only global in their nature, most of which are local that strictly call for sound application of local knowledge, active engagement, and coordinated response of diverse actors. Therefore, this study examined the intervention action of climate change and provides policy implications on the governance system to reduce GHG emissions and climate change impacts in Addis Ababa city administration.

1.2. Statement of the Problem

Over 70% of global GDP is generated in cities, and, with increasing urbanization, cities will projected to grow to 70 % by 2050 (Guoyu, 2015). Globally, urban areas are the largest contributors to climate change through the alteration of green covers like forest and grassland for other land uses (Baklanov et al., 2017; Díaz-Pont, 2020). They are also the most significant cause of the high Green House Gas emission from transportation and buildings (Neij et al., 2015; Rockström et al., 2017). For many cities in the world housing provision, sanitation and waste disposal are the more urgent areas for governance (Romero-Lankao et al., 2018). There is high levels of policy rhetoric about urban climate change governance, but the practice on the ground is limited (Van der Heijden, 2019; Yeganeha et al., 2020).

The development of cities in developing countries is also mostly at the expense of environmental qualities (Anwar, 2016; Lorena, 2020). The rapid rate of urbanization (5.4%), together with the low level of economic development in Ethiopia, creates an acute problem for urban local governments to manage in a sustainable way (MUDHCo, 2015; Karadimitriou et al., 2022). The practice of urban development in Ethiopia is often associated with environmental damage instead of preservation it (Kasim et al., 2018).

Addis Ababa, the capital city of Ethiopia, has experienced a rapid rate of population growth and unprecedented spatial expansion (3.2% per year) (World Bank, 2015). As a result, the ecosystem services of the city are affected seriously (Arisiso et al., 2018; AAEPGDC, 2020). Because of fast rate of urbanization, industrialization and poor waste management practices in the city, water resource highly polluted which threaten ecosystem function as whole. Huge amounts of waste disposal in the river and riverbanks from municipal source, liquid wastes from toilet, open urination and defecation, from construction buildings, fuel stations, garage operations and more than 90% of the industries discharge their waste to nearby river without proper treatment (Maschal and Truye, 2018). More than 35% of the solid waste generated by the city is not collected (Yohannes and Elias, 2017).

The air quality in the city is also affected by emissions from transport, dust from traffic road, discharge from industrial activities, construction operations, and other overall land-use practices (Addis Ababa Road and Transport Bureau, 2018). For instance, the average concentrations of suspended particles and particulate matters (aerodynamic size of 2.5 and 10 microns) were found to be 10-30 times greater than the amount set by the World Health Organization (Tarekegn and Gulilat, 2018).

Because of the increase in population, the Urban Heat Island phenomena also became the feature of Addis Ababa (Arsiso et al., 2017; Worku et al., 2021). The city is increasingly more exposed to heat waves, drought, and severe floods (Fatemeh et al., 2013; Bambrick et al., 2015; Worku et al., 2021). Addis Ababa Green House Gas Inventory results in 2016 show that transport and waste sector emission grew by six and two-fold, respectively, as compared to the result in 2012 and Per capita emission increased from 1.17 to 2.9 t per capita from 2012 to 2016 (AACA, 2015). Going forward, the maximum and minimum temperatures in Addis Ababa have shown increasing value. In addition, an overall increase in rainfall variability will be expected (Arsiso et al., 2018; AAEPGDC, 2020).

Furthermore, a lot of attention is being given for the green areas in city development plan; the real practice is opposing. A large hectare of the planned green area has already been used for purposes other than its planned (Eshetu et al., 2021. The threshold value of minimum green space per capita has been defined by the World Health Organization as $9m^2$; While Addis Ababa attains only less than $1m^2$ per capita (Woldesemayat and Genovese, 2021). The disappearance of green space accounts for 40% of the flooding and landslides in the city and recurrence of flooding is already costing ETB 0.21 million per event and estimated to be ETB

0.34 million per year for emergency assistance at the city administration level (Dusseau et al., 2022). The vulnerability to flooding is more aggravated due to a poor drainage system and rapid informal housing development and the cause of the increase in peak flow of flood is due to climate change and urbanization (Derejeet al., 2016). Addis Ababa is vulnerable to climate change impacts and the combination of climate change and development pressures are expected to aggravate the future situation (Fatemeh et al., 2018).

Based on the environmental policy of the country, the Addis Ababa city administration has adopted different environmental strategies, and plans to manage climate change. To manage the current climate change in Addis Ababa city, the governing system should shift from government to governance. Climate change governance emphasizes the involvement of both state and non-state actors in mitigation and adaptation strategies. In the concept of climate change governance, all actors are responsible for addressing climate change-related issues of cites in multi-level systems. The city administration started to implement Climate Resilience Green growth and integrated climate change response Strategy to minimize GHG emissions and reduce the vulnerability of the city.

The city administration is also one of the members of the international city organization, which is called the C40 Cities Climate Leadership Group (AAEPGDC, 2020). The objectives of the organization are reducing greenhouse gas emissions and adapting climate risks for their citizens and infrastructures through networking of member cities. C40 climate leadership group helps member cities to identify, develop, and implement local policies and strategies across multiple sectors. Hence, the Addis Ababa environment green area development commission is working with this organization based on the Paris agreement. Now the commission held inventories of greenhouse gas and identification of risks in the city (Dusseau et al., 2022).

In addition there are sustainable urban development initiative: such as the city light rail transport project which is also expected to provide multiple benefits such as reduction in traffic congestion, fuel savings, employment generation and reduction in pollution (Dipti Ranjan, 2015; Meseret and Sebawit, 2017) Koshe-Reppie site, to manage the city waste properly and decreasing the greenhouse-gas emissions associated with land filling, Addis Ababa City Administration and Ethiopia Electric Power has established waste to energy plant (Massreshaw, 2018; Tassie et al., 2019) the Addis Ababa city administration together with

the federal government implemented a project to convert river banks of the city into public spaces and green areas (Yared, 2019)

Even though the city government has tried to manage climate change, there still is a state dominant governing system in the city. The mandet vested in government organs for making decisions on environment issue is for Addis Ababa city Environmental Protection and Green Development Commission but with out regulatory power. Institutional and legal frameworks that share responsibilities and accountabilities between government, private sector, and civil society organizations are not clearly defined.

Policies and strategies have been initiated; however, there are still gaps that need to be addressed, such as lack of horizontal and vertical coordination between sectors to manage climate-sensitive resources, poor capacity of local governments, sub cities and weoredas, lack of awareness on existing policies and regulations, shortage of skilled man powers, shortage of finance, accountability, and lack of clear roles and responsibilities of varies agencies, authorities and offices (Mohammed et al., 2020). The participation of communities, CBOs, and affected stakeholders is limited. Decentralization, private-public partnership, transparency, and accountability were not well implemented in the city (AARPO, 2020).

Some previous related studies in Addis Ababa city, which are focused on the trend of climate change, show that water shortage is crated because of climate change (Arsiso et al., 2017). In addition, the city is more vulnerable to climate change by (Dereje et al., 2016; Arsiso et al., 2018; Feyissa et al., 2018), and air pollution through vehicle emissions is the major problem in the city (Tarekegn and Gulilat, 2018; Addis Ababa Road and Transport Bureau, 2018) urban heat island effect by (Ermis and hiwet, 2017; Tarekegn and Gulilat, 2018; worku et al., 2021). However, most of the above studies conducted related to climate change in the city were mainly focused on trends, vulnerabilities and impacts. None of them focused on climate change response action by considering governance indicators and factors.

According to a study conducted by Van der Heijden (2019), which involved a systematic review of 260 publications between 2009 and 2018, the literature on urban climate governance is still primarily dominated by studies and scholars from the global north, accounting for over 86% of the literature, with a predominant focus on North America and Europe. Despite a rapid growth in the urban climate governance literature, the Knowledge from cities in the global south is still piecemeal, and is a lack of studies under the issue.

Several global scientific research (Betsill and Bulkeley, 2006; Bulkeley et al., 2009; Corfee-Morlot et al., 2009; Bulkeley, 2010; Bulkeley and Betsill, 2013; Jannes and Knieling, 2013; Hughes, 2016, Gregorio et al, 2019) have been conducted. However, those studies focused on qualitative analysis in the developed cities; they failed to examine quantitatively in developing countries cities at the local level.

Therefore, this study envisioned to bridge the aforementioned gaps with indepth investigation of climate change intervention actions in Addis Ababa City. The study presents policy suggestions which can help to addres the underlying challenges in the study area and can be applicable for other African cities facing similar challenges.

1.3. Research Objectives

In order to address the research, the following general and specific objectives are developed.

1.3.1. General Objective

The main objective of this study is to understand urban climate change governance practice from a developing country cities context, in the case of Addis Ababa City. The specific objectives are provided next.

1.3.2. Specific Objectives

- To assess effectiveness of existing practice of climate change governance in the Addis Ababa City Administration.
- To analyze determinant factors that hinder effective climate change governance in the city
- To examine the institutional interactions and role of different actors in the governance of climate change in the city.
- To assess various modes of urban climate governance contribution to climate change response in the city.

1.4. Research Questions

The study posed several critical questions which provided answers in the subsequent chapters. The main research questions addressed in this study are:

- What is the existing practice of urban climate change governance to cope up with the current climate changes in Addis Ababa City administration?
- What factors hinders towards the effective climate change governance in the city?
- How does the interaction of the institutions in the governing of climate change in Addis Ababa City?
- How have various modes of urban climate governance contributed to climate change response in the city?

1.5. Literature Review

1.5.1. Introductions

This part discusses the review of relevant literature in the areas of urban climate change and governance. It begins with concepts and definition of some key terms and being followed by broad review and discussion of issues related to urban climate change governance, its measurements, determinants, modes, institutions, actors roles and the issues that necessitated urban climate change governance at different levels. It also presents the theoretical and empirical reviews in relation to urban climate change governance, while portraying the conceptual framework of the study in final part. In general, this section attempted to provide theoretical and empirical literature for the study objectives.

1.5.2. Definition and Concepts of Climate Change Governance

Climate change is the variation in global or regional climates over time. It reflects changes in the variability or average state of the atmosphere over time scales ranging from decades to millions of years (Betsill and Bulkeley, 2003). These changes can be caused by more, recently human activities (Intergovernmental Panel on Climate Change, 2018). Governance is the main issue to minimize climate change in cities (Bulkeley and Betsill, 2005). It is also the prerequisite to manage cities in collaboration way.

There is neither a clear consensus on the definition of governance, including a universally agreed once. Loosely, governance can be described as the relationship between the rulers and

the ruled bodies and it recognizes government, civil society and the private sector as the key actors. Urban governance is the sum of many individuals and institutions plan, and it manages the common affairs of the city (Jiboye, 2011). Governance is the system of values, policies and institutions by which a society administers its economic, political and social matters through synergies within and among the state, civil society and private sector. It describes the rules, institutions and practices that set limits and provide incentives for individuals, organizations and firms (Konstantinos, 2015).

The principles of good public governance include accountability, transparency, responsiveness, equity, and efficiency, following the rule of law and consensus-oriented decision (UNDP, 1997). The notion of governance may seem a general concept but it highly depends on the area where it is applied. From an urban management point of view, it entails empowered and strong institutions that are free of corruption and run by service-minded civil servants, who include decentralization of decision-making power and fiscal resources, transparency, empowering civil society institutions and data (UNDP, 2015).

Urban governance refers to the exercise of authority through formal and informal mechanisms, thus encompassing the power distribution among different state actors (i.e. federal, regional and urban governments), non-state actors (i.e. business and civic society organization), the autonomy of urban government to formulate and implement urban development policies and render basic urban services (UN-HABITAT, 2015). Urban good governance is a prerequisite for sustainable urban employment creation, poverty reduction, inclusive development and environmental management (UNDP, 1997; MUDHCo, 2015). Therefore, climate change governance is the mechanisms and response measures aimed at steering social systems towards preventing, mitigating or adapting to the risks posed by climate change (Frohlich and Knieling, 2013). It refers to the policies, regulations, and actions taken by governments, organizations, and individuals to address the challenges and risks posed by climate change, and transition to a low-carbon economy (Bulkeley, 2010; Navroz, 2021).

1.5.3. Theories related with governance and urban climate change

1.5.3.1. Urban Regime Theory

Because elite theories emphasize the idea of urban elite or minority's holds power and ruled majorities or overall urban agenda, the theory faced criticism (Genieys, 2005). The elite

theories neglect the importance of both the state and non-state actors in meeting the sustainable urban development agenda. The opposite of the elite is regime originated as a political economy perspective that rejects the assumptions that governmental authority is adequate to make and carry out policies, as well as structuralism assumptions that economic forces determine policy (Stone. 1989). The principal originator of the urban regime theory is Stone; in his research in Atlanta led to understand that governance was not merely a matter of strict control of the society or rule in a command-and-control approach. Rather governance forms of coordination of actors to solve city problems. The concept of the urban regime, according to stone (1989), is informal, yet relatively stable groups make a coalition and which has a significant impact on urban policy and management. The urban regime theory was a dominant concept in urban politics and policies because it focuses on how governing is done (Lauria, 1997). It considered as a tool to explain public- and private-sector relationships in American cities; the concept has been applied in a number of different settings: at the regional level, the sub-city level, and the neighbourhood level in America cities (Mossberger and Stoker, 2001).

Urban regime analysis explores the coalition-building on civic cooperation or informal modes of coordination across institutional boundaries. Urban coalitions made up of both state and non-state actors (urban regimes) and the way they interact and make decisions (modes of cooperation) (Stone, 1989). To do the task of governing a city, the ruling coalition works out shared understandings of the problems of current governance and tap their various institutional bases of power for the resources necessary to undertake the tasks of governance. Further, because they have access to substantial institutional resources, business leaders are most often sought out as governing coalition partners, thus creating a systematic bias in urban regime formation (Stoker, 1990).

Urban regime theory strongly argued that adequate power should be needed for governing regimes in order to be able to shape the city's agenda, especially governance require power to combine different interests and to reach considerable result (Stone, 1989). The focus in regime analysis is on the internal dynamics of coalition building on "civic cooperation" or informal modes of coordination across institutional boundaries and or how various interests are incorporated into governing coalition (Mossberger and Stoker, 2001). In general, the urban regime theory emphasis on the interdependence of state and non-state forces in meeting economic, environmental and social challenges focuses attention upon the problem of cooperation and coordination between those actors (Mossberger and Stoker, 2001).

1.5.3.2. Social Network Theory

Networks can be described as a means of coordinated actions carried out by different subsystems, seeking goals and results of common interest and networks (Faria et al., 2009). Social network concept originated in the late 1800s by Émile Durkheim and Ferdinand Tönnies describes as social groups can exist as personal and direct social ties that either link individuals who share values and believes or impersonal, formal, and instrumental social links (Jeffrey and Philip, 2014). In the 1930s, Moreno established the systematic recording and analysis of social interaction in small groups. Social networks have been used to examine how organization interact with each other, characterizing the many informal connections that link executives together, as well as associations and connections between individual employees at different organizations. Social network theory is also some scholars use the name interaction is the study of how people, organizations or groups interact with others to achieve common goals theory (Oberthür and Gehring, 2006; Sanderink et al., 2020).

Hence, the social network theory has chosen for this study because: it allows a systematic assessment of the extent of relationship of multiple actors with multiple interests to cope up with current climate change and it allows for quantitative social network analysis only based on human actor linkage. New sociological methods for studying social cohesions are organized under the social network analysis. Social network analysis focuses on relationships between actors and on the patterns and implication of these relations in the transfer of information and resources to achieve common interests (Othieno et al., 2016; Wouter et al., 2018). It contributes to generation of knowledge and information; mobilization and allocation of resources; and building commitment among its members (Sirkku and Lisa, 2011).

1.5.3.3. New Urbanism Theory

New urbanism is a planning movement or development approach that arose in the early 1980s in the US, based on the principles of how cities had been built in a sustainable way (Bulkeley and Betsill, 2003). New urbanism does not support urban sprawl or low density and also very high density (Parker. 2004). Instead, they advocate relatively compact and mixed land use, which integrate working area, living area school, hospitals, entertainment areas, and other amenities found in close proximity (UN-HABITAT, 2012: Manea et al., 2014). The concept promotes walking and cycling and discourages individual automobile (Parker, 2004). More scattered planning environments require more land, resources, and

infrastructure (water, electricity, roads) and lead to a disintegration of the city space. Very high density creates social, economic, and environmental congestion and undermines sustainability, especially in developing regions; many denser residential areas are associated with poverty and overcrowding (UN-HABITAT, 2012). “City densities must remain within a sustainable range. If the density is too low, it must be allowed to increase, and if it is too high, it must be allowed to decline" (Sholmo, 2012).

New urbanism support good environmental practices suggest moderately-high densities for compact neighborhoods; however, the actual density needs to be context-specific (Hammer et al., 2011). Low density increases energy consumption and carbon emissions (Qunfeng et al., 2017). High emissions per capita are much higher in low densely populated areas (Hammer et al., 2011). The denser the city people closer together by sharing common walls, shortening travel times, and the length of infrastructure networks, increasing the viability of walking, bicycling, and public transport, and saving energy and reducing carbon emissions.

If cities densities are too high and, therefore, unsustainable for a variety of reasons: overcrowding, lack of light and air, pollution, congestions, overburdened infrastructure, and unaffordable land and housing would be crated (Angel, 2012). In addition to increasing density, new urbanism considers developing green infrastructure, including policies about green roof and green building (Manea et al., 2014). According to Angel (2012), one-third of the land of cities is allocated for public space. Green city concept is also focuses on carbon dioxide emissions, energy consumption, buildings, transport, water, waste, air quality, land use, and environmental governance.

1.5.4. Drivers of urban climate change governance

Climate change is caused by the global increase in atmospheric concentrations of greenhouse gasses (GHGs). These gasses include methane (CH4) from landfill, carbon dioxide (CO2) from combustion of fossil fuels, transportation and (NOx) oxides of nitrous from vehicles, industrial energy resource and agriculture and other (UNISDR, 2009). Directly or indirectly enhanced global warming related with the emission of greenhouse gas in cities. For example, urban areas are the major sources of anthropogenic carbon dioxide(90%) emissions from the burning of fossil fuels for heating and cooling; from industrial processes; transportation of people and goods (Sue Grimmond, 2007). These changes can be caused both natural and recently anthropogenic (human) (Nwankwoala**,** 2015). Urban climate change governance driving by humankinds are the following:

1.5.4.1. Urbanization

Urbanization denotes the increases in the share of the population that resides in urban areas predominantly because of natural increase and net rural to urban migration. Before 1950, the majority of urbanization occurred in developed countries. At present time rapid rate of urbanization shift to the south. Between now and 2030, the world's rural population is expected to remain largely static, while the urban population is projected to grow by 1.5 billion people. By 2030, 60% by 2050, 70% of the global population will live in cities and over 90 percent of that urban growth will occur in cities and towns of the developing world, mostly in Africa and Asia (UNDESA, 2015; UNDP, 2016).

Urban areas and urban populations will continue to grow in size and number. It is widely and increasingly accepted that urbanization is an inevitable phenomenon. The rapid rates of urbanization and unplanned expansion of cities have resulted in several negative consequences, particularly in developing countries like Ethiopia. Most cities in developing countries are expanding horizontally and the population is moving to unplanned settlements more than 70% informal settlement in developing countries (Jenkins and Wang 2007). The increasing rate of urbanization in Africa has been results of in-migration from rural areas, causing urban areas to increase in size with a large proportion of growth on the peripheries in informal settlements reside without infrastructure and services (UNDP, 2015).

The clearing of land for cities and roads, and the demand for goods and resources by urban residents, are the major drivers of regional land use change, such as deforestation, which has reduced the magnitude of global carbon sinks. (Sue Grimmond, 2007). Cities are key contributors to many environmental problems, such as air and water pollution. For many cities, municipal waste is a significant problem. Traffic is also one of the major development problems of any major city of the developing world and a major contributor to greenhouse gas emissions (Arisiso et al., 2017). Urbanization is also manifested by land use and land cover (LULC) change on a local level. Urbanization affects the local land surface, altering the surface climate in urban areas. A prominent manifestation of urbanization induced climate change is the ever-increasing urban heat island intensity and the generally consistently rising surface air temperature in urban and the surrounding areas. Urbanization is the major drivers of urban climate change. Studies showed that urbanization and larger-scale land-use changes led to a 0.27 ^{o} C increase in mean air temperature (Guoyu, 2015).

1.5.4.2. Population growth

At present, the world's population numbered nearly 7.6 billion as of mid-2017. By 2030, it is expected to reach 8.6 billion, 9.8 billion in 2050 and 11 billion in 2100 (UN, 2017). Globally, the share of the world's population residing in urban areas increased from 30 percent (746 million) in 1950 to 55 percent (4 billion) in 2015, and is projected to reach 60 percent (5.1 billion) by 2030 and 66 percent by 2050 (UNDESA, 2015b). Nearly 90 percent of the increase will be in Africa and Asia, the fastest urbanizing global regions (UN, 2017). The magnitude of population growth is an important variable affecting urban environmental problem because it is directly affecting the spatial concentration of people, industry, commerce, vehicles, energy consumption, water use, waste generation, and other environmental stresses (Brenna, 1999). The larger the city, it is assumed, the greater the per capita environmental costs or damages.

Therefore, population growth is another driving force of current climate change actions in urban areas. Cities in developing countries faced a tremendous increment of the population accompanying urban expansion, the city received significance population inflows and spatial urban transformation. This unprecedented inflow of people's needs provision of huge infrastructure and services. The expansion of the cities, increasing population size coupled with the economic growth has required respective transport service supply for the increasing mobility needs of the People. The transport services are demanded by the increasing population in the city leads to increasing of emission of pollutants (Roychowdhury et al., 2016).

The WHO (2005) also confirms that the recent phenomena in the growth of population and economy have led to the rise in the automobile ownership in developing country causes air pollution. Sustainable cities manifested by greater levels of societal wellbeing and economic growth at lower rates of resource use, greenhouse gas (GHG) emissions, and other forms of pollution. The rapid rate of environmental changes, like desertification or loss in biodiversity is driven largely by the rapid growth of the world population. The increasing of the world's population living in cities, and the disproportionate share of resources used by these urban residents are key drivers of global environmental change responses (Sue Grimmond, 2007).

1.5.4.3. Inadequate and Poor Quality of Infrastructure and Services

Inadequate and poor qualities of infrastructures are the cause of unhealthy development of urban areas. Infrastructures in urban areas for example, energy (electricity and gas networks),

water and sanitation systems, and urban flood drainage are critical in mediating the relation between climate change and cities. Inadequate provision of infrastructure or its poor maintenance can exacerbate the impacts of climate change and the vulnerability of urban populations (Harriet and Betsill, 2005). Infrastructures and services include: flood control, water supply, drainage, wastewater management, solid and hazardous waste management, energy, transportation, constructed facilities for residential, commercial, and industrial activities, communication, and recreation provision is great challenge for urban leaders (Patricia, 2008). Study conducted in 83 cities of China from 2000 to 2012 showed that emissions from heavy urban traffic have been the most abundant components of urban air pollution and the growth rate of urban traffic infrastructure investment could generally mitigate the air pollution (Sun et al., 2018).

Inadequate road network system has its own environmental consequences, as it directly affects urban mobility and thereby increasing traffic congestion which in turn paves for high carbon emissions from vehicles (WHO, 2005). Many cities are facing very real limits to their ability to deposit waste in municipal landfills. Increasing residential and commercial density in cities, combined with inefficient waste collection, can lead to significant air pollution from waste management services (Hughes et al., 2018). Reduction of GHG emission in cities depends on energy, land and transport planning (Bulkelet and Betsill, 2005). Building design, transportation, waste management influences city GHG emissions (Daniel et al., 2008).

The built environment comprising domestic, commercial, and public buildings is a significant contributor to global GHG emissions. The building sector consumes roughly one-third of the energy used in most countries, and it absorbs an even more significant share of electricity (Bulkeleyet al., 2009). Adaptive capacity in urban contexts is also determined by the extent and quality of infrastructure and public services and by the entitlement of populations to those resources and services (Patricia, 2008).

1.5.5. Urban Climate Change Governance and its Indicators

Governance is the major issue in regulating GHG emissions. It used to provide adequate infrastructures and services and the mechanism to work with different sectors. In cities, both mitigation and adaptation methods are significant to minimize the current climate change (Bulkeley et al., 2009). Climate change governance in urban areas has been manifested by effective implementation of adaptation and mitigation measures. Key factors that shape responses to mitigation and adaptation measures include effective policy and strategy, access

to finance, human power, coordination of different sectors and strong municipal in key areas, especially in energy, transport and waste management (Daniel et al., 2008; Bulkeley, 2010; Donovanburton, 2015). Institutional arrangements, resource allocation, interdepartmental support, political commitment and mainstreaming of adaptation and mitigation measures in cities' development agenda are crucial for sustainability (Margot, 2013).

According to Aylett (2014), there are four key challenging areas for effective response to climate change in cities. The first is resource related challenges. Access to financial, human and technological resources can have an important impact on local government responses to climate change. The second is institutional challenges, that is, the challenges that they face are those related to integrating climate change within individual local government agencies and coordinating across multiple local government agencies. The remaining two challenges are leadership related challenges and challenge of information and awareness.

Having accurate scientific information about local GHG emissions and the likely impacts of climate change on a city is essential to adaptive and mitigates responses (Aylett, 2014). Generally speaking, to measure governance, different international organizations use different guidelines. For instance, a World Bank guideline has set down five principles for governance: strong participatory civil society, open and predictable policy making, an accountable executive, a professional bureaucracy and the rule of law (Buchori, 1999).

United Nation Development Programe conceptualizes governance in four broad categories. The first category is economic governance, which encompasses equity, poverty, and quality of life. The second category is political governance, which includes separate legislative, executive and judicial branches, and it represents the interests of a pluralist polity and allows citizens to freely elect their representatives. The third category is administrative governance, which encompasses efficient, independent, accountable and open public sector. The final category is systematic governance, which encompasses the process and structures of society that guide political and socio-economic relationships to protect cultural and religious beliefs and values to create and maintain an environment of health, freedom, security and with the opportunity to exercise personal capabilities that lead to a better life for all (UNDP, 1999). Organization for Economic Cooperation and Development has recognized that governance can be enhanced with efficient delivery of services by government sectors. However, all these methods and tools lack the concept of urban governance and primarily focused on broader concepts of governance at international level.

According to UN- HABITAT (2004), urban good governance should consist of the following seven principles: ensuring sustainability of urban development; subsidiarity; ensure equity with regard to resource utilization; efficiency and effectiveness in service delivery; transparency and accountability; participation and consensus building and ensuring rule of law and security (UN-HABITAT, 2002). Under the Habitat campaign, Urban Governance Index (UGI) was developed in 2004 to assess the level of governance at global and local level. The index primarily measures and quantifies the level of governance in cities based upon four major principles of governance i.e. effectiveness, equity, accountability and participation by using 26 indicators.

In addition to urban governance indexes developed by UN-Habitat, many researchers used indicators specific to environmental governance. Ensuring effective Climate change or environmental governance requires a proper understanding of what it is, how it can be measured and formulate appropriate policy. The broader governance literature is characterized by attaching the term "good" to show the optimality of governance measures that satisfy different sets of criteria (UN-HABITAT, 2004).

Many multilateral agencies, served good governance as a policy prescription to indicate optimum governance of countries (Gisselquist, 2012). Mostly, good governance in related with environment is often denoted by effectiveness that the environmental governance measures should achieve the objective of protecting the general environment from anthropogenic hazard and the term effectiveness represent an optimal and sound practice of governance system in reduction of environmental problems (Evans, 2012). Some researchers used different indicators to measure good environmental governance or effective environmental governance. As a result, environmental governance was viewed to adhere to such major parameters as transparency, accountability, public participation, law enforcement, ensuring citizen awareness, and freedom of association (Feris, 2010; Sheilds et al., 2016; Ajuang et al., 2016). Similarly, Nathan and Terre (2018) and Berg (2012) provided a list of indicators by referring to attributes of good environmental governance which include: coordination, information, accountability, fairness, participation, and justice.

By the same token, a study conducted in Ghana in mining sector has come up with key composite indicators including accountability, transparency, awareness, knowledge, law enforcement, institutions, actors, fairness, and dispute resolution to measure environmental performance (Darimani et al., 2013). Hence, this study is based on the review of the above sources and others related to climate change governance literatutars, effective urban climate

change governance can be measured by such indicators as accountability, participation, awareness raising, actors, institutionds, climate change law, law enforcement, equity or fairness, and partnership (UN-HABITAT, 2004; Bulkeleyet al., 2009; Feris, 2010; Berg, 2012; Darimani et al., 2013; Aylett, 2014; Sheilds et al., 2016 and Nathan and Terre, 2018).

1.5.6. Determinants of urban climate change governance

Environmental issues in developing cities are complex in nature, as poverty-related issues, industrial-pollution-related issues, consumption and lifestyle related issues (Bulkeley et al., 2009). Urban areas contribute significantly to global greenhouse gas emissions. The concentration of people and economic activities in urban areas consume high levels of energy associated with residential, production and mobility needs. In addition to this huge wastes generate in cities. In this area, governance is the major issue to regulating GHG emissions, providing infrastructures and services and working with different sectors. In cities both mitigation and adaptation are significant to minimize the current climate change (Margot, 2013).

Climate change governance in urban areas manifested, by effective formulation and implementation of adaptation and mitigation measures (Bulkeley et al., 2010). Institutional arrangements, resource allocation, interdepartmental support, political commitment and mainstreaming of adaptation and mitigation in cities development agenda are crucial for sustainability (Margot, 2013).

Factors that determine governance are opportunities for leadership, the authority to tackle the issue, access to resources, and issue framing that has attracted political support that has linked adaptation to pressing urban social, economic, and environmental issues can also serve to hamper efforts for governing climate change in cities (Bulkeley et al., 2009). Political will to address lack of financial and human resources, decision making power and of other components of institutional capacity has hindered the effectiveness of many efforts.

Under the recent process of decentralization and devolution, city officials have been charged with climate relevant responsibilities but often without the funding or political power to make effective action possible (Romero, 2012). In the world, strengthening and maintaining governance is achieved only through the adoption and effective implementation of the appropriate long-run policies, political commitment and cooperation of state and non-state actors (Konstantinos, 2015; Romero et al., 2018).

1.5.7. Roles of non-state Actors in urban climate change governance

Clear roles and responsibilities with the right power of different actors is a prerequisite in the successful implementation of adaptation and mitigation strategies. Literature showed that non-state actors play a significant role in global environmental governance and shape policies and norms (Bulkeley, 2010; Linda, 2016).

The non-state actors can lobby and draw attention to particular policy concerns. In addition to government, the private actors and civil society play an important role in the formulation and implementation of climate change policies and strategies (Klein et al., 2017). The government plays enabling role for non-state actors, by distributing roles and responsibilities among different actors to choose appropriate policy options. If a local government wants to involve more non-state actors in adaptation and mitigation strategies, it needs to shift the responsibilities for certain tasks to those actors. Conflicts between development, mitigation and adaptation priorities may seem incompatible, and giving each actor a chance is essential in developing the potential to engage with climate change information and to react with action for climate change by formulating practical and feasible alternatives that resolve such trade-offs (Vanesa, 2015).

Globally, cities have made commitments to reduce their GHG emissions. However, there is lack of clarity about roles and responsibilities of actors, such as which actors are engaged and to what purpose for climate change solutions (Hughes, 2016; van Dijk, 2017). Theoretically, cities are also formulating inclusive action on climate change by adopting participatory and collaborative planning approaches, while practicing such change is a challenge for many countries in the world (Eric et al., 2018). Many researchers argue that the private sector could be more efficient than the government in implementing especially adaptation measures and also argue for the need to engage citizens to ensure legitimacy of adaptation and inclusion of locally relevant knowledge. However, it lacks clarity for identifying where the private sector is more involved to address climate change and where citizen participation is important (Koop et al., 2017; Klein et al., 2018).

Implementation of policies and strategies require a clear division of roles between private and public sectors; but some sectors were clearly under-represented, such as citizens, firms. In contrast, the ability to influence the strategy was mostly assigned to higher ministries (Van Dijk, 2017). The coordination of different actors both using a top-down or state directed and

bottom-up or locally involved methods are important to mobilize different resources for adapting important measures (Bednar and Henstra, 2018).

Even though cities have shown that there is no a single way and actor to manage energy, water, sanitation, waste management and mobility; there still is a complex problem in the distribution of roles and powers among different actors (Vanesa, 2015). Local authorities play a dominant role in providing adaptation measures (Bednar and Henstra, 2018); cities face vertical and horizontal coordination to manage climate change. Non-state actor involvement in global governance has focused on how non-state actors can influence states rather than the power structures of non-state actors to participate successfully in exercising authority, and, more precisely, what type of governance functions that non-state actors are supposed to give to execute their roles (Koop et al., 2017).

Moreover, different non-state actors have played different roles in climate change governance. Ten key dimensions of non-state actor activities at international negotiations in the policy cycle of climate change governance identified by Nasiritousi et al. (2014). These include: influence the climate change agenda, propose viable solutions to climate change, provide information and experts, influence decisions and policymakers, raise awareness of climate change among the public, take actions on climate change mitigation, take action on climate change actions, evaluate consequences of policies and measures, represent public opinion on climate change issues and represent marginalized voices.

1.5.8. Institutional Arrangements and interactions in climate change governance

Institutions defined as actors have a role in defining or governing the rules on which the specific sector functions ((Eaton et al., 2008; WB, 2010; Pradhan et al., 2012). Institutions are a collection of rules, decision-making procedures, and programs that define social practices, assign roles to the participants in such practices, and govern the interactions among the occupants of those roles (Young, 1999). As noted by Van Dijk et al. (2008) institutions are necessary to direct the urban development process.

Institutional arrangements means the organization of policies, rules, norms and values that countries have in place to formulate, plan and manage the implementation of development, the rule of law, the measurement of change, and other functions of state (WB, 2010; ETF, 2014). An institutional arrangement in climate change response involves multiple institutions and actors with regard to particular issue (Young, 1999; Meinhard et al., 2012). The choice among institutional arrangements or governance structure for instance among governments,

private firms and public and private partnerships entails understanding which arrangement can most efficiently control resources in pursuit of a particular set of goals (Van Dijk et al., 2008)

Institutional arrangement includes both formal and informal institutions. Formal institutions are included in constitutions, laws, the structure of state decision and regulations enforced by judges, courts, police, bureaucracy and the like, whereas informal institutions are norms of conduct, historical traditions or religious principles enforced by custom or habit. Informal institutions also have powers either to support or impede the governance of climate change (Pradhan et al., 2012).

According to Meinhard et al. (2012), the formality of the institutions implicated in the governance arrangement or the vertical axis, against the monocentricity/ polycentricity of the arrangement or horizontal axis. In the horizontal axis reflects the quantity and diversity of actors engaged in the institution architecture of the arrangement; While, in the vertical axis is a function of the institutional formality of the arrangement as measured by the extent to which the operations of the relevant institutions have clearly prescribed legal foundations and mandates and well established rule-based approaches to decision-making and policy implementation at different levels (Meinhard et al., 2012).

The smooth functioning of both formal and informal institutions is crucial to govern climate change. Romero et al. (2013) and Meinhard et al. (2012) identify the measurement of institution for climate change response, which include: appropriate information and knowledge, Participation stakeholders and the public in the decision making process, existence of vertical and horizontal network or coordination of actors, and legal framework. Rights and responsibilities, planning system, motivation of the community are also used to assess institutional arrangements of environmental governance (Sisay et al., 2016). Empowerment and legitimacy, human and financial capacity and institutional network, availability of resource are measurement indicators of effective institutional arrangement for climate change governance (Trinitas, 2015). Information and knowledge, participation of stakeholders and the public in the decision making process, existence of vertical and horizontal network or coordination of actors, existence of legal frameworks, and availability of resources are the measurement indicators of institutional arrangements of climate change governance (Gupta et al., 2010; Meinhard et al., 2012; Romero et al., 2013; Trinitas., 2015; Sisay et al., 2016).

Institutional interaction refers to the phenomenon that institutions influence each other in ways that are relevant for their development and effectiveness (Oberthür and Gehring, 2006; John, 2006; Zelli et al., 2013; Joshua et al., 2022). The relationship or interplay between institutions require that one institution, the source institution, affects the development or performance of another institution, the target institution, in a cause-effect relationship accounting for the identified effect (Liliya et al., 2021).

Institutional interaction is measured by the existence of shared resources, visions, strategies, legal framework, or memorandums of understanding (Nasiritousi et al., 2014; Sanderink et al., 2020), as well as monitoring and evaluating performance (Zelli et al., 2012). Non-state actors can contribute to climate governance by developing new policies and business models to support emissions cuts and build resilience (Thomas, 2018). Institutional interaction involves sharing recourses such as technological, human, financial resources, and knowledge to respond to climate change (Bulkeley and Kern 2006; Muhammad et al., 2020).

1.5.9. Modes of urban Climate change governance

There are many modes of urban governance in literatures. Specifically, related to climate change, according to (Bulkeley and Betesill, 2006), four major urban modes of climate governance are used by local governments. These are self-governing, governing through enabling, governing by provision and governing by authority. These approaches are different in terms of their governing capacities and all are relevance for formulating and implementation of mitigation and adaptation policies (Gotelind and Kern, 2009). The major modes of urban climate governance are presented below.

Self-governing (the local government as consumer): Means emission control of different urban development activities in the public sectors, such as the improvement of energy efficiency in governmental offices, transportation, waste management and other municipality-owned buildings. It relies on reorganization, institutional innovation and strategic investments to mitigate climate change. Sites under risk from flooding and urban heat wave should be identified and the planning and management of public buildings should be adapted to climate change. Generally, self-governance means the capacity of local government to govern its own activities (Gotelind and Kern, 2009).

Governing through enabling (the local government as facilitator):- refers to the role of local government in coordinating and facilitating partnerships with private actors and

encouraging community engagement. The local government develops strategies that support low carbon activities of other actors. Methods such as information dissemination, positive incentives and partnerships are important for this mode of governing. In addition, this mode of governing includes the establishment of public-private partnerships for the provision of services and infrastructures and seeks to encourage other actors to establish climate protection initiatives (Gotelind and Kern 2009; Bulkeley and Betsill, 2006)

Governing by provision: (the government as provider): - explained as provision of low emission public services and infrastructures means that practice is shaped through the delivery of particular forms of services and resources. This is accomplished through infrastructure and service like energy, transport, water and waste services provision (Gotelind and Kern, 2009).

Governing by authority (the government as regulator):- can be characterized as the use of traditional forms of authority, such as regulation and the use of sanctions. In many countries, local governments have the legal power to govern urban climate change by authority, in particular through strategic energy, transport and land-use planning. If such plans incorporate climate change mitigation goals, they have significant effects on GHG emissions.

Although the above modes of climate governance may overlap, individual events are often based on a combination of several modes. This differentiation provides a tool for the analysis of urban climate governance and the measures preferred by cities leaders (Bulkeley and Kern, 2006; Gotelind and Kern, 2009).

1.5.10. Theoretical and Conceptual Framework

1.5.10.1. Theoretical Framework

In the past, when various tasks were carried out in cities, state-centered theories were relevant, in which governments played the role of primary planners, regulators, policy makers, and implementers(Pierre and Peters, 2000). Starting from the 1970s, several new issues emerged, including the stronger influence of local governments and transnational institutions, globalization, the deregulation of the financial market, and others. In response to these pressures, national governments began to explore new directions, which involves depending on horizontal connections and collaboration across private public divides. This brings new ways of formulating and implementing public policy, which is described by the concept of governance (Stoker, 1988; Fröhlich and Knieling, 2012). Governance implies that

national governments have shared authority over the formulation and implementation of public policy with local government agencies, private actors, NGOs, transnational organizations, and citizen groups (McCarney et al., 2011).

Climate change governance is a subset of the broader notion of governance. However, the difference is that it places more emphasis on the mechanism of coordinating different social actors in order to prevent, mitigate, and adapt to the threats posed by urban climate change (Bulkeley, 2010). The key theoretical argument of climate change governance is that all actors are responsible for addressing the climate change related issues of cites in multi-level systems (Betsill and Bulkeley, 2006). Global actors are increasingly in agreement that effective climate change governance has a long term impact on climate efforts. Hence, in general, good climate change governance is often indicated by the effectiveness with which the climate-governance actions realize the objective of a reduction in GHG and risks (Feris, 2017).

The 1990s were considered a turning point for climate-change response because of the increased awareness of the difficulties caused by urban GHG emissions (Betsill and Bulkeley, 2006; Schroeder and Janda, 2009). The foundation of the current system of global governance are the UN Framework Convention on Climate Change (FCCC), the Kyoto Protocol, and the 2015 Paris Agreement to reduce greenhouse gases and the release of highly toxic persistence organic compounds (Bernauer and Schaffer, 2012). Various theoretical concepts that underpin the governance of environmental issues, such as climate change, have emerged to minimize the impact of climate change, such as network theory, urban regime theories, green growth cities, sustainability cities, smart cities, and new urbanism (Giffinger and Gudrun, 2010; Broadbent and Vaughter, 2014; Mossberger and Stoker, 2001; Tîrla et al., 2014; Bulkeley and Betsill, 2003; Sikora-Fernandez, 2016; Hammer et al., 2011).

However, cities in both developed and developing countries still face challenges to govern climate change effectively. For many cities in the world, housing provision, sanitation and waste disposal are the most essential issues for governance (van der Heijden, 2016). Across the world, there still is high levels of policy rhetoric about urban climate governance, but the practice on the ground is limited (van der Heijden, 2019; Romero-Lankao et al., 2018). Research on the development of urban climate policy and governance began in the mid-1990s and focused on single case studies, predominantly on cities in the United States, Canada, Europe, and Australia. Although some research has more recently been conducted in Asia,

South Africa, and Latin America, (Bulkeley, 2010), the information from cities in developing nations is still fragmented (van der Heijden, 2019). Thus, the provision of empirical information on climate-change governance using a comprehensive study is vital to city administrators and other non-state actors for redesigning sound policies and strategies in cities for addressing climate-change impacts and a reduction in GHG in developing countries. Thus, this research is intended to contribute to bridging this gap and applying a mixed-methods approach.

1.5.10. 2. Conceptual Framework

The motivation for the need for climate-change governance includes the rapid increase in population and economic growth, transportation, and the increase in GHG emissions (Dro˙zd˙z et al., 2021). Now, and going forward, cities have also become the home of a major section of the population and its economic activities, which makes them particularly vulnerable to climate change impacts. The following conceptual framework is primarily designed to guide the research work, which shows the interactions between and among variables. In this regard, the central part of the framework is urban climate-change governance. Based on the empirical and theoretical literature, urban climate-change governance requires the multiple interactions of major urban actors, which include private businesses sectors, public agencies, and civil society organizations.

City governments create partnerships with civil society and private sectors to govern cities in a sustainable manner. Especially in developing countries, governments alone cannot provide adequate and quality infrastructure and services for residents because of the fast rate of urbanization and low level of economic development.

Local governments create an enabling environment; they empower and assign clear roles and responsibilities to civil society and the private sector for the formulation and implementation of a city's climate-change responses (Aylett, 2014). The vertical relationships among federal, regional, and local); and the horizontal relationships across the same level of government (across regional departments and local sectors) are crucial to minimizing the current climate change (Vogel, 2015). The relationship among governments and civil society; governments and the private sector; civil society and the private sector; and the interaction of the three: governments, the private sector, and civil society, need to formulate and implement both mitigation and adaptation measure.

A relationship between public and private actors, for the purpose of emission reduction or in the formulation and implementation of adaptation and mitigation strategies, such as involving private actors in energy saving and emission-reduction schemes, transportation, provision of renewable energy, waste management and the mobilization of resources, are crucial in cities. Governments also interact with actors from civil-society organizations, for example, setting climate change agendas, collecting expert opinions, developing policy directions, engaging in mitigation and adaptation actions, and engaging in public-awareness programs. State actors working with environmental issues together with civil society organizations can gain the advantages of achieving closer contact with grassroots movement and communities (Bulkeley and Betsill, 2013). In addition, the relationship of the private sector and civil society organizations through sponsorships, consultation or an exchange of ideas, joint research or development, or the promotion of new products and new markets is important for non state actors themselves and for the government to implement policies and strategies effectively (Nasiritousi et al., 2016).

As depicted in the framework (Figure 1), various modes of policy instruments should be identified and applied by governments for responding to climate change. Identification of modes of urban climate governance is important for city administration to govern climate change. Because international level actions are weak and for mobilizing the entire society, literatures argue that climate change needs to be addressed at the local through policy tool, in this case with "modes of climate governance" (Korkmaz, 2019). Modes of climate governance are a useful framework for a better analysis of urban climate protection actions, and collaborative capacity of municipalities with other actors on climate change (Korkmaz, 2019). As we explained in the literature, there are four types of urban climate governance include self governing, enabling, provision and authority. All modes of climate governance have significance for both mitigation and adaptation actions. Hence, those modes or variables are used for analysis for this study.

As shown in the Figure 1 of conceptual framework, urban climate change governance manifested by the nine major indicators attributes of effectiveness of climate change governance which include participation; accountability; equity; awareness raising; institution; actors; climate change law; law enforcement; partnership. Those indicators are adapted from different sources to measure the level of urban climate change governance in the city (Bennett and Satterfield, 2018; Berg, 2016; Darimani et al., 2013; Feris, 2010; Moretto, 2007; Shields et al., 2016;Taylor and Halfani, 2004; Romero-Lankao, 2012;

Bulkely, 2009; Rehman et al., 2017). The result of those indexes shows the position of cities i.e., whether they are a week or strong with regard to the urban governance related to climate change.

Climate change governance is a rapidly growing research area among academics and development partners, leading to discussions on which variables to use as determinants of the effectiveness of climate change response governance. Based on the theoretical and empirical literature, seven variables were selected to analyze the factors that hindered governance related to climate change. The factors are adapted from many scholars. These factors include policies, strategies and regulations; finance; human resource; technologies; political willingness and leadership; information; and coordination (Marc et al., 2019; Bulkeley and Betsill, 2005; Bulkeley, 2010; Bulkeley and Betsill, 2013; van der Heijden, 2016, 2019; Romero-Lankao, 2012; Aylett, 2014, 2015; Romero-Lankao et al., 2018; Betsill and Harriet, 2006).

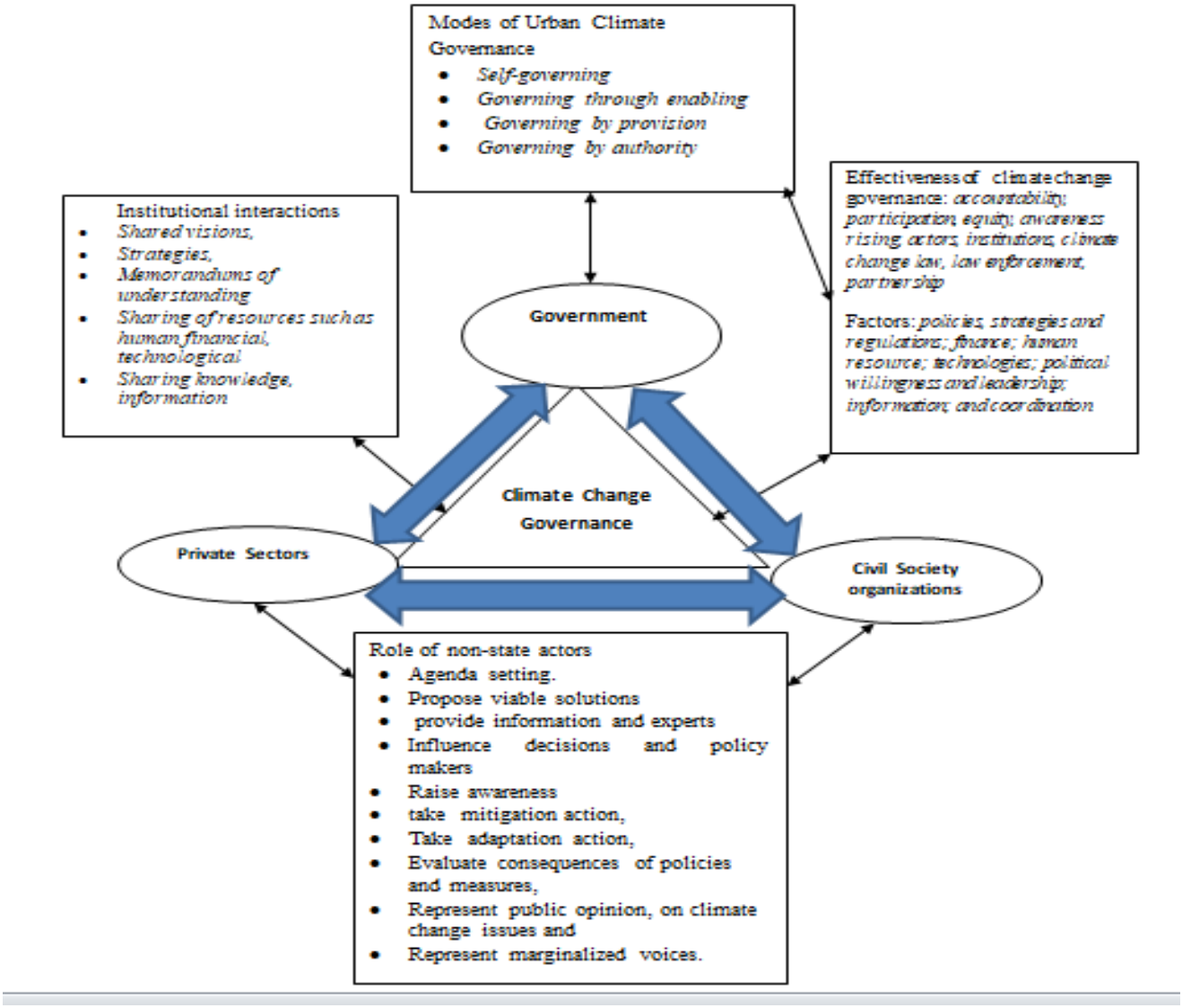


Figure 1: Conceptual Framework

Source; Developed by the author based on literature reviews, 2022

The above conceptual framework also showed institutional interaction of for climate change governance. Institutions are crucial for urban climate change response or implementing both adaptation and mitigation efforts. Strong institutional interaction is a prerequisite to implement adaptation and mitigation plans (Never, 2011). Studies shows that institutional interaction is mearsused by existing shared visions, strategies, legal framework, or memorandums of understanding (Oberthür and Gehring, 2006; Nasiritousi et al., 2014; Sanderink et al., 2020). Institutional interaction involves sharing recourses such as technological, human, financial resources and knowledge to respond to climate change (Bulkeley and Kern 2006; Muhammad et al., 2020). The arrows in the conceptual framework

above show the forward and backward relationship between and among the major components.

1.6. Research Methodology

1.6.1. Study Area Description

Addis Ababa, the capital city of Ethiopia, is geographically located in the central part of the country, surrounded by the Oromiya region (Figure 2). Specifically, it is located at 9°1′48″ N latitude and 38°44′ 24″ E longitude. The city has a total size of 540 square kilometres (Bureau of Finance and Economic Development of Addis Ababa, 2013). Its altitude ranges from 2100 m, in Akaki, in the south part, to more 3000 m above sea level, in the Entoto Mountain, in the north part (WB, 2015; Erena, 2017).

The administrative hierarchy in the city is composed of three levels: the top level, known as the city administration; a middle level, known as the sub-city; and the lowest level, known as the Woreda level. Currently, the city is divided in to eleven sub-cities and 120 Woredas (Addis Ababa City Administration, 2020). The sub-cities include Gulele, Yeka, Lemikura, Kirkos, Akaki, Arada, Bole, Lideta, Addis Ketema, Nifas Silk Lafto and Kolfe Keraniyo. The topography of the city varies, especially between its northern and southern parts. The altitude and slope decrease from north-to-south direction (Bureau of Finance and Economic Development of Addis Ababa, 2013).

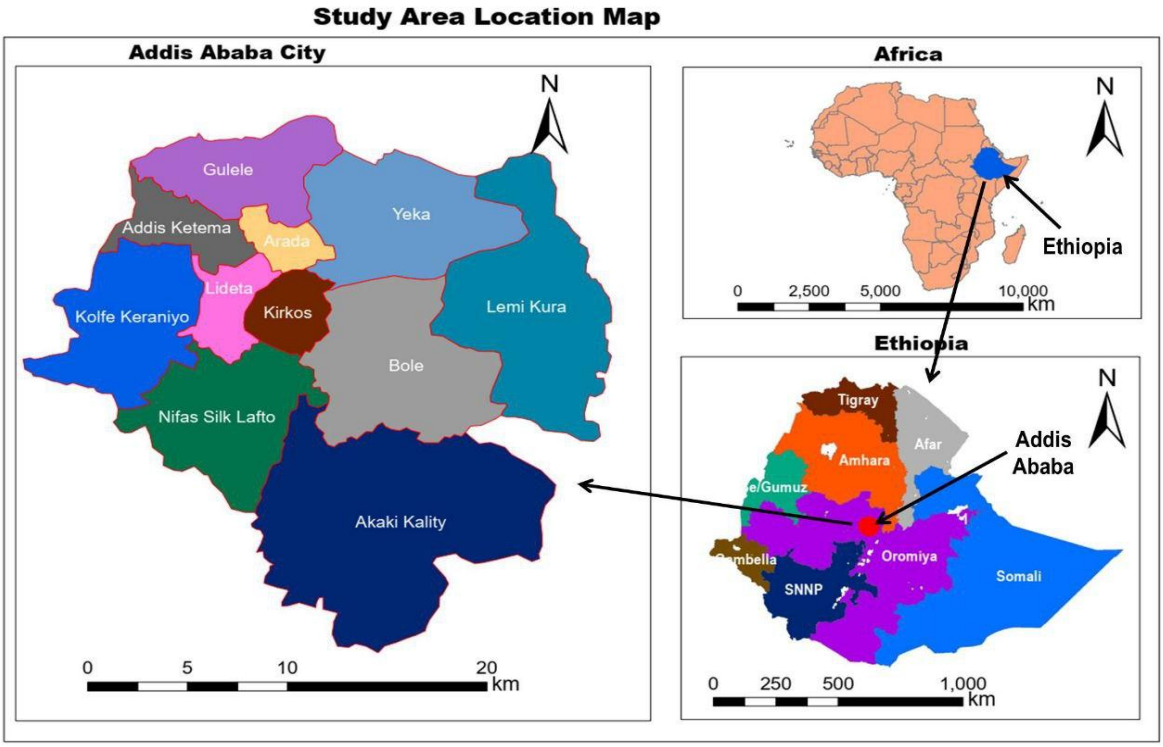


Figure 2: Map of Addis Ababa City

1.6.1.1. Population of Addis Ababa City

Addis Ababa is the primate city, which dominates the political, economic, and historical issues of the nation. It is the capital of the federal government, and it is also the headquarters of the African Union (World Bank, 2015). As the last census in Ethiopia was carried out in 2007, the current population of the city is based on estimation. There are several estimates about the population of the city in different sources. However, the national central statistical agency that carries out national census projections is the appropriate source. When considering the trend in the city's population, in the year of 2007, the population was 2,739,551 (CSA, 2007) with 22.77% of the 11.86 million people living in urban areas of the country (2012). In 2015, the population was around 3.3 million; whereas, currently, the estimated population is around 4 million (Erena, 2017). The population is projected to reach about 6 million in 2030 (CSA, 2012) (Figure 3).

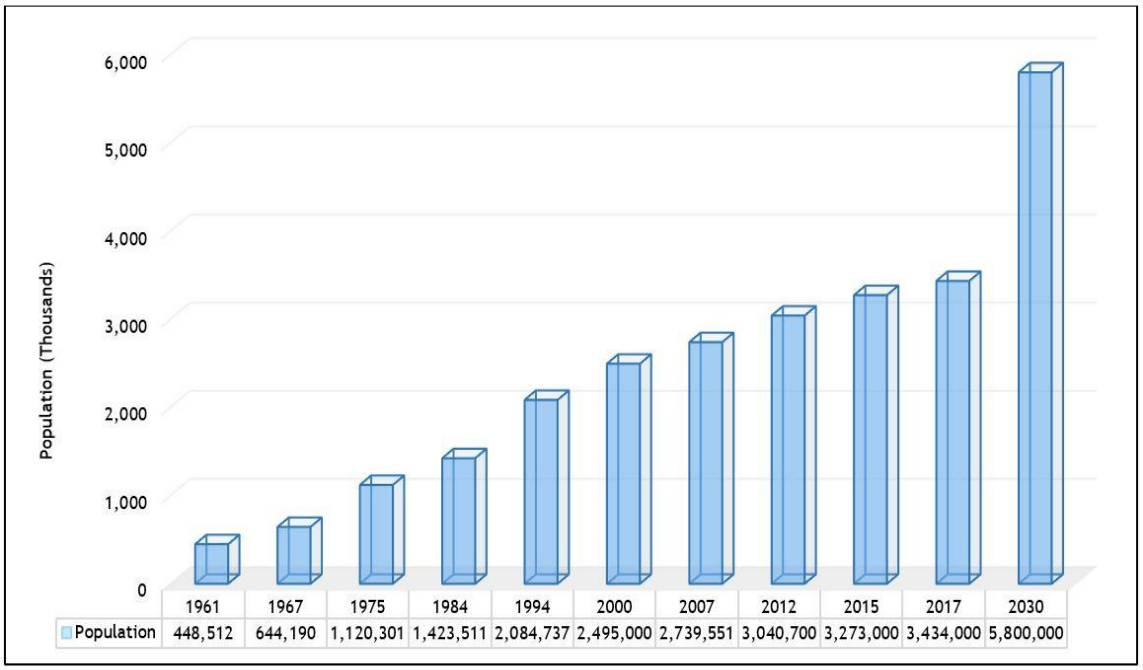


Figure 3: Population trend of Addis Ababa City

Source: (CSA, 2007, CSA, 2012; CSA, 2013; CSA, 2015; CSA, 2017).

1.6.1.2. Climate of Addis Ababa City

Addis Ababa has a subtropical highland climate. The city has a mix of highland climate zones, with average temperature differences of up to 12.2 °C, depending on elevation and prevailing wind patterns (Bureau of Finance and Economic Development of Addis Ababa, 2013). Figure 2 shows the climate data of Addis Ababa, which are analysed on the basis of temperature and rainfall data. The analysis was conducted with 36 years (1982–2018) of data from 56 stations obtained from Addis Ababa Observatory (Ethiopia National Metrology Agency, 2019). Data were segmented into three periods' averages, and the magnitude of change in temperature within the last 36 years was computed.

The analysis shows that both maximum and minimum temperature is increasing. The average maximum temperature from 1982 to 1992 was 23.1°C, while from 1992 to 2002; the average maximum temperature was 24.0 °C. From 2002 to 2012, the average maximum temperature increased to 24.8°C. Finally, from 2012 to 2018 the average maximum temperature increased to 25.5°C. This shows that the rate of change in recent years is greater, and the temperature has increased faster over the last two decades than during the previous decade. Furthermore, the average minimum temperature increased from 9.7 °C in the period from 1962 to 1992 to

10.9°C for the period from 1992 to 2002 and to 11.7 °C for the period from 2002 to 2012 (Figure 4).

Mean annual rainfall distribution over the city for the last 36 years was characterized by three months of heavy rainfall each year with long and dry periods. The average annual rainfall at the Addis Ababa observatory station from 1982 to 2000 was 1036 mm, while the average means value from 2000 to 2018was 935 mm. Although the average rainfall did not show a significant change, it did show significant variability within each decade (Figure 5) (Ethiopia National Metrology Agency, 2019).

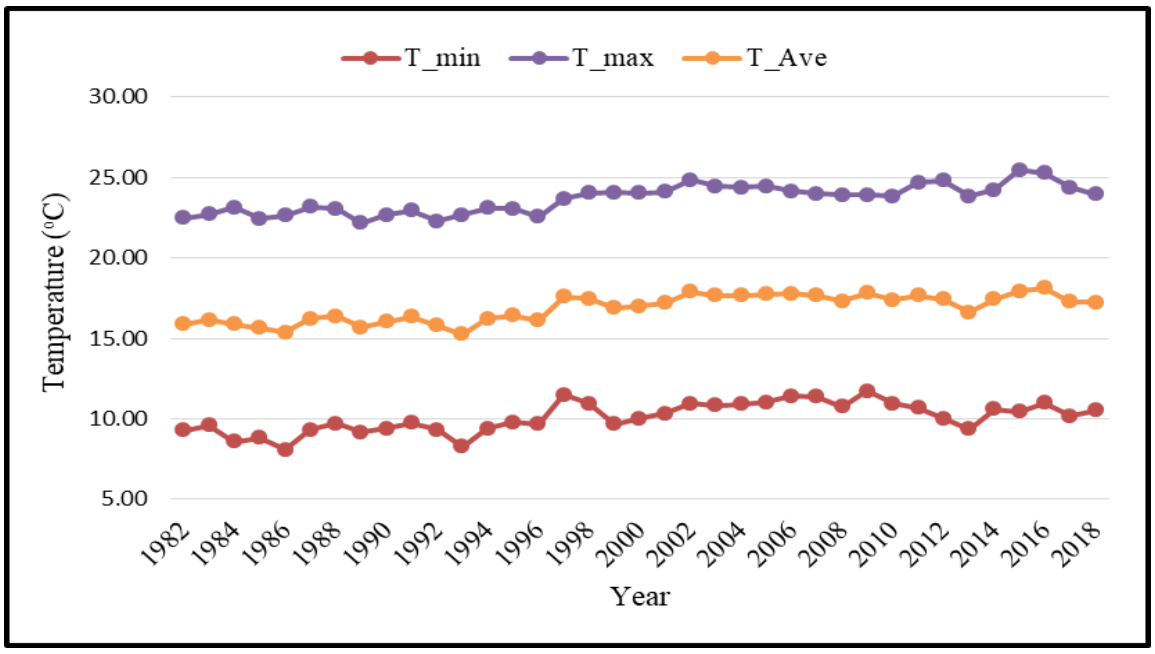


Figure 4: Annual minimum, maximum, average temperatures

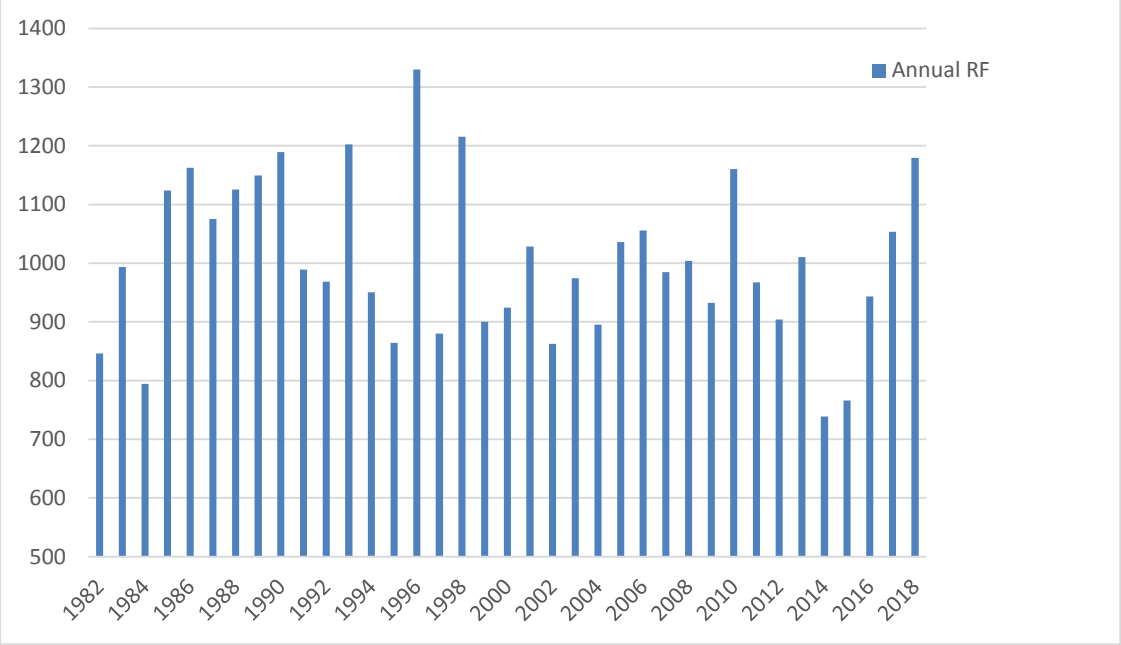


Figure 5: Annual rainfall

1.6.1.3. GHG Emission Trend in Addis Ababa City

Adopted from the national CRGE, the Addis Ababa City Administration has also stressed the achievement a vision of middle-income status by 2025 in a climate-resilient green economy and net carbon zero economic growth by 2030, indicating a 64% reduction against the BAU scenario (FDRE, 2011). To actualize the dream of the city's design targeted GHG reduction actions, the first step is accounting city-wide GHG emissions. Thus, the 2012 Addis Ababa GHG inventory was conducted on the basis of activities taking place within the city, assessing GHG emissions that occur inside the city boundary as well as outside the city boundary.

To this end, Addis Ababa city has implemented GHG inventory activities twice prior to the CRGE envision, that is, the first and the second GHG inventories conducted in 2012 and 2016, respectively (Sani and Tibebu, 2020). The inventories identified sources of emissions and serve as a baseline for setting emission reduction goals and future benchmarking. The city's climate actions goals and targets have shown that the city has a determination to meet their climate-resilient and net zero emission reduction targets by 2030.

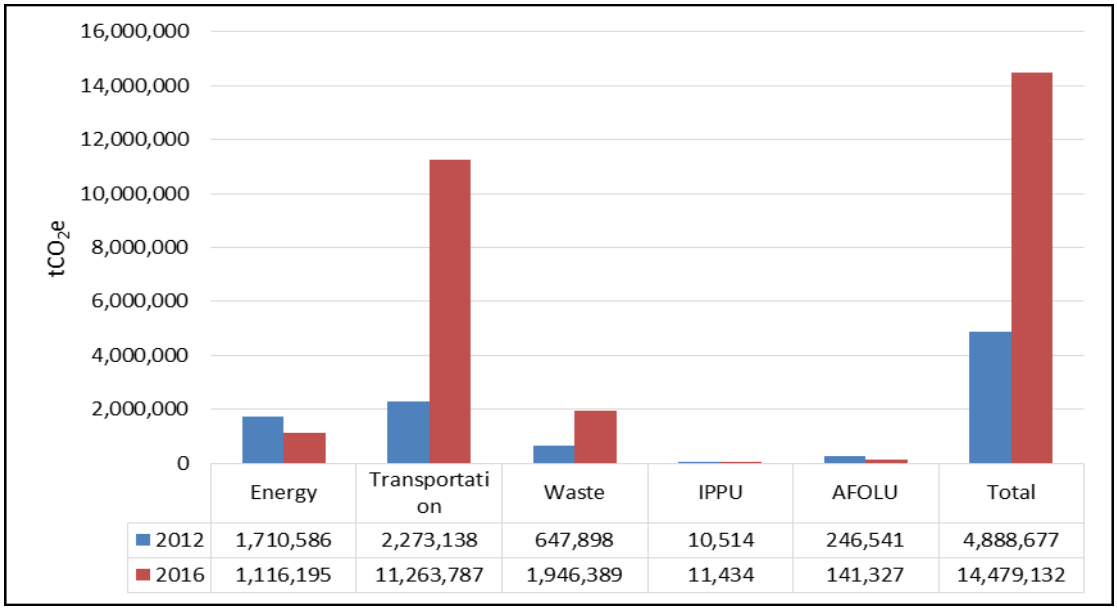
The 2012 GHG inventory for Addis Ababa showed that the city generated a total of 4.89 Mt CO2e, and per capita emissions for the city, which is home to a quarter of Ethiopia's urban population, were found to be 1.6 tCO2e per capita (Addis Ababa City Administration, 2012).

The breakdown of total emission of the city by sub-sector indicates that transportation accounts for the highest emissions, which is about 47%, followed by stationery energy (35%), waste (13%), and agriculture, forestry, and other land use (AFOLU) 5% (Addis Ababa City Administration, 2015).

The city's second round of the Green House Gas inventory in 2016 showed that the city generated a total of 14.48 million tonnes CO2e in that year. Per capita emissions for the city were found to be 4.3 tCO2e per capita (Addis Ababa City Environmental Protection and Green Development Commission and C40 climate leadership group, 2020). The breakdown of total emissions of the city by sub-sector indicates that transportation accounts for the highest emissions, which is about 78%, followed by waste (13%), stationery energy (8%), and agriculture, forestry, and other land use (AFOLU) (1%) (Addis Ababa City Environmental Protection and Green Development Commission and C40 climate leadership group, 2020).

The 2016 Addis Ababa GHG inventory enables a comparison to be made with the previous emissions inventory, compiled in 2012. An emission trend summarized in Figure 6 has shown an increase in total GHG emissions in the city over this period. Greenhouse gas in Addis Ababa emitted 14.48 million tonnes CO_2e (14,479,133 tCO2e) in 2016. This estimation covers the energy, transport, and waste sectors. The transport sector was found to be the highest emitter, accounting for 78% of the total emissions, followed by the waste sector at 13% and the stationary energy sector at 8%. An analysis of Addis Ababa's GHG emissions in 2016 indicated a ~3 times increase in emissions compared with the first emissions inventory, prepared in 2012.

The growth has been attributed to the rise in emissions from the transport by 8,990,649 tCO_2e due to more fuel being consumed and existence of old vehicles. Emissions from waste are around 1,298,491 tCO_2e higher in 2016 than 2012 due to a reduction in total waste arising sent to landfill and an increase in composting. Whereas the source from the stationery energy has been reduced dramatically by 594,391 tCO_2e; this is due to improvements in generation efficiency and electricity consumption by residents. At the same time, emissions from AFOLU are around 105,214 tCO_2e lower in 2016 than 2012 due to a reduction in total number of livestock and minimum application of fertilizer (Figure 6) (AAEPGDC, 2016). This indicates that the Green House Gas emissions of the city in an increasing trend.



	Energy	Transportation	Waste	IPPU	AFOLU	Total
2012	1,710,586	2,273,138	647,898	10,514	246,541	4,888,677
2016	1,116,195	11,263,787	1,946,389	11,434	141,327	14,479,132

Figure 6: Comparison of GHG emission between 2012 and 2016 inventory

1.6.1.4. Climate Change Impacts and Responses in Addis Ababa City

Climate change in Addis Ababa is manifested by an increase in rainfall and subsequent flooding and severe temperature, with more heat-wave occurrences (Arsiso et al., 2017; Feyissa et al., 2018; Alemu and Dioh, 2020; Jemberie, and Melesse, 2021; Arsiso, 2018; Teferi and Abraha, 2017). The major direct impacts of climate change in the city are flooding, drought and urban heat island (UHI) (Addis Ababa Environmental Protection and Green Development Commission, 2014) (Figure 7).

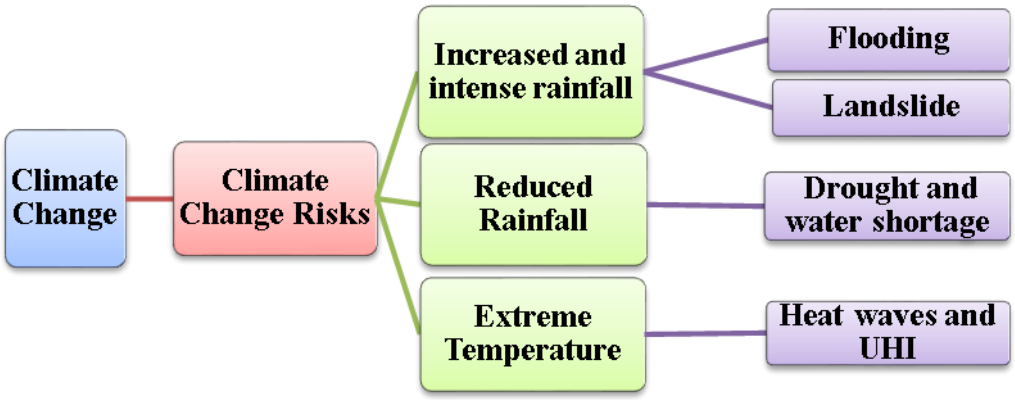


Figure 7: Climate change risks in Addis Ababa City

Addis Ababa is more vulnerable to the impacts of climate change in terms of extreme rainfall which causes flood (Feyissa et al., 2018; Jemberie, and Melesse, 2021; Addis Ababa Environmental Protection and Green Development Commission, 2020; Jalayer et al., 2013). A significant increase in city flooding is evident due to the rapid urbanization, loss of green areas, poor drainage systems and climate change (Birhanu et al., 2016). There were 89 flood-related hazards in total between 2013 and 2018, with a particularly substantial increase between 2017 and 2018 (Addis Ababa Environmental Protection and Green Development Commission, 2020). Floods have caused losses of human life and harm to infrastructure and property (Addis Ababa Environmental Protection and Green Development Commission, 2020; Jalayer et al., 2013; Birhanu et al., 2016; Addis Ababa City Administration, 2021). More irregular heavy rainfall events are expected to occur in the future and this is likely to result in worsening flooding conditions in the city (Moges et al., 2013; Worku, 2017; Arsiso, 2018). The following figures show effect of floods, causing of damage to different infrastructures, including residential, commercial, roads, and water systems and the disruption of traffic and loss of property and human lives (Figure 8).

Figure 8: Flood impact in Addis Ababa city Source: AACA, 2021; 2022

(**a**,**b**) show damage to human life and their property; (**c**) damage to vehicles, human life and transport infrastructure; (**d**) flooded streets in the middle of the city causing disruption to the transportation system and flooding effects on roads.

In addition to flooding, drought is another impact of climate change and it affects the quantity and quality of water, the health and wellbeing of Addis Ababa's dwellers (Arsiso et al., 2017; Worku, 2017; Addis Ababa Environmental Protection and Green Development Commission, 2020). In recent years, the city has already been feeling the pressure of unprecedented drought because of reductions in seasonal rainfall, reductions in river flows, reductions in inflow into reservoirs, falling groundwater tables, and increased temperatures, which, in turn, increase evapotranspiration from the reservoirs (Worku, 2017; Arsiso, 2018; Addis Ababa Environmental Protection and Green Development Commission, 2020).

Overheating and the UHI effect is also a major consequence of climate change in the city. Overheating or heat waves, occurring in extreme hot days and nights, can have a substantial impact on health heat stress, on air pollution, and on water and energy supply and infrastructures (Addis Ababa Environmental Protection and Green Development Commission, 2020; Sikora-Fernandez, 2016). The ways the city grows and develops are both key drivers of climate change and its impacts. Besides the emission of greenhouse gases from different sectors, and unprecedented rate of urbanization and rapid population growth, built-up-area expansion, less green-area coverage, and land use changes have the most anthropogenic influence on climate change (Arsiso et al., 2017; Worku, 2017; Arsiso, 2018; Worku et al., 2021). The impacts are also exacerbated by a lack of consideration of climate-sensitive issues in urban planning (Worku, 2017).

Starting from 2014, the AAEPGDC prepared a climate change resilient green development strategy to protect and enhance the quality of life of its residents. As shown in Figure 9a, this development strategy includes climate change responses of both green development, which is preventing climate change (mitigation), and resilient development, which is responding to the impact of climate change (adaptation). Mitigation has been at the heart of strategic responses to climate change in the city being practiced in buildings, transport, energy, waste, industry, urban agriculture, land-use change, forestry and other sectors. Furthermore, they aimed to formulate a strategy on how to reduce the emission of GHGs from various urban system components of Addis Ababa. The strategy offers a structure to help partners collaborate more effectively and efficiently to carry out adaptation and mitigation measures (AAEPGDC, 2014).

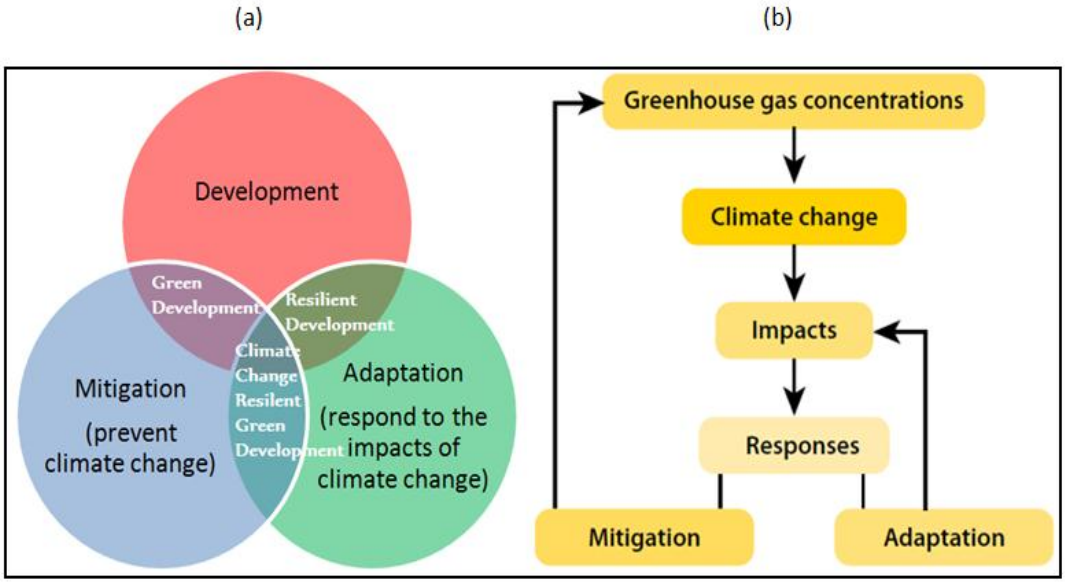


Figure 9: Climate-resilient green growth strategy (a) Climate resilient green growth strategy concept in the city and (b) relationship between climate change, impacts and responses

Source: (AAEPGDC, 2014)

Adaptation is a key means by which resilience and reduced vulnerability in local communities and economies are built. Adaptation combines risk management, economic activity adjustment, infrastructure modifications, and changes in community needs. A fundamental problem for decision makers is determining priorities and appropriate activities to fit the dynamics of the city and lessen anticipated local climate-change impacts in Addis Ababa city. The key to effective adaptation that shields communities from the effects of climate change is a locally relevant, cogent, and multidisciplinary response strategy that works across government and community. An effective adaptation plan needs to reveal the anticipated local impacts of climate change and to build resilience when dealing with the city's vulnerabilities. Adaptation efforts in the city can offer co-benefits for climate change mitigation and for local economic development. The climate change-resilient green growth strategy in Addis Ababa addresses both climate-change adaptation and mitigation issues, as shown in Figure 9 a, b (AAEPGDC, 2014).

Climate change governance actions started well after the formulation of a strategy. The commission was appointed to oversee issues related to the city's environment and climate change. Starting from 2015, major climate actions undertaken in the city include: tree planting, encouraging community level adaptation, and the expansion of the light-rail transit network. These actions were taken to minimize climate-change risk and emissions reduction.

The city has implemented car-free days to promote walking and cycling. The car-free day is held every month, aiming to make attitudinal change in the long run. Smart parking is also another instrument to improve traffic flow and GHG emissions reduction (Addis Ababa Environmental Protection and Green Development Commission, 2020).

Currently, climate change governance is being practised in the city to address both climate change adaptation and mitigation issues. During the planning process for climate action, the city determined 20 priority adaption measures and 14 mitigation initiatives. The city developed a climate action plan in 2020, which was started in 2017 by the C40 Cities Climate Leadership Group. Addis Ababa joined C40 as a member of the program and pledged to achieve net-zero GHG emissions by 2050.

1.6.1.5. Climate Change Strategy in Addis Ababa City

Effective climate change policies and strategies that aim at mitigating GHGs emission or adapting to the impact of climate change are very crucial to achieve sustainable development. In recent years, countries have specific climate policies to respond to climate change. In Ethiopia, before 2011, the national policies and strategies regarding to climate change had not been given due attention in urban areas. Starting from 2011, Ethiopia has initiated the Climate Resilient Green Economy to protect the country from the adverse impacts of climate change and to build a green economy that will help realize its ambition of reaching middle-income status by 2025 (FDRE 2011). Ethiopia is one of the countries to have signed the Paris Agreement and has a Climate Resilience Green Economy Strategy (CRGE) that is aimed at reducing emissions by 64% in 2030 from the 2010 baseline. The CRGE will form an important part of the journey towards achieving carbon neutrality in 2050.

Addis Ababa has a vision to create a clean, resilient, and liveable city for its inhabitants. The city recognizes that it is difficult to meet the vision without incorporating climate change into city plan and action agenda. Upon the release of the national CRGE strategy in 2011 by the federal government, the city has incorporated climate change and other issues in order to achieve compatible development. To this end, the Addis Ababa city Administration initiated a plan called Addis Ababa Climate Resilient Green Growth Plan and Integrated Climate Change Response Investment Plan (CRGCP) in 2014 (Addis Ababa Environmental Protection and Green Development Commission, 2015). This plan has been incorporated climate change response measures both (mitigation and adaptation) in different sectors such as: land (integrated land use planning), buildings and settlements, roads and transport and

related infrastructures, green infrastructures and open spaces, water, energy, waste, industry, tourism, urban agriculture, health, population, and others. The Addis Ababa City Environmental Protection and Green development Commission are also mainstreaming climate change response actions in more than 26 sectors.

1.6.2. Research Design

Conventionally, in social science research, there exists a division between quantitative and qualitative research approaches. The choice of methodology depends more on the objectives of the study and the corresponding research questions than the preference of the researcher (Johnson and Onwuegbuzie, 2004). Each approach has its own place in the research, with both its strengths and weakness. Qualitative research helps to understand, explain, explore, and clarify attitude, values, beliefs, and experiences of a group of people, and it gives depth to the finding whereas, quantitative research method helps the researcher to infer the finding from the sample and gives breads of the finding (Kothari, 2004). A combination of qualitative and quantitative data is vital since by combining both quantitative and qualitative information, a more in-depth understanding can be achieved. According to Creswell (2003), if the research utilizes a mixed method, the approach of knowledge inquiry is pragmatism in viewing the actual fact.

The understanding driving force of urban climate change and governance process requires integrating multiple disciplines. Hence, for this research, both quantitative and qualitative research approaches were applied, depending on the research questions addressed. The mixed-method approach, which focuses on collecting, analysing, and mixing both quantitative and qualitative data in a single study, is very important to solve the weakness of both individual approaches (Creswell & Clark, 2007).

To this end, a mixed research design was employed to guide the study's objectives. Specifically, a combination of methods was used to generate data from various sources and administrative tiers, enabling a comprehensive exploration of the study's objectives. Of the different components of mixed research design, the study utilized a concurrent research design. This approach involved collecting both qualitative information and quantitative data simultaneously. Given that the study's objectives were primarily captured by qualitative information, greater emphasis was placed on qualitative studies. However, the findings from the quantitative study were also used to complement the qualitative data. Generally, it is

essential to integrate complementary research methods when trying to analyse a very complex urban issue, like climate change governance.

1.6.3. Sampling Methods

The data for this research was gathered from employees drawn from three administrative levels of AAEPGDC. These levels are city level, sub-city level (10 sub-cities; currently, after data collection, one sub city was added and the number of sub cities now is 11), and Woreda level (a total of 20 Woredas, with 2 Woredas randomly selected from each sub-city). We included Woreda 7 and 8 from Gulele sub-city, 5 and 6 from Yeka, 8 and 9 from Kirkos, 5 and 8 from Akaki, 1 and 10 from Arada, 7 and 6 from Bole, 1 and 10 from Lideta, 5 and 8 from Addis Ketema, 1 and 12 from Nifas Silk Lafto, and 6 and 7 from Kolfe Keraniyo.

Quantitative data were solely gathered from AAEPGD experts at the city, sub-city, and woreda levels for data management purposes. As for the objective of institutional interaction with mainstream sectors such as transport, energy, waste, construction, urban planning, and others, data were collected from commission experts, and the questionnaire was formulated based on the Addis Ababa City Climate Resilient Green Growth Investment Plan and mainstreaming activities. We purposively consulted climate change and pollution experts to gather useful information due to the existence of various directorates and departments, such as green area development, forest management, natural-resource management, climate change and pollution, and others. Finally, because of the small number of respondents, a total number of employees were selected. As mentioned in Table 1, the questionnaires were distributed among 232 experts with 219 of them responding to our questionnaires, having a response rate of 95%.

To gather comprehensive information for the research from various perspectives, interview methods were employed. Purposive sampling methods were utilized to select suitable interviewees. The interviewers comprised representatives from various organizations, including the Environment, Forest, and Climate Change Commission's Climate Change Directorate, the Ministry of Urban Development and Construction's Climate Change Directorate, the Deputy Mayor of the city, the Federal Civil Society Organization Agency Directorate, Civil Society Organization Representatives, the Director of the AA Civil Society Organization office, the Addis Ababa City Environment, Forest, and Climate Change Commission's Commissioner, the AA City Waste Agency head, the AA City Waste to

Energy Project Team Leader, Private Sectors Representatives, the AA City Transport and Road Authority, the A.A Planning Commission, the A.A Land Management Agency, the A.A City River Basin and Green Development Agency, and others (refer to the annex section of this dissertation for more details). More than 45 respondents were selected for an in-depth interview, chosen from different actors and sectors.

Table 1: Number of respondents (experts) from different levels of AAEPGDC

Level	Total	Return
City	17	14
Sub City	67	65
Woreda	148	140
Total	232	219

Source: Survey, 2021

1.6.4. Data Collection Methods

Both primary and secondary data sources were employed in this study, to gather both quantitative and qualitative information. A questionnaire with five-point Likert scale questions was used to gather the quantitative data. A total of 232 specialists from AAEPGDC office at the city, sub-city, and Woreda levels filled in the questionnaire.

In addition, interviews with professionals from different sectors and actors were conducted to substantiate the data collected via the questionnaire. The interview questions were prepared depending on the sectors and activities of the actors to be interviewed. Observations were conducted in city targeting waste-to-energy project, green areas, smart car parking, flood vulnerability and affected sites. A review of secondary data, including books, journals, strategies, regulations, proclamations, plans, reports, and others related to the topic were also synthesized to produce this research.

In order to increase the reliability and validity of the instruments, a pilot test was conducted with 30 participants that were selected randomly at the city, sub city and woreda level in city administration. Then, the questionnaires were improved based on the results obtained during the pilot testing. In this study, the qualitative research would be validated by using both the methodological and data source triangulation. The methodological triangulation involves the use of multiple methods. Hence, the qualitative information would be triangulated by

complementing with quantitative data. On the other hand, the data triangulation involves using different sources of information in order to increase the validity of the study.

1.7. Organization of the dissertation

This Ph.D. dissertation is organized into six chapters. Chapter one presents the general background of the study, problem statement, study objectives, basic research questions, literature review, and conceptual framework. It also describes the general research methodology of the study. Chapter two outlines effectiveness of urban climate change governance. Chapter three analysis factors affecting climate change governance. Chapter four is devoted to examining institutional interaction and the role of actors. Chapter five specifically deals with assessing the modes of climate change governance in Addis Ababa city. Finally, chapter six synthesizes the main findings of the research, describes scientific contributions of the study, recommendations, and areas of further studies.

Chapter Two: Effectiveness of Urban Climate Change Governance in Addis Ababa City, Ethiopia

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Abstract: *Addis Ababa is one of the eleven cities in Africa that have been taking bold action in meeting the objectives of the Paris Agreement. At the present time, the city is working toward reducing greenhouse gas emissions and enabling the city to be resilient to the impacts of climate change. To make the city carbon neutral and resilient to climate change, the coordination of different sectors and actors is crucial. To this end, the planning and implementation of mitigation and adaptation measures needs effective climate change governance. Thus, this study was intended to explore the effectiveness of climate change governance in Addis Ababa City, Ethiopia. The study followed both quantitative and qualitative research approaches and relied on both primary and secondary data sources. A survey of 232 respondents, who were environment experts at different levels, was conducted using questionnaires. In addition, interviews and observations were conducted to gather relevant data. Secondary data were collected from different sources. The quantitative data were analysed using relative importance index (RII) analysis. The study found that existing environmental policies, strategies, regulations, proclamations, laws, and implementations in the city were facing major challenges in terms of weak accountability, the poor enforcement of regulation, and the failure to involve key actors, especially NGOs, communities, and private sectors; these failures were characterized by weak institutional setup and a lack of formal systems allowing actors (private sectors, communities, and NGOs) to interact to respond to climate change. Hence, climate change governance was ineffective in terms of accountability, participation, law enforcement, equity, institutions, the role of actors, and partnership. Thus, the Addis Ababa City Environmental Protection and Green Development Commission should give more emphasis to the coordination of other actors (NGOs, communities, private sectors, and research institutions) to respond to climate change in the city. In addition, the commission should provide training to the lower layers of experts and mobilise the community for climate change response, particularly in the undertaking of adaptation measures. Furthermore, Addis Ababa City administrators should give due attention to climate change response through an established strong accountability system to enforce regulation, rules, proclamations, laws, policies, and strategies in different sectors.*

Keywords: *climate change governance; effectiveness; Addis Ababa; mitigation; cities*

2.1. Introduction

Climate change is a globally concerning issue which strongly calls for a new governance agenda in the sectors of both theory and policy (Fröhlich and Knieling, 2012; Liu and Lo, 2020). The growing challenges of climate change are complex and far-reaching, requiring interventions beyond a single source and actor (Lemos and Agrawal, 2006). Environmental problems and climate change in particular, occur in different contexts and extents world-wide and cannot be addressed successfully by a single actor (Boyd and Juhola, 2014; Leck and Simon, 2012). Climate change with cross boundary impacts in nature has been positively impacted through climate change governance (Liu and Lo, 2020). Climate change governance can therefore be described as the coordination of different institutions and actors, in horizontal and hierarchical forms, concerning climate change adaptation and mitigation actions (Fröhlich and Knieling, 2012; Betsill andBulkeley, 2006; Bulkeley, 2010; Bulkeley and Betsill, 2005; Bulkeley and Kern, 2006). It has also been viewed as a broad range of options of coordination concerning the prevention of greenhouse gas emissions (mitigation) and adaptation to the impact of climate change (Bernauer and Schaffer, 2012; Yazar and York, 2021).

Cities around the world are key in managing global carbon emissions (mitigation) and reducing vulnerability to climate change (adaptation) (Romero-Lankao, 2012; Wagner et al., 2021). Cities occupy a unique space in terms of the causes and impacts of climate change (van der Heijden, 2019). The impacts in cities have been aggravated due to concentrated populations. Urban areas are the largest contributors to climate change through the alteration of green covers, such as forests and grasslands, for other land uses (Baklanov et al., 2018). At the same time, the projected impacts of climate change show that urban populations and infrastructure around the world are at significant risk (Romero-Lankao, 2018).

In the face of this, cities are sites for climate action and increasingly central to the global governance of climate change, and much of their activity takes place through the interaction of governments, private sectors, and civil society at local, regional, national, and global scales (van der Heijden, 2019; Gordon, 2018). Therefore, in an urban context, climate change governance is the set of formal and informal rules, rule-making systems, and actor networks at all levels (from local to global and from state to non-state actors), which are established to steer cities towards mitigating and adapting to climate change (Betsill and Bulkeley, 2006; Bulkeley and Betsill, 2005; Bulkeley and Kern, 2006; Romero-Lankao, 2012; Schroeder and

Janda, 2009). Climate change governance is characterized by the integration of climate adaptation and mitigation in different sectors such as energy, urban planning, transportation, water management, waste management, agriculture, health, and others that interact in various ways (Felix et al., 2020).

In the face of growing global, national, and local environmental crises, good governance of the natural environment is deemed to be crucial not only for sustainable development but also for the harmonious existence of humanity with nature (United Nation, 2012). Owing to this, there is a growing consensus among the global actors that good environmental governance has an enduring effect on environmental actions and outcomes. Hence, in general, good environmental governance is often denoted by the effectiveness in which the environmental governance measures achieve the objective of protecting the general environment from anthropogenic hazards, as well as the optimal and sound practice of the governance systems in the reduction in environmental problems (Evans, 2012). Hence, effective climate change governance must adhere to major parameters such as transparency, accountability, public participation, law enforcement, the ensuring of citizen awareness, coordination, information sharing, fairness, justice, and the involvement of actors and institutions (Ajuang et al., 2016; Bennett and Satterfield, 2018; Berg, 2016; Darimani et al., 2013; Feris, 2010).

Although there is no single governance solution to climate change, coordination and participation among multiple actors in the reduction in GHGs, climate risk identification, and in the prioritization and implementation of adaptation measures is known to lead to more effective urban climate change governance (Filho et al., 2018). The effectiveness of governance in responding to climate change in cities depends on human resources, financial resources, legal frameworks, and legitimate institutions (Bulkeley, 2010; Aylett, 2014). Scientific information is also necessary in creating a strong foundation for effective urban climate change governance (Romero-Lankao et al., 2018). In addition, effective climate change solutions should include the cooperation of various institutions and actors at different levels, whether in the prevention of greenhouse gas emissions (mitigation) or in the process of adaptation to the impacts of climate change (Fröhlich and Knieling, 2012; Armitage et al., 2012). According to (United Nation, 2012), rule of law, citizens' rights of access to environmental information, meaningful participation of the wider public in environmental matters, and justice are the bases for achieving environmentally sustainable development.

Effective urban climate change governance should incorporate principles of justice in order for vulnerable groups to be represented in adaptation and mitigation planning processes, issue framing, as well as recognizing their particular needs and actions (Hughes, 2016). Key factors that shape responses to mitigation and adaptation measures include effective policy and strategy, coordination of different sectors, and strong municipal governance in key areas, especially in energy, transportation, and waste management (Bulkeley, 2010; Hoornweg et al., 2011). Political commitment and mainstreaming of adaptation and mitigation measures in cities' development agendas are crucial for sustainability (Hill, 2013). Having accurate scientific information about local GHG emissions and the impacts of climate change on a city is essential to take adaptation and mitigation responses (Aylett, 2014).

Due to the growing recognition of climate change problems as a result of GHG emissions in cities, the 1990s were seen as a turning point for climate change response (Betsill and Bulkeley, 2006; Schroeder and Janda, 2009). The development of the UN Framework Convention on Climate Change (FCCC), the Kyoto Protocol, and the 2015 Paris agreement are the backbone of the existing global governance system (Bernauer and Schaffer, 2012; Romero-Lankao, 2012). Even though there is a strong global consensus that climatic changes must be addressed through the coordination of actors at different level (Bernauer and Schaffer, 2012), measures addressing it in cities through existing governance arrangements are still far from what is required (Yazar and York, 2021; Díaz-Pont, 2020). In summary, rather than climate action, for many cities around the globe, traditional matters, such as housing provision, sanitation, and waste disposal, are the more urgent areas for governance. Climate change remains ungoverned in cities (van der Heijden, 2019; Bulkeley and Betsill, 2013), leaving a gap between policy rhetoric and action on the ground (van der Heijden, 2019; Romero-Lankao et al., 2018).

Especially in cities in developing countries, climate change governance lacks active engagement from urban actors (Pasquini, 2019). According to UN-HABITAT (2017), in most cities in developing countries, urban governments do not fully deliver their responsibilities due to various existing institutional arrangements, such as shortages of resources, inadequate capacity and weak frameworks for the engagement of actors, and weakening urban governance. Accordingly, many cities in Africa are more vulnerable to the impacts of climate change due to unplanned urbanization, lack of necessary risk-reducing infrastructure, services, and failures in urban governance (Diep et al., 2016; United Nations Economic Commission for Africa, 2010). Other challenges of climate change governance in African

cities arise from lack of clarity in the assignment of responsibilities, lack of ownership over implementation, lack of resources, insufficient coordination, low political will, low private sector participation, and ineffective communication practices (Averchenkova et al., 2019; Kareem et al., 2020).

Ethiopia, an African country, faced the challenge of the governance of environmental issues (Damtie and Kebede, 2012). Environmental law is poorly enforced, and there is weak inter-sectorial coordination and stakeholder participation and low synergy among actors in initiating development programs (EPA, 2012). With low levels of environmental awareness, private companies lack adequate policies and management plans to discharge their corporate responsibility and safeguard the natural environment (Cesar, 2013). Enforcement of environmental regulations is often constrained by a number of institutional and resource user-constituency factors, thereby ensuing numerous social and economic harms to the wider society and the economy at large (Krueger et al., 2012). There are considerable discrepancies between those environmental commitments made by the country and the actual implementation (Cesar, 2013). Even though the country is championing global sustainable development, the economic component of sustainable development is given more emphasis than its environmental component (Damtie and Kebede, 2012). Moreover, the country failed to meaningfully involve stakeholders at all levels of society, particularly at the local level (Jones and Carabine, 2013).

The notion of urban development practice in Ethiopia involves destroying the environment rather than protecting it (Kasim et al., 2018). The climate resilience green economy (CRGE) document indicates that under current practices, greenhouse gas emission will more than double from 150 Mt CO_2e in 2010 to 400 Mt CO_2e in 2030, which indicates an increase of 250 Mt CO_2e (FDRE, 2011). Out of this amount, about 42% of the increase or 105 Mt CO_2e is expected to be from urban areas (transportation, building, wastes, and industries) (Addis Ababa City Administration, 2012). If no further action is taken, GHG emission in the cities will increase by six-fold from 20 Mt CO_2e in 2011 to 125 Mt CO_2e by 2030(Addis Ababa City Administration, 2015). The air quality in the city is affected by emissions from transport, dust from traffic roads, discharge from industrial activities, construction operations, and other overall land-use practices. The emission of pollutants from vehicles causes environmental risk in Addis Ababa (Tarekegn and Gulilat, 2018).

Because of the increase in population, the Urban Heat Island phenomenon also became a feature of Addis Ababa (Arsiso et al., 2017; Worku et al., 2021). The city is more exposed to

heat waves, drought, and severe floods (Bambrick et al., 2015; Jalayer et al., 2013; Teferi and Abraha, 2017). The disappearance of green space accounts for 40% of the flooding and landslides in the city and the recurrence of flooding is already costing and estimated to be USD 6800 per year for emergency assistance at the city administration level. The vulnerability to flooding is more aggravated due to a poor drainage system and rapid informal housing development, and the cause of the increase in peak flow of flood is due to climate change and urbanization (Birhanu et al., 2016). Addis Ababa is vulnerable to climate change impacts and the combination of climate change and development pressures are expected to aggravate the current situation (Jalayer et al., 2013).

Based on the environmental policy of the country, the Addis Ababa city administration has adopted different environmental policies, strategies, proclamations, and regulations to manage the environment in general and climate change in particular. The city administration started to implement Climate Resilience Green growth and integrated climate change response strategy to minimize GHG emissions and reduce the vulnerability of the city. Even though the city government has tried to manage climate change, there still is a state dominant governing system in the city.

Institutional and legal frameworks that share responsibilities and accountabilities between the government, the private sector, and civil society organizations are not clearly defined (Damtie and Kebede, 2012). Policies and strategies have been initiated; however, there are still gaps that need to be addressed, such as a lack of horizontal and vertical coordination between sectors to manage climate sensitive resources; the poor capacity of local governments, sub-cities, and Woredas; lack of awareness on existing policies and regulations; shortage of skilled manpower; shortage of finances; accountability; and a lack of clear roles and responsibilities of varies ministries, agencies, authorities, and offices (UN-HABITAT, 2017).

Several researchers, such as (Arsiso et al., 2017), have investigated the trend of climate change with water shortage; (Jalayer et al., 2013) conducted a climate change induced risk analysis of Addis Ababa city. The flood risk and vulnerability of Addis Ababa city due to climate change was conducted by (Birhanu et al., 2016), and assessment of present and projected climate change in Addis Ababa was analysed by (Arsiso et al., 2018). Using a GIS based method, the quantification and mapping of climate change and vulnerability hotspots in Addis Ababa city was conducted by (Feyissa et al., 2018). Climate change- induced heat wave hazards in Dar es Salaam and Addis Ababa were evaluated by (Capuano et al., 2013). Vulnerability of the city to climate change (Feyissa et al., 2018) and air pollution through

vehicle emission are the major problems in the city (Tarekegn and Gulilat, 2018). All of the above studies have focused on the analyses of climate change scenarios, impacts, and vulnerabilities of the urban systems in Addis Ababa, but thus far, there has been no attempt made to integrate actors to respond to climate change.

Additionally, a study conducted by (Bulekely, 2010) shows that the urban climate governance literature is dominated by western country cities. Some studies conducted in cities of developing countries include: governance framework to mitigate climate change in India conducted by Sethi and Mohapatra, 2013); the implications for urban climate change governance in West Africa studied by (Gore, 2015); pathways to international cooperation on climate governance in China studied by (Kang and Alex, 2020); cities and climate change mitigation in three Asian cities Kolkata, India Palembang, Indonesia, Johor Bahru, studied by (Gouldson et al., 2015); the urban governance of climate change adaptation in least developed African countries studied by (Hickmann and Stehle, 2019); and urban climate change governance within centralized governments in Egyptian cities studied by (Eissa and Khalil, 2021).

However, those studies focused on qualitative analysis methods by using secondary sources. Therefore, this research is initiated to explore the practice of climate change governance in Addis Ababa City. The coordination of different tiers of government, vertically (federal, city, sub-city, and Woreda level) and horizontally (government, private sectors, and civil societies) are crucial to minimizing the current climate change in the city. Hence, the main objective of the study was to explore effectiveness climate change governance in the city of Addis Ababa.

2.2. Method of Data Analysis

2.2.1. Quantitative Data Analysis Method

Several multilateral agencies use good governance as a policy description to indicate optimum governance of countries. When we discuss the environment, good governance often denotes the effectiveness in which the environmental governance measures should achieve the objective of protecting the general environment from anthropogenic hazard and the term effectiveness represent an optimal and sound practice of the governance system in reduction in environmental problems. Climate change governance, being a rapidly growing research agenda among academics, development partners, and consultants, there has been debates as to which indicators or variables to use in quantifying the effectiveness of environmental

governance in general and climate change governance in particular. Different approaches are used by scholars to measure environmental governance, depending on the specific set of goals. For this research, based on theoretical and empirical literature, nine indices have been chosen to measure the level of governance related to climate change, involving specific 43 indicators. The indices are adapted from many researchers including: accountability, participation, equity/fairness, awareness rising, institution, actors, climate change law, law enforcement, partnership (Bennett and Satterfield, 2018; Berg, 2016; Darimani et al., 2013; Feris, 2010; Moretto, 2007; Shields et al., 2016;Taylor and Halfani, 2004; Rehman et al., 2017).

For this study, the data analysis method adapted from the above sources is used to measure effectiveness of climate change governance. Hence, effective climate change governance is assumed to be the result of interaction among the nine components, which were used to measure effective climate change governance, and the indexation is used to create a single measure of climate change governance by using nine components. The quantitative data were analysed by using SPSS (26.0) software. The methodology places multiple indicators under the broad nine components and 43 specific indictors. A composite index approach was used to calculate effectiveness of climate change governance. To produce a single result, the following steps were applied.

Frist the data collected through Likert-type questions were normalized to bring consistency using the Relative Importance Index formula for each of the indicators.

RII = Sum of weights (W1 + W2 + W3 + ... + Wn)/A x N

Where W = weights given to each factor by the respondents and will ranges from 1 to 5, where ‘1’ is less significant and ‘5’ is extremely significant.

Equation (1):

$$RII = \Sigma W/(A \times N) \qquad (1)$$

Where

W = weighting as assigned on Likert’s scale by each respondent in a range from 1 to 5, where 1 = strongly disagree, 2 = Disagree, 3 = Natural, 4 = Agree and 5 = strongly agree;

A = Highest weight (here it is 5).

N = Total number in the sample.

Second, after each variable was standardised, the value for the nine components were averaged using:

$$V1 = \Sigma (I)/N \quad (2)$$

Where V1 = the value for one of the nine indices, Σ (I) represents the sum of standardised value for variables under the first indictor, and N = stands for number of variables in the first indictor.

Third, once the values for each of the nine indices were calculated, they were averaged using Equation (3) to obtain a single measure of climate change governance by using 9 major indicators and 43 specific components. The climate change governance index was computed as a raw sum of the different variables divided by the number of variables for each of the 9 components, which was latter aggregated to acquire the composite index by multiplying the respective index value with the weights attached to each index (i.e., number of variables that formed each component). Thus, if the result of indexed value is

≤ 0.50, the climate change governance is ineffective:

$$X = \frac{(A_1 * W_1) + (A_2 * W_2) + (A_3 * W_3) + \cdots + (A_9 * W_9)}{\sum_{i=1}^{n=9} (W_i)} \quad (3)$$

X = Composite index;

A = Indicator;

W = Weight of specific index.

2.2.2. Qualitative Data Analysis Method

The qualitative data were collected using interviews; secondary sources and observations were prepared in Amharic language. Then, the data were translated into English. Subsequently, the data were repeatedly read and coded, and similarities between the data were identified using N'Vivo (10.1) software (NVivo is a software program developed by QSR International based in Burlington, MA, USA). The results from qualitative studies were analysed by using a thematic area approach and summarised in the form of texts along with the quantitative survey results.

2.3. Results and Discussions

2.3.1. Climate Change Governance Indicators in Addis Ababa City

Realizing good urban climate change governance is a prerequisite to ensuring sustainable urban development. Hence, nine major indicators with forty-three specific components were used to determine the existence of good or effective climate change governance in Addis Ababa City. It is clear that as participation, accountability, equity, awareness rising, institutions, actors, climate change law, law enforcement, and partnership increase, the effectiveness of climate change governance increases, which, in turn, greatly contributes to sustainable city development. Below, the indicators of effective climate change governance in the city are discussed.

2.3.1.1. Participation Indicator

Participation of actors in climate change governance was broken down into seven specific components in order to evaluate participation. In response to the first component, participation of private sectors in the planning of climate change governance measures has a value of 0.40, while the early-phase planning and problem identification of civic associations is 0.41 and the participation of the community in climate change response actions is 0.51. In terms of the private sector, we found that the result for participation in the implementation of adaptation and mitigation measures is 0.51. With regard to the engagement of civic associations in the implementation of adaptation and mitigation measures, the result is 0.43. Related to the existence of public forums about climate change issues, the result is 0.42. Moreover, the survey result indicates that involvement of other government sectors in climate change governance is 0.52.

The above result indicates that in the planning phase, the CSOs and the private sector have shown weak engagement, whereas in the implementation of climate change action, especially in the planting of trees, the private sector and the community both show good performance. In the city, there is a lack of inclusive planning, especially in terms of the involvement of the private sector and civil society (Addis Ababa Resilience Project Office, 2020). The participation of CSOs, communities and private sectors in the decision-making process of climate change issues is poor compared to the city stakeholders of the Addis Ababa City Environmental Protection and Green Development Commission (AAEPGDC) (Table 2).

When we see the general survey results, actors' participation in climate change response is not effective, as indicated by result of 0.45.

Table 2: Participation indicators

Participation (0.45)	Index Result
Your office invited private sectors in planning of climate change governance measures	0.40
Civic associations are involved in planning of climate change governance measures	0.41
Your office invited the community in climate change response actions	0.51
Private sectors are involved in implementation of adaptation and mitigation measures	0.51
Your office participates civic associations in the implementation of adaptation and mitigation measures	0.43
Your office prepared public forum about climate change issues	0.42
Other government offices are involved in Climate Change Governance (CCG)	0.52

Source: Survey, 2020.

The interview with the Addis Ababa Environmental Protection Green Development Commission Commissioner and the Climate Change Work process head revealed that the general participation of actors (private sectors, the public, and CSOs) is poor. However, due to the existence of the country's green legacy, the private sector and the communities are participating in planting trees. Literature surveys show that more effective urban climate change governance needs the participation of multiple actors in the reduction of GHGs and in climate risk identification, prioritization, and implementation of adaptation measures (Filho et al., 2018). Challenges of climate change governance in African cities arise due to insufficient coordination and low private sector participation (Averchenkova et al., 2019; Kareem et al., 2020).

In the Ethiopian context, despite a genuine interest in the participatory governance principles, a highly centralized approach is being implemented, with a government party making all major decisions while some limited room is left for citizen participation (UN-HABITAT, 2017; EPA, 2012). A study conducted by (Mohamed et al., 2020) shows that Addis Ababa

city faced a problem of good governance, which is manifested by top-down and non-participatory approaches to the governance system.

2.3.1.2. Accountability Indicators

The accountability indicator in climate change governance is considered as the sum of six components, as indicated in Table 3. The results show that there is a lack of accountability in government bodies when they make decisions that aggravate climate change (0.21). Similarly, the results shows that roles and responsibilities of the office are not clear in terms of climate change response measures (0.32). By the same token, the survey response has generated a negative outcome for the rest of the four major components of accountability. The result for lack of accountability when they deviate climate change protection law is 0.24; the result for lack of timely responses to communities vulnerable to climate change is 0.31; the result for poor clear performance audit of the office budget for climate change activities is 0.38; and finally, the result for the climate change governance not being consistent with the respective climate laws is 0.22. This indicates that there is a poor exercise of accountability in relation to clarity of roles and responsibilities, whereas the government bodies across relevant tiers are exercising weak accountability to respond to their actions, and inconsistent practice on the part of the government bodies prevails in undertaking climate change actions. Among the six component indicators of accountability, there was no component that received a positive response. Thus, the study indicated that there is very weak practice of accountability in climate change governance (0.28) (Table 3)

Table 3: Indicators of accountability

Accountability(0.28)	Index Result
Government bodies are held accountable when they decide that aggravate climate change	0.21
The roles and responsibilities of your office is clear in terms of climate change response measures	0.32
Your office is held accountable if they violate the laws pertaining to climate change protection.	0.24
Your office timely responds to vulnerable community to climate change	0.31
There are clear performance audit of your office budget for climate change activity	0.38
Decisions in your office in terms of CCG (climate change governance) are consistent with the respective environment proclamations or regulations	0.22

Source: Survey, 2020

The above quantitative findings were also supported by the qualitative information collected from interviews and secondary sources. The interviews extracted from the Addis Ababa City Environmental Protection and Green Development Commission commissioner and the climate change team leader indicates that even though the commissioner was working in mainstreaming climate change issues among more than 22 organizations at the city level, there is still a lack of clear system of accountability regarding the GHG reduction and adaptation response. At the same time, interview responses from the federal environment and the Green Development Commission have also shown consistent results similar to the above findings. In particular, the Federal Climate Change Directorate director has responded that Addis Ababa city has top-down organizational structure problems as a result of being autonomous, which, in turn, leads to weak accountability and ineffective governance practice.

A weak accountability system and the absence of mechanisms to engage non-government stakeholders are major obstacles for effective urban governance (Addis Ababa Resilience Project Office, 2020). According to Damtie and Kebede (2012), in Ethiopia, institutional and legal frameworks that share responsibilities and accountabilities between the government, the private sector, and civil society organizations are not clearly defined. In a country with a low level of environmental awareness, private companies lack adequate policy and management plans in order to discharge their corporate responsibility and safeguard the natural environment (Cesar, 2013). Effective environmental governance needs implementation of transparency and accountability parameters (Ajuang et al., 2016; Darimani et al., 2013).

2.3.1.3. Equity Indicator

In order to capture the extent of equity, only two indicator components were conducted in relation to the governance of climate change. The responses to the first component have shown that there is no clear policy, strategy, or plan that supports the poor or the most vulnerable (0.39). In terms of women's involvement in climate change response measures, the result is 0.48. In general, climate change governance activities have not been implemented by practicing equity principles (Table 4). Effective urban climate change governance should incorporate principles of justice in order to represent vulnerable groups in the adaptation and mitigation planning processes, issue framing, and setting and to recognize the particular needs and actions of vulnerable groups (Romero-Lankao et al., 2018; Hughes, 2016).

Table 4: Indicators of Equity

Equity(0.44)	Index Result
There are pro-poor policy to climate change response	0.39
Your office involved women actively in climate change governance	0.49

Source: Survey, 2020.

2.3.1.4. Indicators of Awareness Creation

In order to understand the extent of awareness in climate change governance, six indicator components were considered. Regarding awareness-raising practices in relation to climate change measures for actors, the result looks positive (0.79). The rest of the five components indicated poor performance regarding awareness creation about climate change and its response in different actors, including their employees. Specifically, the result indicated a poor awareness creation campaign for the communities (0.48), poor existence of training programs about climate change adaptation and mitigation measures (0.49), low participation of employs in training/meetings related to climate change governance (0.42), poor change about climate change governance (0.43), and low awareness of the experts about climate change actions (0.47). Hence, it can be said that there has been awareness-raising practices, especially for stakeholders, but there are challenges in terms of knowledge, attitude, and skills about the climate change response action of experts. In general, there is a growing tendency in the level of awareness among actors with regard to climate change action and governance compared to the past, and the responses to these components have shown positive results (Table 5).

Table 5: Indicators of awareness

Awareness Raising(0.51)	Index Result
There are awareness raising practice for actors about climate change measures	0.79
There are awareness creation campaign for the communities about climate change and its measures	0.48
There are training programs about climate change adaptation and mitigation measures	0.49
You are participated in training/meeting related to CCG	0.42
Training efforts have been able to change your attitudes about CCG	0.43
You are well aware about climate change Actions	0.47

Source: Survey, 2020.

Evidences from the Addis Ababa City Environment and Green Development Climate Change Team Leader interviews have shown that training and awareness creation campaigns were held at the city level for around 26 sectors' stakeholders for the commission. The leader added that there will be a plan for training sub-city and Woreda experts. However, at present time, there is lack of expert training at the sub-city and Woreda levels as well as awareness-creation campaign about climate change and its response in the city's residents. Other interviews held with sub-city- and Woreda-level experts also revealed that they did not receive training about climate change and its actions. A study conducted in Kenya revealed that awareness-raising campaigns about climate change issues among the community is very important for an effective response to climate change (Ajuang et al., 2016). Having accurate scientific information about local GHG emissions and the impacts of climate change on a city is essential to make adaptation and mitigation responses (Aylett, 2014).

2.3.1.5. Institutional indicators

The existence of an adequate number of environmental institutions, adequate resources, clear regulation, and systems together with the engagement of local community based organizations were the major indicator components used to measure the institutional factor for climate change governance effectiveness. Hence, the results have shown that there were no adequate environmental institutions in charge of specific climate change issues in the local and upper levels (0.40). Additionally, governance decisions are not solely carried out by the local-level institutions (0.42), and they also lack the necessary support from upper-level government (0.43). Regarding the adequacy of the resource capacity to enact a climate change response, the results show that there are inadequate resources at Woreda level, sub-city level, and even at the city level (0.39). Regarding the involvement of CBOs (community-based organizations) in climate change decisions, the results show a lack of involvement of communities (0.40) (Table 6).

Table 6: Indicators of institutions

Institutions (0.41)	Index Result
There are adequate Environmental Institutions in the locality with clear mandate to coordinate Environmental protection	0.40
Climate change governance decisions are carried out solely by local level institutions or without intervention of upper levels	0.42
Climate change governances are carried out with adequate support from the upper level government	0.43
Your office has adequate resource capacity to coordinate CCG	0.39
CBOs (community based organizations) have significant role in CCG	0.40

Source: Survey, 2020.

Interviews with sub-city and Woreda team leaders about institutions have shown that adequate local governmental environmental institutions, which coordinate environmental issues, have failed to give attention to climate change and have been unable to provide a clear allocation of mandates. Even though there are local environmental institutions which coordinate environmental protection and governance activities, they have not been creating an enabling environment for CBO, NGO, or private sector actors. Thus, climate change governance is limited to government institutions, but it is neither working with communities' institutions nor empowering non-state actors. Similarly, there were empirical studies that support the importance of strong institutions for climate change governance. To this end, studies suggest that climate change solutions need the coordination of different institutions and actors in horizontal and hierarchical forms concerning climate change adaptation and mitigation (Fröhlich and Knieling, 2012; Betsill andBulkeley, 2006; Bulkeley, 2010; Bulkeley and Betsill, 2005; Armitage et al., 2012). According to UNDP (2016), in most cities in developing countries, urban governments do not fully deliver on their responsibilities due to problems of institutional arrangements.

2.3.1.6. Actor indicators

The survey findings regarding the engagement of different actors in climate change governance in particular has also shown consistent results with the above indicator components. In this study area, it was evident that there was less involvement of non-state

actors, especially NGOs, in mitigation and adaptation measures. Accordingly, the results show that the governance of climate change is carried out only by government bodies (0.74).

The roles of NGOs and communities have been very minimal, with values of 0.36 and 0.41, respectively. Involvement of the private sector is also low (0.46). The study has also revealed inadequate combined effort from state and non-state actors in the conservation of environmental protected areas (0.44). Thus, actor involvement in the study areas has merely been limited to the government bodies while there was no significant involvement of communities, NGOs, or the private sector (Table 7).

Table 7: Indicators of actors

Actors(0.48)	Index Result
Climate change governance is carried out by only government bodies	0.74
Climate change governance is supported by NGOs	0.36
Climate change governance is carried out by participation of local communities	0.41
Climate change governance process engages private sectors	0.46
Environmental protected area is conserved by collaboration of actors	0.44

Source: Survey, 2020

The interview with Addis Ababa City green development commission climate change team leader indicated that the climate change issue is being mainstreamed in 26 government sectors, which means almost all the actors are government bodies. In addition to the above response, the community and private sectors are participating only in the planting of trees. Regarding NGOs, there is only C40, which has participated in climate change issues. The team leader added that, at the city administration level, the steering committee was established by the city mayor from different sectors to lead climate change issues. However, although the steering committee has been established more than six months, nothing has been enacted by the committee. In addition, there is a lack of political commitment regarding climate change action among the higher-level officials. This study shows that establishing coordination of actors in mitigation and adaptation response is crucial to addressing the problem of climate change action. Similarly, there were empirical studies that support the findings presented above.

To this end, studies show that, especially in cities in developing countries, climate change governance lacks active engagement of urban actors (Filho et al., 2018; Averchenkova et al., 2019; Hickmann and Stehle, 2019; Eissa and Khalil, 2021). In addition, effective climate change solutions should also include the cooperation of actors, whether in the prevention of greenhouse gas emissions (mitigation) or adaptation to the impact of climate change (Fröhlich and Knieling, 2012; Armitage et al., 2012). In addition, in developing countries, it is difficult to implement climate change governance framework without strong coordination of actors and different sectors (Gouldson et al., 2015; UN-HABITAT, 2022).

2.3.1.7. Indicators of Climate change Laws

In terms of rules and regulations in relation to climate change action and governance, three component indicators were presented to capture the perceptions of employees. With regard to adequacy of laws and regulations, the study result shows that there were adequate laws and regulations (0.78). Regarding awareness of experts about climate change protection laws, rules, and regulations, the results shown that laws, rules, and regulations were known by experts (0.47) while the rules and regulations set by the community have little to do with the governance of climate change (0.45). In general, the results show that there are adequate climate change laws, rules, and regulation actions to respond to the adverse impact of climate change in the city (Table 8).

Table 8: Indicators of Climate Change law

Climate Change Law(0.57)	Index Result
There are climate change governance rules or regulations at your office	0.78
You are well informed about rules, regulations, proclamation related to climate change	0.47
Besides government regulations, local community regulations has also been used for climate change protection	0.45

Source: Survey, 2020.

The effectiveness of governance to respond to climate change in cities depends on legal frameworks and legitimate institutions (Bulkeley, 2010; Aylett, 2014). The 1995 constitution

of Ethiopia provides principles and guidelines for environmental protection and management. Based on the constitution and environmental policy of the country, several related legislations were formulated to mitigate environmental problems. Some of the legislations are: Proclamation on Environmental Impact Assessment (Proc. No. 299/2002) (FDRE, 2002), Proclamation on Environmental Pollution Control Proc. No. 300/2002(FDRE, 2002), Proclamation on Public Health Proc. No. 200/2000 (FDRE, 2000), and others. However, there is no proclamation crafted that relates different sectors, such as transport, waste, energy, and others, to climate change response action.

2.3.1.8. Indicators of law enforcement

In order to find out the extent of implementation of environmental laws, rules, and regulations, four indicator components were administered during the survey. In terms of ease implementation of the rules and regulations, the results show that the rules and regulations were relatively not easier to enforce (0.39). In relation to the proper implementation of rules and regulations, the findings show that challenges in the enforcement of laws or regulations were faced (0.21). In terms of actors' participation in the implementation of regulation and rules, the findings show that there is lack of involvement of NGOs, communities, and businesses during implementation (0.32); likewise, people or companies who deviate from the rules and regulations fail to receive punishment according to the law (0.24). Therefore, the study result shows that there was weak implementation of the rules and regulations (Table 9).

Table 9: Indicators of laws enforcement

Laws Enforcement (0.29)	Index Result
The existing climate change protection rules and regulations are easy for implementation	0.39
Climate change protection regulations are implemented properly	0.21
Climate change protection regulations are implemented by participation of Actors	0.32
People or company who deviate the rules and regulations are punished according to the law	0.24

Source: Survey, 2020

The interview with Addis Ababa City Environmental and Green Development Commission climate change team leader showed that environmental policy, strategy, regulations, laws, and proclamations and their implementation have been problematic. This problem is due to the nonexistence of accountability systems and a weak understanding of the environmental impacts of development on the part of higher officials. Another interview with the Federal Climate Change Directorate director also repeated the same concern, which is that environmental policy implementation has been so problematic, lacking accountability lines, having poorly designed institutional structure, and a weak constellation of actors regarding climate change issues. According to the Addis Ababa City Environmental and Green Development Commission commissioner, laws, rules, legislation and proclamation implementation are significant problems for the city because environmentally specific climate change response action implementation involves several sectors. He further explained that mitigation and adaptation action is not the only mandate of environmental and green development commission and that it needs the coordination of different sectors. According to (Mohamed et al., 2020), in the city, the major gaps of governance system is implementing the intended plans and the actual development processes is not related.

A weak regulatory environment and the limited enforcement capacity of environmental agencies exacerbate environmental pollution and degradation in the city (Addis Ababa Resilience Project Office, 2020). In Ethiopia, environmental law is poorly enforced, experiencing weak inter-sectorial coordination and low synergy among actors in initiating development programs (EPA, 2012). Moreover, institutional and legal frameworks that share responsibilities and accountabilities among government, private sector, and civil society organizations are not clearly defined (Damtie and Kebede, 2012).

There are considerable discrepancies between those environmental commitments made by the country and the actual implementation (Cesar, 2013). Even though the country is championing the global sustainable development, the economic component of sustainable development is given more emphasis than its environmental component (Damtie and Kebede, 2012).

2.3.1.9. Indicators of Partnership in climate change governance

In order to understand the extent of partnership being practiced among involved stakeholders, five explicit components were used. Regarding partnership with community based organizations; the result indicated that there was poor partnership between the local

environmental protection offices and the communities (0.44). Comparatively, environmental protection offices have good partnership with other government offices (0.51). Related to NGOs, there was no adequate partnership with NGOs (0.36). There was also inadequate partnership between environmental protection offices and research institutions (0.41) and between environmental protection offices and the private sector (0.42). Therefore, the result indicated that partnership is exercised only between environmental protection offices with other government stakeholders, while there is weak links among NGOs, private sectors, and CBOs with environmental protection office, which indicate that climate change governance is dominantly practiced by the government (Table 10).

Table 10: Indicators of Partnership

Partnership (0.43)	Index Result
Your office has strong partnership with community based organizations	0.44
Your office has strong partnership with other government offices	0.51
Your office has strong partnership with NGOs	0.36
Climate change governance is done in partnership with private sectors	0.42
Climate change governance is done in partnership with research institutions	0.41

Source: Survey, 2020.

2.3.1.10. Summary of Climate Change Governance Indexes

Following the descriptive statistics of indicators, the indices used to measure the effectiveness of climate change governance are presented in Table 11 and discussed hereunder. Participation of actors was found to be an important indicator with a value of 0.45. Accountability, being a sum of six component indicators, has been computed with an aggregate index value of 0.28. Hence, the survey respondents have shown that accountability is a key to the effectiveness of climate change governance. The equity index, as an outcome of two components and as one of the key indices to measure effectiveness of climate change governance, has been computed with an aggregate index value of 0.44.

Table 11: Summary of Indexes

No	Indicators	Average index	Composite index
1	Participation	0. 45	3.15
2	Accountability	0.28	1.68
3	Equity	0.44	0.88
4	Awareness rising	0.51	3.06
5	Institution	0.41	2.05
6	Actors	0.48	2.4
7	Climate change Law	0.57	1.71
8	Law enforcement	0.29	1.16
9	Partnership	0.43	2.15
			18.24/ 43= 0.42

The awareness index, as an outcome of six components and as one of the key indices to measure effectiveness, has a mean index value of 0.51. Institutional performance was another key indicator with a mean index value of 0.41. Similarly, the role of different actors and the level of discharging responsibilities have been strongly considered with a mean index value of 0.48. The availability and clarity of adequate rules, laws, and regulations pertaining to climate change was also considered as one of the major indicators, with a mean index value of 0.57. Law enforcement, which is considered as the most crucial indicator, has a mean index value of 0.29, and it has the lowest index value next to accountability.

The partnership index has a mean value of 0.43 and is also a key indicator of the effectiveness of climate change governance. Among these, only the existence of climate change laws, regulations, rules, or proclamations and awareness rising have the highest index values, with mean values of 0.57 and 0.51, respectively. Moreover, to determine whether the current climate change governance practice is effective or not, the study developed a composite index for measuring the effectiveness of climate change governance for future policy direction. In this regard, the average of the indices shows a value of 0.42. Thus, the climate change governance outcome is ineffective, falling below the threshold, which is $\leq$ 0.50 (Table 11).

2.4. Conclusions

This study investigates the effectiveness of climate change governance in Addis Ababa City, adapting nine key indicators of effectiveness based on the literature. The findings indicated that the implementation of and adherence to these nine key indicators was found to be inadequate. Particularly, this study arrived at such a conclusion that climate change governance was ineffective in terms of the implementation of almost all key indicators, which include accountability, participation, law enforcement, institution, the role of actors, equity, and partnership. In addition, environmental policy, law, regulation, and proclamation implementation in the city have been facing major challenges in terms of weak accountability, poor enforcement of regulation, and failure to involve key actors, especially NGOs, communities, and private sectors, characterized by weak institutional setup and a lack of formal systems for actors to interact (the private sector, communities, and CSOs) to respond effectively to climate change. Moreover, there was a lack of capacity building through training among the sub city and Woreda level experts and a lack of awareness-creation campaigns about climate change and its response for city residents. Thus, the Addis Ababa City Environmental Protection and Green Development Commission should give more emphasis to the coordination of other actors (NGOs, community, the private sector, and research institutions) to respond to climate change in the city. In addition, the commission should provide training to the lower layers of experts and mobilise the community for climate change response, especially in terms of adaptation measures. Moreover, Addis Ababa city administrators should give due attention to climate change response through established strong accountability systems to enforce regulation, rules, proclamations, laws, policies, and strategies in different sectors.

Chapter Three: Factors Affecting Climate Change Governance in Addis Ababa City, Ethiopia

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Abstract: *Climate change in Ethiopia's capital city of Addis Ababa is characterized by an increase in rainfall and subsequent flooding and severe temperature with more heat waves. The city government has now recognized climate change as a serious threat, including it being a reason for loss of life and livelihoods. Even though governance has become a key mechanism to address a reduction in greenhouse-gas emissions and vulnerability to climate change, the practice of climate-change governance has been undermined by different factors. Thus, this study examined factors affecting climate-change governance in the city. The research adopted a mixed research design and depends on primary and secondary data sources. The binary logistic regression model and descriptive statistics were both used to analyse the quantitative data, while the descriptive method was used for the qualitative data. The results reveal that a lack of coordination, political will and leadership are the major factors that hinder the practice of governance in the city, followed by inadequate finance, policy, strategy, and regulation. In addition, a shortage of knowledgeable experts, lack of access to information and technologies had their own contributions to the ineffectiveness of climate-change governance. Thus, the city administration should place emphasis on climate change, giving it comparable weight to other crosscutting issues, and enabling the functioning of the steering committee with a strong accountability system. In addition, the city administration should take aggressive measures, including revising or formulating new policy, strategy or regulation, and even creating an independent institution for climate-change issues. Furthermore, the Addis Ababa City environmental protection and green development commission should create an enabling environment to attract non-state actors, in general, and NGOs, in particular, and should assign one directorate to mobilise finance, following the approach taken by the federal environmental protection commission. The commission should implement a mechanism to efficiently utilize the budget by applying continuous monitoring and evaluation. The commission should also provide continuous training and capacity building for leaders and experts at sub-city and Woreda levels.*

Keywords: *climate change adaptation; coordination; actors; political willingness; policy*

3.1. Introduction

Climate change is one of the most contested and undeniable environmental issues, and has been receiving significant attention around the world. It manifests as rising temperatures and increasingly erratic rainfall, as well as severe floods and droughts (IPCC, 2014; 2021). Climate change is no longer a low-level issue but has become a life-threatening global emergency (IPCC, 2021; Tyfield and Yuille, 2022). According to a study by IPCC (IPCC, 2018, 2021), temperatures are predicted to rise by 2.4 °C by the year 2100. This is significantly above the target value of 1.5 °C, which was accepted by the Paris agreement. The effects of this increment are likely to be disastrous in the future.

All economic sectors are affected by climate change, which also poses different challenges for environmental systems (Averchenkova et al., 2019; Sibiya et al., 2022). These challenges are more pronounced in cities, since most of the world's people reside there. Currently, cities are significantly affected by consequences of climate change such as heat waves, flooding, heavy rains and storms (Marc et al., 2019; Adenle et al., 2017). At the same time, cities produce around two-thirds of the total global greenhouse-gas (GHG) emissions, and account for a similar proportion of total global energy consumption (Marc et al., 2019; Droz˙dz˙et al., 2021).

Climate change is a global threat which requires policy action at international, national, and local levels of governance. Climate change governance refers to a range of initiatives, regulations, and government decisions aiming to establish cooperation between state and non-state actors in dealing with climate change (Bulkeley and Betsill, 2005; Bulkeley, 2010). It is a subset of the broader governance field, but the difference is that a greater emphasis is placed on the mitigation and adaptation of climate change (Hughes, 2016; van Dijk, 2017). In environmental terms, climate change governance is the mechanisms and response measures aimed at steering social systems towards preventing, mitigating, and adapting to the risks posed by climate change (Rockström et al., 2017; Díaz-Pont, 2020; Frohlich and Knieling, 2012).

Climate change governance in cities is manifested by the process of the formulation and implementation of adaptation and mitigation measures (Bulkeley, 2010; Navroz, 2021). Cities are rapidly becoming key locales for climate-change governance, through the designing of institutions and infrastructures that drive decarbonization and adaptation to the

changing climatic conditions (Marc et al., 2019; Bulkeley & Betsill, 2013; van der Heijden, 2016, 2019; Xiaolong, 2021).

To this end, several empirical studies show that the effectiveness of climate change governance is hindered by a number of factors. One of the main determinants of responses to mitigation and adaptation is effective policy, strategy, regulation and law (Romero-Lankao, 2012; Schoenefeld et al., 2021). Conflicts of interest during issue framing or giving priority to mitigation and adaptation in relation to other policy concerns, such as infrastructure provision or poverty reduction, are the major factors that hindered climate change governance (Aylett, 2014; Hayley and Debra, 2015; Poli et al., 2022). A lack of implementation of policy, strategy, rules, plans and inadequate legislation are also part of the factors that determine climate-change response (Worker and Palmer, 2020; Peterson, 2021).

Several studies indicated that a shortage of finance is another factor for the implementation of climate change response measures (Romero-Lankao, 2012; Aylett, 2014; 2015; Worker and Palmer, 2020; Eissa and Khalil, 2022). Mostly, local governments or municipal authorities face a shortage of finance to implement mitigation and adaptation because of the existence of many competing issues on urban agendas (Romero-Lankao, 2012; Worker and Palmer, 2020; Lesnikowski et al., 2021). According to Aylett (2014), cities face three major resource related challenges for an effective response to climate change, including access to financial, human and technological resources. Lack of human resources is also a major challenge of climate-change governance in cities (Díaz-Pont, 2020; Aylett, 2014; Eric-Chu and Patterson, 2018). Governance capacity to respond to climate change is also affected by legal frameworks and legitimate institutions (Romero-Lankao et al., 2018). Lack of an independent institution that is directly accountable for climate change matters is also a factor that determines the governance of climate change, especially at a local level (Bulkeley and Betsill, 2013; Mukhlis and Perdana, 2022).

Weak coordination of actors and sectors are also key factors that hinder climate change governance (Rockström et al., 2017; Worker and Palmer, 2020; Aylett, 2015; Romero-Lankao et al., 2018; Nasiritousi and Grimm, 2022; Teng and Wang, 2021). Most countries' local governments or municipalities lack cooperation with academia, the private sectors, the community, and NGOs (Eissa and Khalil, 2022) and lack vertical coordination between national and local levels, which is important to devise solutions to governance problems at the local level (Tyfield and Yuille, 2022).

Another factor that hinders climate-change governance in cities is access to updated sources of data, including future climate predictions, GHG inventories, and climate vulnerability assessments and impacts such as heat waves and flood (Eissa and Khalil, 2022). Information accessibility and availability can improve decision-making skills by assisting decision-makers in assessing and prioritizing climate change (Romero-Lankao, 2012; UN-HABITAT, 2022). Building a solid foundation for effective urban climate-change governance requires scientific data (Romero-Lankao et al., 2018).

The political willingness of leaders and leadership is another major factor that hinders climate-change response (Eissa and Khalil, 2022). Lack of political will is a challenge the collaborative governance of the climate-change response in most cities (Mukhlis and Perdana, 2022; Tosun, 2022). Leadership quality is also critical in shaping climate-change responses (Worker and Palmer, 2020; Romero-Lankao et al., 2018; Yeganeha et al., 2020). Climate change action is also affected by a lack of technology that is needed to take action on climate-change issues (Tyfield and Yuille, 2022; Worker and Palmer, 2020).

When we look at African cities, the coordination of actors is a major factor that hinders good climate-change governance (Averchenkova et al., 2019; Butterfield et al., 2017; Hickmann and Stehle, 2019). In African cities, collaborations regarding climate-change response between the local government and government departments at different levels and sectors, civil society, residents, and community-based organizations are weak (Lesnikowski et al., 2021; Anwar, 2016; Lorena, 2020; Taylor et al., 2021). A study conducted in two cities of Africa, Karonga from Malawi and Dar es Salaam from Tanzania, found that climate change governance is hindered by poor collaboration among governments, the private sector and civil-society organizations (CSOs) (Lorena, 2020). A study conducted in Lusaka, Zambia and Durban city, South Africa, indicated that there is a lack of finance and capacity problems for executing policies, strategies and plans at all levels of government. This is more pronounced at the local government level (Taylor et al., 2021). Lacking political willingness and poor leadership are other problems for implementing an effective climate change response in African cities (Hickmann and Stehle, 2019).

When it comes to Ethiopia, an African country, one of the factors that determine climate change response is lack of coordination among actors (Webster et al., 2020). The country accepts and implements the New Urban Agenda United Nations Economic Commission for Africa (2020) and Sustainable Development Goal Hailemariam (2019) that are necessary for the development of an industrial base to create employment in urban areas. However, climate

change response still ranks low on the list of overall development priorities (UNECA, 2020; Haileab, 2018).

According to a study conducted by (Climate Action Tracker, 2020), Ethiopia showed less concern about climate-change action compared to other countries, such as Kenya and South Africa. However, without an effective response to climate change, sustainable development cannot be achieved (Xiaolong, 2021). The Climate-Resilient and Green Economy (CRGE)'s Strategy implementation and evaluation results show that the strategy was not effective as it lacked political commitment at local and national levels, as well as in multiple sectors (Haileab, 2018). In the country, limited numbers of non-state actors were involved in the governance of climate change (Climate Action Tracker, 2020; OXFAM, 2018). In addition, security concerns and the pandemic have adversely hampered the implementation of climate action (Webster et al., 2020; UNDP, 2020).

Addis Ababa City is highly affected by climate change, such as flooding, drought, heat waves and landslides (Arsiso et al., 2017; Worku, 2017; Feyissa et al., 2018; Alemu and Dioh, 2020; Jemberie and Melesse, 2021). In the city, climate change and its impacts are aggravated by an unprecedented rate of urbanization and rapid population growth, built-up-area expansion, less green-area coverage and land use change (Arsiso et al., 2017; Moges et al., 2013; Worku, 2017; Arsiso, 2018; Addis Ababa Environmental Protection and Green Development Commission, 2020). To govern climate change in the city, the Addis Ababa City Environmental Protection and Green Development Commission (AAEPGDC) was awarded a mandate and will implement a climate resilient green growth strategy for 10 years until the year 2025, based on the 2011 country's CRGE strategy (FDRE, 2011). The strategy addresses both climate change adaptation and mitigation issues, and began in 2014.

Adapting this strategy, the AAEPGDC has made climate-change issues mainstream across various offices: land use, housing, transportation, water supply, solid waste, education, energy and more than 22 other sectors (Alebel, 2014; Woldesenbet, 2018; Yirga et al., 2022). Even though the strategy is in place, the implementation of the strategy is still piecemeal and climate-change response action is given a low priority compared to other issues.

The provision of empirical information on the major factors that hinder climate change governance using a comprehensive study is vital to city administrators at different levels and other non-state actors. This is important for redesigning sound policies and strategies to address climate change impacts and a reduction in GHG in the city. However, most of the

previous studies conducted related to climate change in the city were mainly focused on trends. None of them focused on climate change governance by considering governance factors. Numerous international scientific research works have been carried out in this area. However, those studies concentrated on comparative study in cities of industrialized countries, neglecting to do so in developing cities. Hence, this research intends to bridge this gap by identifying factors that hinder climate change adaptation and mitigation response action.

3.2. Data Analysis Techniques

For this study, binary logit model was used to analyse the quantitative data. We used binary logistic regression model because the dependent variable is dichotomous: in this case, ineffective or effective. Where the dependent variable is dummy, binary logit model is suggested (Sarkar and Midi, 2010; Berger, 2017). Hence, binary logistic model was used to determine the relationship between climate change-governance effectiveness and the related underlying factors or independent variables, including lack of policies, strategies, and regulation; lack of finance; lack of human resource; lack of technologies; lack of political will and leadership; lack of information, and lack of coordination. The dependent variable was coded with a value of 0 for ineffective and 1 for effective; whereas, the independent variables was designated with 1 as low, 2 as moderate, and 3 as high, in the coding system. SPSS software version 26.0 was used to analysis the binary logit model by creating the high-scale level as a reference category for the independent variables.

Before applying the binary logistic regression, the logit model was evaluated for possible inadequacies. To assess the model's overall fit, a Hosmer and Lemeshow test was performed. The chi-square value for this test is = 2.791, sig = 0.947. This result shows that the model sufficiently fits the data (Table 12). How well the model categorizes the observed data is another approach to establish the model's effectiveness. Table 13 shows that, overall, 87.2% of climate-change-governance effectiveness was predicted properly. The independent/ covariate variables suggest that climate-change governance is ineffective (95%).

Table 12: Hosmer and Lemeshow test

Step	Chi-square	Df	Sig.
1	2.791	8	0.947

Table 13: Classification table

Step	**Observed**		**Predicted**		
			Climate Change Governance Effectiveness		Percentage Correct
			Ineffective	Effective	
1	Climate Change Governance Effectiveness	Ineffective	150	8	94.9
		Effective	20	41	67.2
	Overall Percentage				87.2

The model summary, shown in Table 14, also highlights the goodness of the model. The result reveals that 62.8% of the variance in climate-change-governance effectiveness can be explained by a linear combination of the seven independent variables (coordination; political will and leadership; policy, strategies, regulations; finance; human resource; information and technologies). Based on the results shown in Tables 14, we come to the conclusion that the model, along with the given independent variables, is acceptable.

Table 14: Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	133.807	0.436	0.628

In addition to the binary logit model, descriptive statistics were applied for data analysis. A total of 30 questions were prepared, distributed, then later computed and recoded into seven variables, including lack of policies, strategies and regulations; finance; human resource; technologies; political will and leadership; information and coordination. The average responses from all respondents to all the questions that reflect each variable were used to discuss the findings. Each variable is represented and addressed by a distinct question. The qualitative data were also repeatedly read, coded, and similarities between the data were identified using N'Vivo (10.1). The findings from qualitative studies were analysed using a thematic area approach.

3.3. Results

3.3.1. Results of the Descriptive Statistics

The study results were collected based on seven independent variables: lack of policies, strategies, and regulation; lack of finance; lack of human resource; lack of technologies; lack of political will and leadership; lack of information and lack of coordination. The results are summarized in Table 15. Regarding lack of coordination, the majority of respondents (64.4%) consider that it highly affects climate change governance, while 22.8% and 12.8% of respondents consider its effect to be moderate and low, respectively. Lack of political willingness and leadership quality is another major factor that hinders climate-change governance in the city. This factor is characterized as high by 60.7% of respondents. The table below also shows that lack of finance and policies, strategies, and regulation significantly affect climate change governance: both are characterized as high by 53% of respondents.

Table 15: Descriptive statistics results of factors affecting climate change governance

Responses	Lack of Policies, Strategies, Regulation	Lack of Finance	Lack of Human Resource	Lack of Technologies	Lack of Political will and Leadership	Lack of Information	Lack of Coordination
	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)
Low	57 (26)	38 (17.4)	27 (12.3)	75 (34.2)	42 (19.2)	53 (24.2)	28 (12.8)
Moderate	46 (21)	65 (29.7)	156 (71.2)	97 (44.3)	44 (21.1)	108 (49.3)	50 (22.8)
High	116 (53)	116 (53)	36 (16.4)	47 (21.5)	133 (60.7)	58 (26.5)	141 (64.4)
Total	219 (100)	219 (100)	219 (100)	219 (100)	219 (100)	219 (100)	219 (100)

Source: Survey, 2021.

Table 15 demonstrates that many respondents (71.2%) responded that a lack of human resources has a moderate impact on climate-change governance. The remaining number of expert's is divided between the relatively low factor (12.3%) and high factor (16.4%). As shown in Table 15, a high number of respondents characterized lack of information and technologies as moderately affecting climate-change governance, with percentage values of 49.3% and 44.3%, respectively.

3.3.2. Binary Logistic Regression Results

Seven independent variables were entered into a binary logistic regression model in order to pinpoint the major factors that hinder the effectiveness of climate change governance. These variables are coordination; political will and leadership; finance; policy, strategies and regulation; human resources; information and technologies.

As shown in Table 16, the results of logistic regression reveal that coordination; political will and leadership; finance; and policy, strategies and regulation significantly affect climate change governance at different level of significance. Exp (B) gives the odds ratios for each variable. As shown in the table, a log odd of climate change governance effectiveness is positively related to coordination; political will and leadership; finance; and policy, strategies and regulations. Hence, climate-change-governance effectiveness with the existence of lower problems in coordination; political will and leadership; finance; policies, strategies and regulations is 66. 861, 5.372, 5.673 and 3.379 times, respectively, more likely to have an effect than that of higher problems in coordination; political will and leadership; finance; and policy, strategies and regulations.

Table 16: Results of analysis on factors that hinder climate change governance

Variables	B	S.E.	Wald	Df	Sig.	Exp (B)
Lack of Coordination (Ref.= High)			24.232	2	.000	
Lack of Coordination (Low)	4.203	.881	22.740	1	.000	66.861
Lack of Coordination (Moderate)	1.223	.493	6.162	1	.013	3.398
Lack of Political will and Leadership (Ref.= High)			11.190	2	.004	
Lack of Political will and Leadership (Low)	1.681	.568	8.747	1	.003	5.372
Lack of Political will and Leadership (Moderate)	1.442	.548	6.924	1	.009	4.228
Lack of Finance (Ref.= High)			7.895	2	.019	
Lack of Finance (Low)	1.736	.618	7.895	1	.005	5.673
Lack of Finance (Moderate)	.676	.536	1.595	1	.207	1.967
Lack of Policies, Strategies, Regulation (Ref.= High)			7.884	2	.019	
Lack of Policies, Strategies, Regulation (Low)	1.218	.549	4.916	1	.027	3.379
Lack of Policies, Strategies, Regulation(Moderate)	1.524	.592	6.633	1	.010	4.593
Lack of Human Resource(Ref.= High)			1.355	2	.508	
Lack of Human Resource (Low)	.927	.861	1.160	1	.282	2.526
Lack of Human Resource(Moderate)	.263	.673	.153	1	.696	1.301
Lack of Information (Ref.= High)			1.680	2	.432	
Lack of Information(Low)	.757	.678	1.244	1	.265	2.131
Lack of Information (Moderate)	.721	.594	1.476	1	.224	2.057
Lack of Technologies (Ref.= High)			1.401	2	.496	
Lack of Technologies (Low)	.193	.681	.081	1	.777	1.213
Lack of Technologies (Moderate)	.652	.623	1.097	1	.295	1.920
Constant	-5.323	1.040	26.180	1	.000	.005

Source: Survey, 2021. df = degree of freedom. S.E = standard error. B = coefficient. Sig = significance. Exp (B) = odds ratio for the predictors.

Similarly, Table 16 shows that climate change-governance effectiveness with moderate problems of coordination; political will and leadership; finance; policy, strategies and regulations are 3.398, 4.228, 1.967 and 4.593 times more likely to have an effect than that of high problems of with these factors, respectively. Hence, the above four variables (lack of

coordination; political will and leadership; finance; and policy, strategies and regulations) have a highly significant effect on climate change-governance effectiveness.

3.3.3. Interview Results

The quantitative result discussed above was also supported by our qualitative analysis. By using several interview questions, we collected qualitative responses from officials and experts from federal, city, sub city and Woreda levels; private sectors and NGOs. The result was summarised in figure 10. As shown in the figure, the majority of interviewees repeatedly answer that major the constraints of climate- change governance in the city were weak enforcement of laws/regulations; lack of political willingness of officials and weak horizontal interaction of stakeholders. Lack of finance, accountability, and leadership are also part of the factors that hinder climate- change governance.

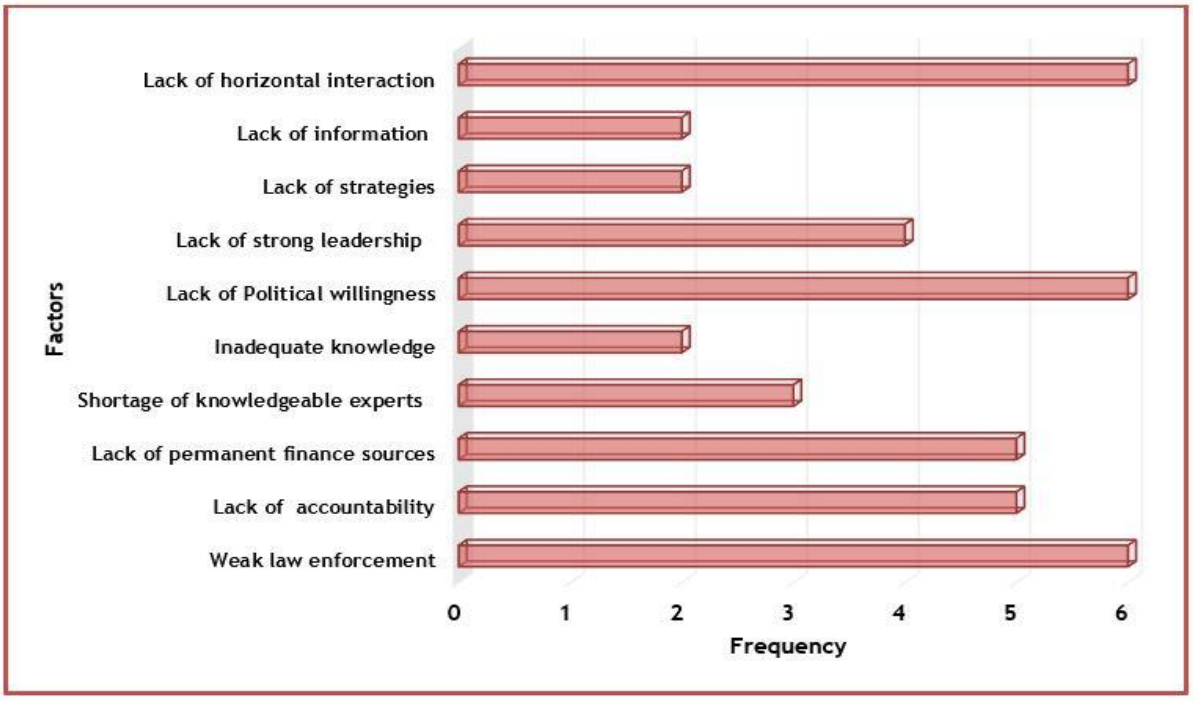

Figure 10: Factors that hinder climate change governance

In Figure 10, we provide a summary of the top ten factors that hinder climate-change response in the city, gathered from the aforementioned interview response. Note that the figure only shows the number one responses, i.e., the most important ones according to the respondents.

To add further context to the aforementioned results, we present some interview responses. The interview with the AAEPGDC commissioner sheds light on the key factors that impede climate change response in the city. The commissioner stated that: "The major factors to take mitigation and adaptation action in city is lack of coordination of sectors and finance" [Interview, 10 August 2021]. He elaborated that, "Even though, the 2019 redesigning city administration proclamation gives the mandate to manage and control environmental issue to AAEPGDC, the proclamation lacks clarity about regulatory issue. The commission mainstreamed climate change issue in more than 23 sectors and gave training for those sectors; however, the commissioner has no authority to control, evaluate and make accountable the work of these sectors. Hence, the work of the sectors that is related to climate change issue is voluntary type activity. Although this is a very serious problem for climate change governance in the city, the commission's major work has been planting trees. In addition, although the commission tried to establish steering committee led by the mayor, even after more than six months, it is still not functional because of several reasons, including due to the country's security issue".

In an interview with one of the experts of the commission, the expert said that one of the major problems of AAEPGDC, at different levels, is the constant change in leaders and weak leadership style [Interview, 21 July 2021]. Even during this study, three leaders were changed at the commission level. He added that due to a lack of legal systems, those leaders imposed their own interests. According to the energy group leader in the commission, leaders focus on short-term goals that are politically motivated and then they ignore the long-term impact of climate change [Interview, 3 July 2021]. He added that at the commission level, for example, leaders pay more attention to the natural-resource management directorate than to climate change because the directorate mobilizes money for the commission by selling quarries in millions. On the contrary, climate-change issues need a budget, whereas leaders assume the climate-change agenda is insignificant. Hence, there is a misunderstanding by officials when it comes to climate change and its impact on economic development.

According to an interview held with a commission climate-change-mainstreaming expert regarding employees, in 2020, the city administration recruited a large number of degree holders to decrease unemployment by creating job opportunities and assigning them to different sectors using a quota system [Interview, 25 September 2021]. During that time, a large numbers of employees that were recruited, especially at Woreda level, have degrees that are not related to climate change or the environment. The majority of Woreda employees

have educational backgrounds in the areas of geology, maths, physics, accounting, management, chemistry, engineering and other similar fields.

Hence, a large number of experts lack an educational background related to climate change. In addition, there is a lack of training or capacity building at the sub city and Woreda levels. During this study's data collection period, most sub-city and Woreda experts did not have knowledge of the Addis Ababa CRGE strategy. One interviewee from Bole sub-city (Woreda 6 expert) told us that the employee got the chance to take training on the Addis Ababa CRGE strategy, whereas almost all other experts did not get the training [Interview, 28 June 2021].

Interview results from the federal urban and infrastructure ministry environmental and climate-change management leader [Interview, 21 July 2021] and the federal EPGDC climate-change directorate director [Interview, 9 July 2021] revealed similar responses regarding the vertical coordination in the city. Both argued that "compared to the regional government, there was weak vertical coordination in Addis Ababa city". They said that the reason is the autonomy granted to the city, and making the assumption that the city has potential and, consequently, there is a lack of interest in obtaining support from the federal level. The federal EPGDC climate change directorate director added that "when we call all regional and two city administration experts to give training, the Addis Ababa city commission experts did not participate."

Another example is the interview we had with the C40 adviser. The view of the advisor is: "As a city advisor in AAEPGDC, during this work, the major problem of climate change governance in the city is lack of political commitment of officials. The level of understanding about climate change is still low." He argued that "the attention of climate change response given by the city administration is very low". He added that "shortage of budget and lack of accountability system is also the major problem of climate change governance" [Interview, 12 June 2021]. The C40 advisories also reiterated that climate-change-resilient-strategy implementation has been so problematic because of poorly structured institutions and the weak cooperation of actors. Additionally, the reasons includes a weak understanding of the climate change impacts of development on the part of policy makers and investors and a lack of action in urban areas compared to rural areas. The interviewee result of the C40 Cities Climate Leadership Group adviser indicated that new climate policy, rules, and regulations are needed to address GHG emissions in different sectors.

According to an interviewee affiliated with the City climate change mainstreaming leader about climate change response action [Interview, 6 July 2021]. “The major problem of mitigation and adaption action is lack of political willingness of higher officials, weak leadership and lack of accountabilities”. She added that, even though the commission established a steering committee led by the mayor, more than six months later the committee is not functional and repeated enquiries had not received any response.

As an example of interviewing people from private sectors, we interviewed some people from a Hujain shoes factory [Interviewee, 3 June 2021] and soufflé malt factory [Interviewee, 23 June 2021]. They indicated that the city’s administration does not encourage the involvement of private sectors in preparing and implementing the climate-change strategy and plan. They also added that AAEPGDC lacks cooperation with the private sector, especially targeting issues such as, industrial emission reduction and environmental management- plan preparation, but instead they are quite active in punishing them.

3.4. Discussion

Climate change issues require support and participation not only from environmental offices or departments but also from all city administration sectors and actors. This study shows that involving only the government sectors in environmental offices for climate change governance is not sufficient to address GHG and minimize vulnerability to climate change in the city. Thus, the result of this research determines the aspects of effective climate change governance that is not well implemented in the city. It is clear from the study that as coordination, finance, policy, strategies, and regulations, political willingness, and leadership improves, the effectiveness of climate change governance will also improve. The above quantitative and qualitative results show that the effectiveness of climate change governance is being hindered by different factors.

The major factor that hinders the effectiveness of governance in the city is a lack of coordination of actors and sectors. Even though the commission made climate change issues mainstream across different sectors, such as transport, waste, plan commission, disaster risk management, building, health, and green development, the horizontal collaboration of these sectors in the governance process is weak. Studies found out that GHG emissions and risks in cities are not only municipal- or local government concerns but they are also concerns for a range of actors across sectors, in creating coordination for effective climate-change

governance to mitigate emissions and adaptation to climate risks (Aylett, 2014; Romero-Lankao et al., 2018; Nasiritousi and Grimm, 2022).

Regarding the lack of coordination, the commission itself is not able to attract the participation of NGOs and the private sector in the decision-making process. Only the C40 advisor participated actively in the climate-change action in the city. The commission is not particularly working to attract NGOs in the future. However, the federal government has one directorate, named the resource mobilization directorate, which works to attract CSOs. Our finding, in this regard, is supported by a study conducted in two cities of Africa. Studies conducted in the cities of Karonga in Malawi, and Dar es Salaam in Tanzania, also find that climate-change governance is hindered by poor collaboration between the government, private sector and CSOs (Diep et al., 2016).

Lack of political will is another major problem that hinders the response to climate change in the city. The first important thing for effective climate-change response is the political willingness of leaders in different sectors and levels (Mukhlis and Perdana, 2022; Tosun, 2022). According to the AAEPGDC, the climate change mainstreaming team leader, the climate-change issue has lacked attention from higher officials, especially from the city administration. The reason is that the steering committee has not been functional for more than 6 months. The commissioner also argued that the steering committee incorporates different sectors and it is the most important committee for climate-change response actions, but it is not starting their work yet as the city administration gives more attention to the country's security issue and COVID-19. Security concerns and the pandemic have adversely impeded climate change governance in Ethiopia (Webster et al., 2020).

Lack of strong leadership at the local level is another problem related to climate change action. Leadership is an important issue because it motivates people to accomplish positive changes in the organization and play an important role in guiding who participate in the decision-making process and what actions they take. To achieve sustainable or long-term development, shaping climate change response leadership at different levels is critical (Aylett, 2014; Yeganeha et al., 2020).

Weak implementation of policies, strategies and regulations is another factor that hinders the governance process. The 2014 Climate Resilient Green Growth Strategy incorporates many mitigation and adaptation strategies across different sectors.

The major constraint is weak enforcement of strategies, laws, regulations, and plan. A similar study conducted in African cities, specifically in Lusaka and Durban, shows that the governance process faced serious capacity problems in executing strategies and plans, especially at the local level (Taylor et al., 2021). Even though the mandate for climate change issues was given for EPGDC and mainstreaming is carried out across different sectors, the commission has no authority to control the sectors. Hierarchically, these sectors are accountable to the city administration and the municipality; hence, the environmental commission lacks authority over these sectors.

In addition to the weak implementation of policies, strategies and regulations, inadequate laws and legislations are also factors that determine climate change response (Peterson, 2021; Schoenefeld et al., 2021; Worker and Palmer, 2020). Climate change issues are poorly understood by city officials and, in most cases, they assume that it is not a critical issue for our country. Hence, there is a limitation in the strategy, regulations, proclamations, and laws to address GHG emission across different sectors, including transport, waste, building, energy and others. Lack of an independent institution, which would be directly responsible for climate-change issues, is a factor that determines the local governance of climate change (Díaz-Pont, 2020; Mukhlis and Perdana, 2022).

Inadequate financing for the implementation of plans or programs is another factor that hinders climate-change response. The permanent source of funds is the budget from the upper level government. The fund assigned to the work of the commission is not just only for climate-change purposes and is insignificant in the first place. Furthermore, at the same time, there is lack of resource mobilization to obtain financing from different CSOs. In cities of developing countries, a shortage of financing is a major factor that hinders climate change governance because they need budget for housing, infrastructure provision, job creation and poverty reduction (Hickmann and Stehle, 2019; Diep et al., 2016).

A shortage of knowledgeable experts is another problem of climate change response in the city. Although the number of employees, in particular, is not a problem, experts lack general climate change knowledge. However, studies showed that experts knowledgeable on climate change are the key source of success for climate change governance (Aylett, 2014; 2015; Romero-Lankao et al., 2018).

Additionally, according to the results shown above, both quantitatively and qualitatively, compared to other variables, lack of access to information is not a major factor. The study

shows that information is not a major problem because the city administration holds a GHG-emission inventory every 2 years. Regarding impact and vulnerability, there are several reports that indicate that higher officials as well as the community well understood vulnerable places. Climate change governance in cities require access to current, context specific sources of data, including future climate predictions, GHG inventories results, climate vulnerability assessments, and impacts, such as heat waves and floods (Romero-Lankao, 2012; Eissa and Khalil, 2022).

Finally, this study shows that, currently, lack of access to technologies is not a major problem of climate change governance in the city. However, this does not mean that it is not a problem at all and our study shows that, in the city, there is inadequate knowledge about technologies. When it comes to climate planning, studies show that it is necessary to support climate change response action with different technologies and technical solutions (Tyfield and Yuille, 2022; Worker and Palmer, 2020).

3.5. Conclusions

In Addis Ababa city, the practice of climate-change governance is ineffective. It is significantly hindered by different factors. The result of this study reveals that a lack of coordination, political will and leadership are the key problems of governance in the city, followed by inadequate finance and policy, strategy, and regulations. In addition, a shortage of knowledgeable experts and lack of access to information and technologies make their own contributions in the ineffectiveness of climate change governance. The study also concludes that when the level of coordination, political will and leadership increase, climate change governance effectiveness shows improvement. Thus, the city administration should emphasise climate change like it does other crosscutting issues and should enable the steering committee by implementing a strong accountability system. In addition, the city administration should try to revise or formulate new policy, strategy or regulations, as well as establish independent institutions for climate change issues. Specifically, the commission should create an enabling environment to attract non-state actors, and should assign one directorate to mobilise finance, following an approach undertaken by the federal environmental protection commission. The commission should also provide continuous training and capacity building to sub city and Woreda level leaders and experts.

Chapter Four: Institutional Interaction and Role of Actors in the Governance of Climate Change in Addis Ababa City, Ethiopia

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Abstract: *This study assesses institutional interaction and role of actors in Addis Ababa City. Structured questionnaires, interviews and document reviews were used to collect the data. Descriptive statistics and thematic approaches were employed to analysis the data. The study found weak interaction among government sectors in climate change response action even though, the Addis Ababa city environmental protection and green development commission (AAEPGDC) mainstreams climate change adaptation and mitigation actions in different sectors. The AAEPGDC has weak vertical interaction with other sectors in climate initiatives at the sub city and woreda level. The commission works on mainstreaming and supporting the sectors but lacks implementation, monitoring and evaluation guidelines. Additionally, there is no specific proclamation, legal framework, or memorandum of understanding with mainstreaming sectors indicating which specific climate actions are accountable to each institution. Although there are local environmental institutions that coordinate environmental protection actions, they have not created an enabling environment for CBOs, NGOs, or private sectors in the city. The development of climate change strategies and implementation is highly dominated by state actors and CSOs, and the private sectors have played a limited role so far. The result also indicted that weak institutional arrangement, lack of information about urban climate change governance and limitation of policies, and regulations are the three major challenges faced by non -state actors involved in climate change issues in the city. Thus, the city administration should give attention to climate change mitigation and adaptations measures, create strong coordination among government institutions, and mobilize non-state actors at different levels in the city. The city administration should also revise the institutional arrangement of different sectors from the city to the woreda level, especially related to energy and climate change issues. The AAEPGDC should put more effort into engaging other government sectors, NGOs, research institutions, CBOs, business sectors, and residents through meetings, workshops and public forums and incorporate them as partners in the decision-making -process. The AAEPGDC should clearly identify climate change mainstreaming activates for each stakeholder and monitor and evaluate them through preparing a legal frame work, guideline, or memorandum of understanding.*

Key words: Climate change governance; Institution; Institutional interaction; Non-state actors; Role, Sectors in Addis Ababa, Ethiopia

4.1. Introduction

Institutions have long been considered central to governing climate change (Finnegan, 2019; Navroz and Dubash, 2021), and are most often discussed as the "rules of the game" prescribing interaction in different social domains; from local to international levels (Pradhan et al., 2012). While, people often use the terms "institutions" and "organizations" synonymously, the concept of institutions is not the same as that of organizations (Scott et al., 2021). Organizations are a specific kind of institution composed of groups of individuals working toward a shared goal, but they do not set the rules. In contrast, institutions include rules such as laws, regulations and their enforcement procedures (WB, 2010). Institutions defined as actors have a role in defining or governing the rules on which the specific sector functions (WB, 2010; Pradhan et al., 2012).

According to Mario (2018), institutions are based on formal rules, decision-making procedures, and programs that define social practices, assign roles to the participants in such practices, and govern the interactions among the occupants of those roles, as well as on informal constraints such as conventions and norms. Maria and Mark (2022), classified institutions into two categories: formal (constitutions, laws and property rights) and informal (sanctions, traditions, norms of behavior and codes of conduct).

In the absence of formal rules, a dense social network, repeated interactions, reputations and mutual knowledge lead to the development of customs, laws, trust, and normative rules that constitute an informal institutional framework (Andrew and Laurence, 2015; John and Mattea, 2017). It is important to consider the informal institutions that people relate to institutional norms and rules in taking climate action (Scott et al., 2021; Abbott and Faude, 2022). Informal institutions support or impede the development of climate change adaptation capacity (Pradhan et al., 2012).

Environmental institutions are entities that have a mandate to protect the environment from different hazards that affects directly or indirectly. It sets rules and regulations of the respective institutions that regulate the environmental matters (Zelli et al., 2013). Institutions have a central role in climate change governance. Climate change requires institutions to move towards a more collaborative and inclusive culture, improved dialogue, more integrated, multilevel, and holistic approaches (Aylett, 2013). This includes horizontal or multi sector and vertical integration (Bulkeley, 2010). Both formal and informal institutions

are crucial, including how various local government units are involved in climate change planning, implementation and mainstreaming (Aylett, 2014).

In urban governance schemes, institutions are usually established around specific areas such as transport, energy, waste, education, water, health, infrastructure, planning, green development, construction, housing and others within municipalities or at a citywide scale, which also interact with broader levels of governance including local, regional, national, international (Patterson and Huitema, 2018). These sectors have their own aims and have created conflicts of interests among them (Bulkeley, 2010; Romero, 2018).

However, to address climate change issues, individual institutions are not enough, and the city government must make networks of actors to be effectively engaged (Aylett, 2015). Establishing institutions at the appropriate scales, horizontal and vertical co-ordination among state actors, and partnerships between state and non-state actors have proved to be critical in building the resources and capacities of municipal governments to address climate change. However, for several years institution to manage mitigation and adaptation have been dealt with in isolation (Bulkily, 2010). Some institutions enact laws and policies while other institutions exercise government authority and enforce policies, creating institutional fragmentation that seriously affect climate change response (Joakim and Ingemar, 2021; Pattberg et al., 2022).

Integration of mitigation and adaptation strategies requires constellations of different institutions. Integration of the two strategies called “adaptigation” is a response to climate change that integrates adaptation with mitigation, to avoid conflicts and create synergies to address climate change more effectively in cities (Gopfert et al., 2019). According to Zelli et al. (2013) and Oberthür and Gehring (2006), strong institutional interaction is needed for taking adaptigation actions.

The meaning of interaction is similar with interconnection, interplay, interchange, interactivity interlinkage and it is mutual or reciprocal action or influence of two or more peoples, groups or institutions communicate with each other (Young et al., 1999; Joshua et al., 2022). Therefore, institutional interaction is a two-way engagement occurring process between institutions to achieve common goals (Oberthür and Gehring, 2006; John, 2006; Sanderink and Nasiritousi, 2020).

Institutional interaction also refers to the phenomenon that institutions influence each other in ways that are relevant for their development and effectiveness (Oberthür and Gehring, 2006;

John, 2006; Zelli et al., 2013; Joshua et al., 2022). The interaction between institutions require that one institution, the source institution, affects the development or performance of another institution, the target institution, in a cause-effect relationship accounting for the identified effect (Oberthür and Gehring, 2006; Liliya et al., 2021). Institution interact, which can broadly be understood as situations in which the policy processes, knowledge, norms, or functions of two or more institutions are connected, which in turn affects the development and performance of the respective institutions (Zelli et al., 2013). Effective institutional interaction avoids information, knowledge, ideas, and plans generated under one institution on negative effect of the development of another (Sanderink and Nasiritousi, 2020).

Institutional interaction is manifested by the existence of shared resources, visions, strategies, legal framework, or memorandums of understanding (Nasiritousi et al., 2014; Sanderink et al., 2020), as well as monitoring and evaluating performance (Zelli et al., 2012). Institutional interaction involves sharing resources such as technological, human, financial resources, and knowledge to respond to climate change (Muhammad et al., 2020).

Greater coordination among relevant actors (networks) increases institutional response capacity by avoiding policy gaps and encouraging learning between relevant departments or organizations regarding the effectiveness of the legal framework, the availability and use of information, and the mechanisms by which actors participate in decision making for climate change responses (Fariborz Zelli, 2011; Meinhard et al., 2012; Di Gregorio et al., 2019; Aylett, 2015).

Addressing climate change requires addressing interaction across sectors and governance scales, on climate policy integration and mainstream (Navroz, 2021; Finnegan, 2019; Jun and Shu, 2020). Assigning unique or independent institutions for climate change actions to coordinate actors is the cornerstone of climate change response (Mukhlis and Perdana, 2022).

Climate change solutions also require the collaboration of various none state institutions at different levels, whether in the prevention of greenhouse gas emissions or adaptation (Jannes and Jorg, 2013). Both strategies involve the interest of many sectors and actors. In cities, governments are not the only source of decision making in environmental issues. New actors also participate in the decision-making process to achieve effective adaptation and mitigation strategies (Armitage et al., 2012; Hughes et al., 2018; Worker, and Palmer, 2020), In addition to their own climate action, non-state actors can contribute to climate governance by developing new policies to support emissions cuts and build resilience. Knowledge exchange

and capacity-building have a role to play in helping state actors (Bäckstrand et al., 2017). Non state actors include NGOs, business groups, think tanks, trade unions, research institution and others (Kuyper et al., 2018).

Non-state actors play diverse roles throughout the whole policy process, from influencing policy makers to taking action, sharing information, building capacity, implementing policies, and setting rules (Nasiritousi et al., 2014, 2016; López-García et al., 2018; Dimitrovski et al., 2021). The more advanced a city is in its adaptation policy process, the more likely it is to address the private sector and citizens in its initiatives to adapt to climate change (Klein et al., 2018). However, the majority of adaptation and mitigation initiatives focus exclusively on the public sector and do not address the private sector or citizens (Susannah and Swenja, 2012; Bulkeley and Betsill, 2013; Veronica and Alberto, 2017; Ebba and Wamsler, 2019; Elia et al., 2022). Local governments do not effectively engage civil society actors, citizen, and the business sectors for climate change measures (Jason, 2020; Savitri, 2019; Marquardt et al., 2022; Mukhlis and Perdana, 2022).

In developing countries cities' capacity to fully engage and shape the landscape of non - state actors through agenda- setting, consulting in decision-making processes. and implementation is still piecemeal (Romero Lankao et al., 2018; Chan et al., 2019), Moreover, institutional failures are increasingly being exposed in practice in cities across the Global South through the increasing experiences floods and droughts' impact (Patterson and Huitema, 2018). According to Romero Lankao et al. (2018), due to the limited resources and pressing agendas of meeting basic needs, in these countries, GHG mitigation has a negative connotation because of the perception that this will deny them their basic right to growth in human services and economic activities. The prospects of reduced growth or no growth are not feasible, but the communities most likely to be affected by the impacts of climate change, and air pollution are worse in these countries' cities (Bulkily, 2010).

The key institutional weaknesses including insufficient inclusion of grassroots people, poor coordination among policy actors, ineffective decentralization, and limited attention to non-state actors are characteristics of cities in developing countries (Ampaire et al., 2020; Knieling, & Filho, 2013). The development of adaptation policies and strategies is highly dominated by state actors, while civil society organizations and local communities have played a limited role in the formulating climate change adaptation policies and strategies (Anwar, 2016).

In Ethiopia, institutions' functions, such as resource mobilization and allocation, capacity building, and the provision of leadership, could play a crucial role in promoting climate change adaptation (Desalegn et al., 2015) The degree of connectedness between government agencies and NGOs determines the effectiveness and efficiency resource mobilization (Firew et al., 2020). Good governance is a critical element in the efforts made to sustainably adapt to climate change (Azeb and Frank, 2019). On the contrary, weak connectedness of institutions and a lack of good governance could hinder effective climate change adaptation (Desalegn et al., 2015). Institutional interaction in Ethiopia is weak (Gebremedn et al., 2018; Sayer, et al., 2016). The study conducted by Damtie and Kebede (2012) and Dagne et al. (2022) shows that climate change mainstreaming is relatively strong during the planning process but remains weak during implementation of climate action.

Like in other countries, civil society actors are observable on the overall institutional landscape of Ethiopian society. However, due to specific contexts, compared to many other African countries, Ethiopian NGO/CSOs are not as developed in terms of diversity, and capacity (Chekole et al., 2021; Webster et al., 2020). Proclamation No. 621/2009 explicitly restricts the role of CSOs in general and NGOs in particular in Ethiopia. Additionally, NGOs face legal and administrative barriers, poor networking among NGOs, lack of capacity, lack of information, and a lack of a clear role on policy issues as constraints for influencing policies (Ariti et al., 2018). The major challenges faced by actors involved in climate issues in the country are a low level of interaction among actors, slow speed of information dissemination in the network of actors, lack of human and financial resources and, weak monitoring and evaluation systems (Abonesh et al., 2020).

Although Addis Ababa is suffering from climate change impacts and is making the residents vulnerable to various climate risks, the methods of dealing with such problems are ineffective (AEPGDC, 2020; Addis et al., 2022). Weak institutional interaction is the prominent challenges among government sectors and non-state actors. Different government sectors, including transport, energy, waste, green development, urban planning, construction, housing, infrastructure provision, education and others sectors, community-based organizations, and other civil society organizations are responsible to address climate change. However, although the EPGD is trying to mainstream climate change issues in more than 22 sectors, the level of coordination is incredibly very weak (Adds Ababa resilient project office, 2020; Addis et al., 2023). Climate change governance is limited to government institutions, namely, AAEPGDC and there is a lack of involvement of non-state actors.

The objective of this study is to improve our understanding of the interaction between actors in climate change governance in Addis Ababa City. To achieve this, we identified the key institutional government actors involved in climate change governance, assessed the interactions between them, and examined their roles in climate change response actions. Additionally, we assessed the contributions of non-state actors, especially NGOs and private entities, in climate change actions. Subsequently, we assessed the challenges faced by non-state actors in climate change governance in the city.

4.2. Research Methodology

Because the nature of the problem requires an in-depth description of the interaction of different institution and the contribution of actors in climate change response action in the city, a descriptive research design and mixed research approach were employed. For this study the level of institutional interaction and role of non-state actors collected variables are all ordinal. The quantitative data were collected using a questionnaire as a tool. The questionnaire, which consisted of five-point Likert scale questions, was prepared and distributed to 232 experts. The indicator variable data was originally collected by using a five point Likert scale (The choices are 1= Very low (hardly connected), 2= Low, 3= Moderate, 4= High, and 5= Very high (closely connected). However, for computational purposes, it was recoded into three categories: 'low', which included 'very low' and 'low'; 'medium', which included 'moderate'; and 'high', which included 'high' and 'very high'.

The variables for this study were developed from different sources. There have been debates as to which indicators or variables to assess the level of institutional interaction in climate or environmental governance. Based on conceptual and empirical studies reviewed, the three major indicators or variables (decision making process, information and Knowledge and resources), and specific components under each indicator were used to assess the level of interactions adapted from (Oberthür and Gehring 2006; Zelli et al., 2012; Sanderink, 2020; Sanderink and Nasiritousi, 2020).

Decision making process which includes: existence of interdependence of commitments, principles or objectives, existence of institutional arrangements that promote mutual benefit about climate change actions, existence of collective decisions making method like memorandums of understanding climate change actions, existence of consultation mechanism with other sector before that sector decides its annual plan or any programme regarding to climate change governance, existence of shared performance measurement

system to evaluate the implementation of strategies or plans. The other indicator is information and knowledge which includes: sharing of information, existence of information transmission means, and sharing of knowledge about adaptation and mitigation measures. Resources are also another indicator to assess the level of institutional interactions which includes: sharing of expertise, technologies finance to support climate change measures.

Based on the above three major variables, a questionnaire containing 15 questions were developed and administered. Data were collected from experts using this questionnaire. After collecting the data, the 15 questions were computed and reduced back to the three variables. Descriptive statistics were then obtained and presented under each climate governance mode in the following sections. The above quantitative data were analyzed, summarized and presented in different statistical forms, including descriptive statistics such as frequency, percentage and mean used to describe the results. The results from qualitative studies were summarized in the form of description such as texts and direct quotes along with the quantitative survey results.

4.3. Results and Discussions

4.3.1. Organizational Structure of AAEPGDC

The AAEPGDC, directly accountable to the Mayor, is mandated to govern the environment in general and climate change issues in particular in the city. It is responsible for establishing the GHG emissions data and climate mitigation and adaptation measures, and working with other sectorial institutions in the city.

Figure 11 shows the structure of the AAEPGDC of Addis Ababa, which includes the Botanical Garden and the Green and Watershed Development Agency, both under the control of the commission. The commission also has two major departments: the environment and climate change department and the natural resources monitoring and licensing department, which incorporate two directorates and six teams. The environment and climate change department has one directorate, the environmental pollution and climate change directorate, which as six teams. From these teams, climate change protection strategy implementation and monitoring team is mandated to manage the city's climate change issues and work on climate action mainstreaming.

The team works in line with other city institutions in planning, measurement, monitoring and reporting of climate action. However, But, working with other institutions is difficult when

the climate issues are managed at the team level, showing that climate issues lack attention from EPGDC itself. In other regions of the country, climate change is led by the directorate or department level. The EPGDC has also faced challenges in horizontal integration with other city sectors, including transport, waste, housing, planning, and land use, among others. It also has weak vertical integration and cascading of climate action to the sub- city and woerda level.

Another team from the environmental pollution and climate change directorate is energy. However, this sector also lacks attention from the city administration, even though it is the third greenhouse gas emission sector after waste. As shown in Figure 11, the energy team is found at the team level, but it should be found at the city agency level or even in the directorate level in EPGDC.

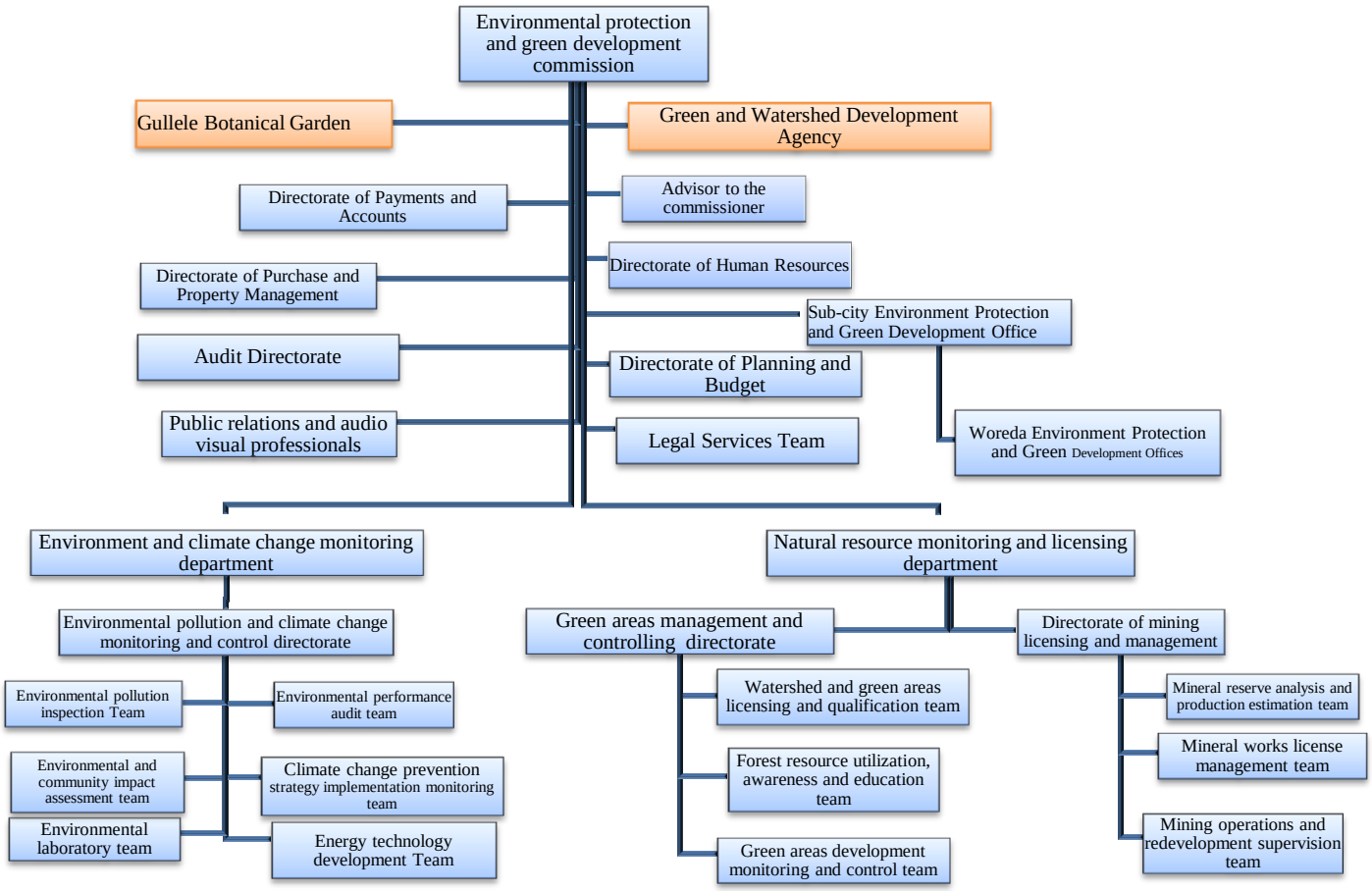

Figure 11: Organizational structure of AAEPGDC Source: AAEPGDC, 2022

Institutional structures have mostly been established to facilitate coordination between government sectors and none state actors. In Ethiopia, environment forest and climate change commission is involved in institutional learning at different levels, but it has affected by repeated restructuring of this institution (CAT, 2020). The institutional structure of the main environmental authority, now the EPA, has repeatedly changed since its establishment as the Environmental Protection Authority in 1995. In 2013, the EPA was upgraded to the Ministry of Environment and Forest, gaining responsibilities of the Ministry of Agriculture related to

forestry as well as an explicit mandate in relation to CRGE and deforestation activities (CAT, 2020).

Two years later, the ministry was renamed the Ministry of Environment, Forest and Climate Change, and given additional responsibilities and an improved mandate to address climate change. In 2018, the ministry converted to a federal commission, and the name changed to the Environmental, Forest and Climate Change commission (EFCCC). In 2022, it changed to Ethiopia Environmental Protection Authority and there will be a process to move the forest to Ethiopia forest development and climate change move to Ethiopia Planning ministry. These repeated institutional shifts have exacerbated issues of high turnover of staff and lose of institutional memory (CAT, 2020).

4.3.2. Institutional arrangements of AAEPGDC

Institutional arrangements affect the planning and implementation of strategies and plans as well as shaping the relationship between the state and non-state actors. An institutional arrangement incorporates existence of clear roles, responsibilities, legal frameworks, accountability systems, availability of resources. Some of the interview responses of officials and experts regarding to institutional arrangements provide as follows.

An interview with AAEPGDC commission commissioner provides insights into the major factors that hinder environmental matter in general and climate change action in particular in the city. The commissioner stated that: “The major factors to take mitigation and adaptation action in city is inadequate finance that allocated from city adminstration” [Interview, 10 August 2021]. He added that,“Even though, proclamation number 64, 2019 redesigning city administration gives the mandate to manage and control environmental protection activities to AAEPGDC, the proclamation lacks clarity about regulatory issues or power. The commission mainstreamed climate change actions for different sectors; however, the commission has no authority to control, evaluate, sanction, and make accountable the work of the sectors. Such power is vested to city administration. Mandate or responsibilities in the absence of power to enact laws and sactions led to the ineffectiveness of institutional arrangements (Sisay et al., 2016).

Another interview held with Addis Ababa City Environmental Protection and Green development commission climate change mainstreeming expert, showed the problem of institutional arrangements and capacity:

The institutional capacity is also constrained by frequent changes in institutional arrangements, and limited funding, inadequate knowledge of staffing regarding GHG emissions, inventory, adaptation and mitigation action especially at sub city and woreda levels to climate change actions. In addition shortage of human resources knowledge about climate change responses, still some woredas does not have expert on climate change.

4.3.3. Institutional interaction of AAEPGDC with other government sectors

No single institution plays a dominant role in the governance of climate change, but a network of actors or institutions is involved. Especially in climate change, there needs to be interaction among different institutions. As described in the introduction part institutional interaction is termed as the policy processes, knowledge, norms, or functions of two or more institutions are connected, which in turn affects the development and performance of the respective institutions (Zelli et al., 2013; Sanderink and Nasiritousi, 2020).

Currently, climate change adaptation and mitigation actions are fragmented across different government sectors in the city. The lead institution for climate change issues is AAEPGDC, which has mainstreamed climate change issues in more than 22 government sectors. For this study, we selected seven major sectors to analyze the level of institutional interaction with AAEPGDC. The commission provided data on 22 sectors, and based on this information, we determined that these seven sectors exhibited a comparatively higher level of connection with AAEPGDC. Table 17 shows that the majority of respondents, 80.3% for waste management and 75.4% for green development, consider institutional interaction in the city to be ‘‘high” or closely connected. As shown in table 17 the results show that out of all sectors, AAEPGD offices at different levels have good interaction or interconnected with waste management offices and green development offices, respectively. In this case, the result may be related to the fact that these two sectors have offices at the sub- city and woreda levels. Other sectors, such as transport, energy, urban planning does not have offices at sub city and woreda levels.

Table 17: Institutional interactions with AAEPGDC for climate change response

Responses	Transport Office	River Basins &green Areas Dev't	Construction	Waste Management office	Energy	Land Management	Urban Planning
Low	159(72,6)	26 (11.9)	167 (76.3)	12(5.5)	195 (89)	161 (73.5)	152(69.4)
Moderate	42 (19.1)	28(12.7)	37(16.9)	31 (14.2)	10(4.6)	35 (16)	47 (21.5)
High	18 (8.3)	165(75.4)	15(6.8)	176 (80.3)	14 (6.4)	23 (10.5)	20 (9.1)
Total	219 (100)	219 (100)	219 (100)	219 (100)	219 (100)	219 (100)	219 (100)

Source: Survey, 2021

4.3.3.1. Waste management office:

The Addis Ababa city environmental office at city, sub- city and Woreda level and west management office have a better interaction. Both offices have branches at the sub city and woreda level. At the city level the waste management agency has its own objectives to manage waste and decrease emissions from it. During an interview with the Waste Management Agency's Training Project Manager, he said that Addis Ababa city is part of an international network on waste management. He added that "composting, recycling and waste- to- energy practices are the main methods used in the city to manage waste and reduce of emissions from it" [Interview, 8 July 2021].

In addition, to mitigate methane emissions from waste, the agency implements methane gas damping on the ground and burns the gas, resulting in a reduction of CO^2 emissions by 16-25%. However, low public participation, problems with attracting NGOs, creating awareness, and coordination with stakeholders are major challenges in waste management. Although, there is a memorandum of understanding with actors it is not put it into practice, and there is no evaluation system. Weak law enforcement of AAEPGDC regarding some regulation is also a challenge for waste management. For example, the regulation does not permit the production of pastel size of 0.03 millimeters, but there is a huge amount of pastel waste in the city. Waste Management remains a problem still in Addis Ababa city (Dusseau et al., 2023).

4.3.3.2. River basins and green areas development office:

Regarding the interaction of AAEPGDC with River Basins & Green Areas Development Agency, it shows closely connected, because at the city level, the agency is under the control of EPGDC. The organizational structure and interaction of this office is better at the sub- city and woreda levels. However, at the city level, the AAEPDC has faced challenges related to green area development. According to an interview with the Addis Ababa Green Development Research Monitoring and Management Directorate Director, there is a serious problem related to implementation.

The major issue is land garbling. Although the plan shows a green area, when the go to the place, it has changed to other land use both legally and illegal. Due to this, 655 maps have changed to other land use legally through map garbling and they have filed complaints and are processing the issue through the law. Addis Ababa has a plan to plant 7 million trees every year, but there is no space available. In terms of green area development, Addis is at risk, due to weak law enforcement and lack of coordination among major sectors such as city planning, city mayor, land management agency, and AAEPGDC. The city administrators view the green spaces as wasted places. Implementing green legacy in Addis is a great challenge. The media and the reality on the ground about greening in the city are different [Interview, 12 June 2021].

The loss of green spaces in Addis Ababa due to current development practices and changing urban land use is exacerbating landslides and flooding within the city (Arisiso et al., 2018). Therefore, Preserving of green spaces is an important resilience strategy for the city (Dusseau et al., 2023). However, the lack of adherence to plans and institutional structures that impede coordination and collaboration among city agencies are the major barriers to the preservation of green spaces in Addis Ababa (Ayele et al., 2022).

4.3.3.3. Transport office:

The institutional interaction between Addis Ababa transport office and AAEPGDC is very weak. The interaction between the two at different levels is poor, as shown in the table above. The majority of the respondents (72.6%) consider the interaction with transport offices to be low while 19.1% and 8.3% of respondents consider it to be moderate and high, respectively. This result may be related to the absence of transport office at the sub-city and woreda level. In an interview with transport head, the transport office stated that they have interacted with

AEPGDC and have attempted to minimise emissions from transport through promoting biking and walking. Despite the transport office's efforts to device strategies and implement measures to minimise the emissions, transport remains the major or first GHG emitting sector in the city.

4.3.3.4. Construction office:

The construction office is another sector that has integrated climate change issues, but is characterized as low by 76.3% of respondents, with 16.9%considering moderate and 6.8% considering it high. The interaction between AEPGDC and the construction office at the city level is very weak, and at the sub city and woerda level, it is almost non-existent. One interviewee from Addis Ababa City Construction Permit and Monitoring Authority stated that:

> *The authority promotes eco- friendly construction material and there is a list of such construction materials, but it is not mandatory, and there are no clear regulations regarding construction materials. With regard to green areas, the Building Standard of 2010 stipulates that every 100 meters should have one planted tree, and 30% of land from residential housing, 20% from commercial, and 15% from industry should be allocated to green areas, but this standard is not properly implemented. Comparatively, the industry sector practices this more. The problem is related to the organizational structure from upper to lower levels, with no clear responsibility, and accountability system in the sectors.*

Informal construction practices in environmentally sensitive areas exacerbate climate change, especially floods in the city (Dusseau et al., 2023).

4.3.3.5. Energy

Table 17 above shows that a large portion of respondents 89% indicated that energy is a sector with very week interaction (hardly connected) with AAEGDC in climate change response actions. The remaining respondents are split between considering it to be moderate (4.6%0 and high (6.4%). At the city level, there is no energy agency or office like in other region of the country. Instead, there is a team within AAEPGDC called Energy Technology Provision Team responsible for implementing mitigation measures related to energy by

providing energy-saving materials, supporting energy-saving material providers, and checking the quality of solar materials.

According to the Energy Technology Provision Team Leader, alternative energy like solar energy is necessary, especially during power interruptions, but the city administrator and AAEPGDC itself do not give attention to energy. The redesigning of Addis Ababa city administration in the 2019 proclamation does not consider the energy sector. Energy is the third largest GHG- emitting sector in the city. Although electricity coverage is good in the city power interruptions are a serious problem of Addis Ababa. Solar energy is crucial in the city, but it is not considered in the city administration as a solution to minimize GHG emissions. The main challenge is the lack of attention by city government and AAEPGD in organizational structure at different level. The structure is only found as a team within the commission, and it does not have a branch at the sub- city and woreda levels [Interview, 6 June 2021].

4.3.3.6. Land management:

As shown in Table 17, a large number of respondents (73, 5%) characterized the interaction between the land management office and AAEPGDC in climate change response as low, while the remaining 16% and 10.5% of respondents indicated that the interaction is moderate and high, respectively. During interviews with the two offices at different levels, it was clear that the relationship is very poor. In terms of incorporating climate and resilience concerns, the land management office is ineffective in the city (Dusseau et al., 2023).

4.3.3.7. Urban planning:

The above table also shows that 69.4% of respondents perceived the interaction between AAEPGDC and the Addis Ababa city planning office as low, while 21.5% perceived moderate, and 9.1% perceived it as high. During a discussion with the Addis Ababa city Plan Commission Environmental Leader provided that:

> *The Addis Ababa city 10-years plan divides the city's land into three parts: 30% for green area development, 30% for road and other infrastructures and 40% for buildings. The commission has attempted to implement mixed land use to minimize mobility and emissions, but there are challenges in implementing green spaces. Green area land has been converted for other uses. For example, one park area was changed to a hospital by higher official, including the mayor's office, while*

another park has been occupied by informal settlers and destroyed green areas. Many public spaces have been changed to other uses, including informal settlements. The major challenges include a lack of awareness among higher officials about the importance of green areas for the city and a focus on construction of different buildings. City administrators view open space for green areas as a waste of land. Another challenge is the lack of coordination among officials or sectors and the absence of accountability systems among offices. The AAEPGDC itself lacks the identification, follow-up and implementation of green spaces [Interview, 25 September 2021].

The AAEPGDC is working on mainstreaming and supporting sectors but without implementation, monitoring, and evaluation guidelines. However, there is no specific proclamation, legal framework, or even a memorandum of understanding with mainstreaming sectors indicating which specific issues each institution is accountable for. All those sectors are accountable to the city mayor and municipality, not for EPGDC. As a consequence, legally, the relations between these institutions have not been clearly demarcated, and this absence of implementation, monitoring and evaluation guidelines leads to failure of climate change action in the city. Studies shows that institutional interaction is manifested by existing shared visions, strategies, legal framework, or memorandums of understanding (Oberthür and Gehring, 2006; Nasiritousi et al., 2014; Sanderink et al., 2020). Institutional interaction involves sharing recourses such as technological, human, financial resources and knowledge to respond to climate change (Bulkeley and Kern 2006; Muhammad et al., 2020). However, almost none of the sharing of resources or strategies exists among institutions for climate change response action in Addis Ababa city. Currently, in the city, climate change governance is a new issue.

Climate change governance activities should be the responsibility of all stakeholders, who are expected to initiate collaborative structures to deal with the problem. However, in Addis Ababa, the task of mobilizing and organizing various sectors into a collaborative platform to deal with climate change action is assumed to be the responsibility of only a few stakeholders, or only AAEPGDC while other stakeholders remain unconcerned unless they are pushed. One of the most important challenges is the poorly understood processes of institutionalizing climate change planning within city agencies, and building effective accountability systems. Institutional instability, loss of institutional memory, and frequent

turnover of responsible bodies are also challenges for the EPGDC. In general, the Addis Ababa city government institutions lack collaboration to enforce strategies and plans.

4.3.4. Institutional interaction at each administrative level

Climate change response actions require both horizontal and vertical interaction of actors. Figure 12 illustrates the involvement of different sectors in climate change response measures at various levels based on the above institutional interaction indicators and specific components. As shown in the figure, 64, 3% of respondents at the city level reported that the interaction of institutions in climate change governance is high, while 21.4% and 14.3% respondents considered it moderate and low, respectively. At sub-city level, 63.1% of respondents indicated that interaction is low in response to climate change. The remaining respondents were divided between moderate (16.9%) and high (20%). At the Woreda level, a significant proportion of respondents (86.4%) indicated that interaction in climate change governance is very low. The remaining respondents answered moderate (7.9%) and high (5.7%), respectively.

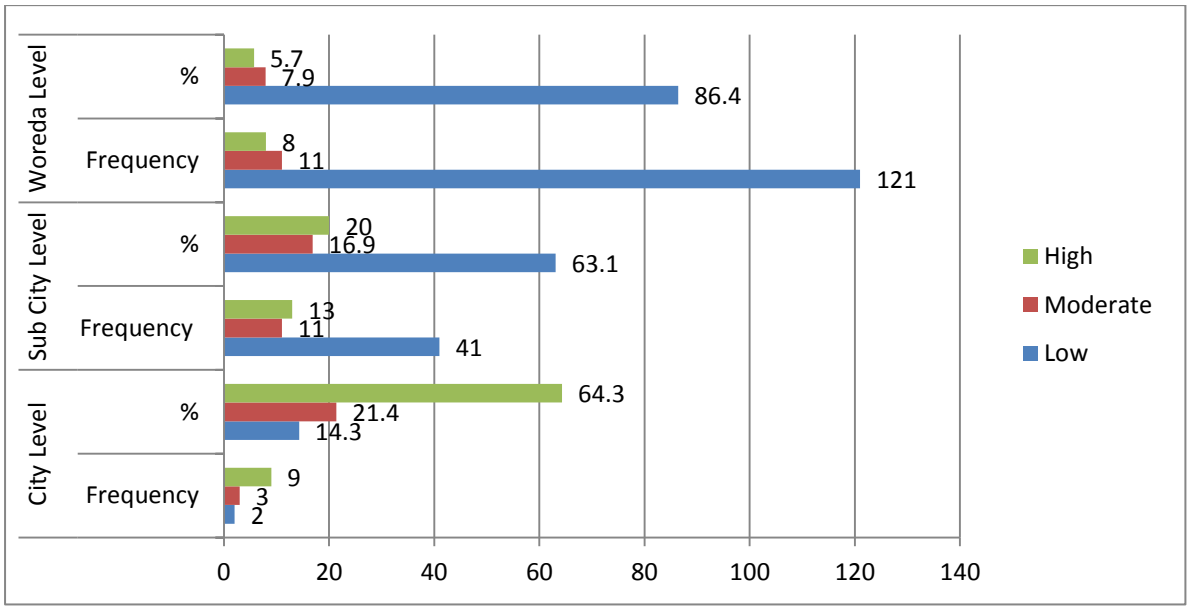

Figure 12: Institutional interactions in climate change actions at each level.

Source: Survey, 2021

As seen in Figure 12 institutional interaction level in climate change response action is better at the city level, while at the sub city and woreda level, institutional interaction in climate change action is weak. During interviews with sub cities and woreda officials and experts, they assured that climate change issues are not clear, and even training is lacking, causing a

knowledge gap about Addis Ababa CRGE. At sub city level, they only measure water and sound pollution when woredas inform them of a problem, but lack awareness of GHG emission issues.

At the woreda level**,** the climate change and pollution team said their major activities are reporting sound pollution to the sub cities only when there is a complaint from residents, and they lack understanding of concepts related to GHG emission, air pollution, and climate change issues at this level. In the present time, the causes of climate change, impact, and response actions are well understood at the city administration level, but the cascading of climate change issues at the lower levels is poor. Studies have shown that to address climate change challenges in the city, coordination of the lower tiers of government is crucial (Gopfert et al., 2019; Firew et al., 2020).

4.3.5. Role of none state actors in climate change governance

Other than government actors, non-state actors have significant roles in climate change governance (Nasiritousi et al., 2014; Linda, 2016; Smedby, 2016). To obtain empirical results from the respondents, we asked about the status of involvement of non-state actors in climate change governance in Addis Ababa city. According to figure 13, 82.2% of the total respondents considered the involvement of civil society organizations (CSOs) in climate change action as low, while, 13. 2% and 4.6% responded as moderate and high, respectively. This shows that the participation of NGOs, private sectors, research institutions, and others in climate change response action is very week.

In an interview with, a federal CSOs agency about why these organizations are poorly involved in Addis Ababa city, he discussed that CSOs are involved based on proclamation No.621/2009, which constitutes different principles that frame the relationship between civil society and the government. Hence, the government promotes their involvement in areas related to women, children and youth, health, education, disability, aged people, agriculture, food security and environment in remote and rural areas (Ariti et al., 2018).

Another interview held with Addis Ababa City CSOs and Cooperation Monitoring Directorate Director. The director's perspective is that, as a city CSOs director, over 300 organizations have participated in HIV/AIDS, orphan, disability, women, COVID, and related issues, but no CSOs were engaged in climate change issues during this work. [Interview, 12 June 2021]. He speculated that this is due to the lack of promotion of climate change as an agenda or the issue not being reputably raised in different areas like women or

other issues. Forum for environment leader raised a problem regarding proclamation No.621/2009, stating that they have done many things in the city, but during the interview, they already stopped the activities. In another interview held with Leme Ethiopia, it was said that the city administration has not created an enabling environment to participate in climate change issues.

The major CSOs that involved in climate change mitigation and adaption action in the city is C40. According to an interview held with AAEPGDC climate change mainstreaming expert regarding to role of C40, he said that "C40 advisor are involved in providing GHGs emissions information, providing training for stakeholders, proposing viable solutions to climate change, taking actions on climate change mitigation and adaptation" [Interview, 25 July 2021].

Regarding the participation of private sectors, Figure 13 shows that a significant proportion of respondents (72.1%) considered the involvement of private sectors in climate change response action in the city to be low. The remaining respondents reacted that the private sector participation was moderate (20.6%) or high (21%).

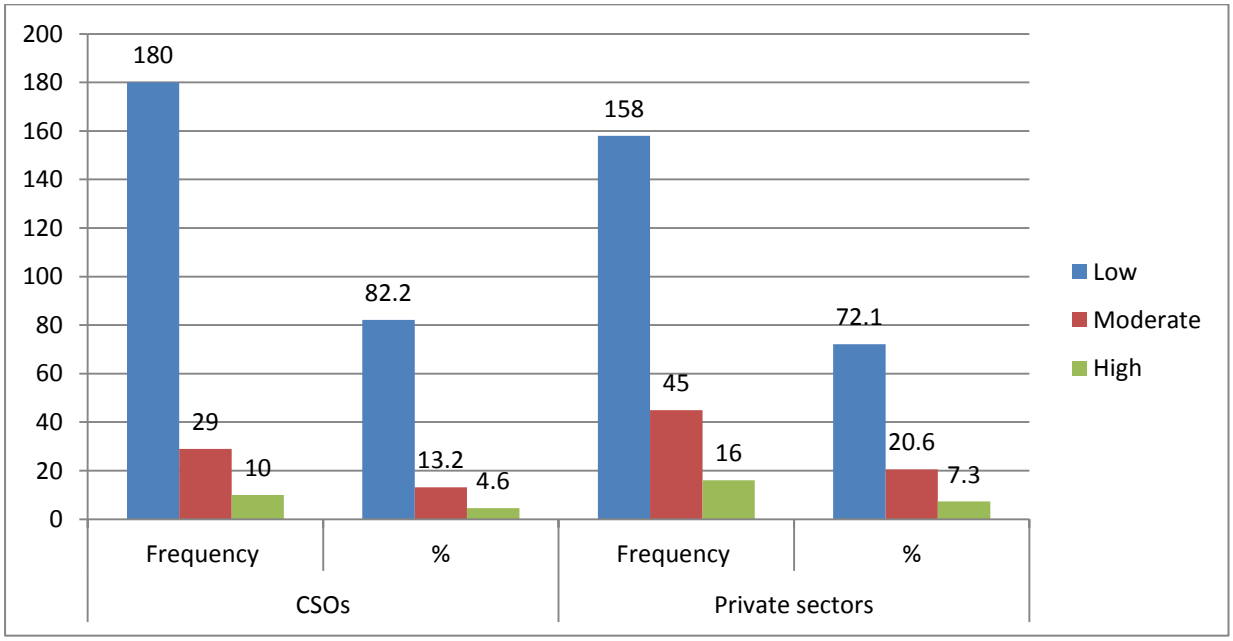

Figure 13: Involvement of non-state actors in climate change governance

Source: Survey, 2021

One of the non-state actors that form a governing partnership in the city is the private sector. According to an interview held with a commission climate change mainstreaming expert

regarding to role of private sectors, he said that "the private sectors are involved in green development and waste minimization through preparing environmental management planning in Addis Ababa City" [Interview, 25 July 2021]. Additionally, the director of the Green development Research Monitoring and Management Directorate stated that the private sectors participate in the green beatification of different places in the city through agreements, such as 40/60 meter tree planting, and they benefit from the promotion of their businesses. However, according to previous studies, if CSOs and the private sectors are not sufficiently involved in urban climate change measures, climate change governance is ineffective (Klein et al., 2018). The more advanced a city's adaptation process is, the more likely its adaptation activities address the private sectors and citizen (Klein et al., 2018).

Although there are local environmental institutions that manage environmental protection actions, they have not been created an enabling environment for CBOs, NGOs, or private sector involvement in Addis Ababa city. The development of climate change strategies and implementation is highly dominated by state actors in the city, with CSOs and the private sector playing a limited role. As a result, the interests of non-state actors are not adequately reflected in climate change responses actions in the city. The city administration in general and the AAEPGDC, in particular, have failed to act effectively on climate change issues and create space for non-state actors. Government institutions alone cannot address all climate issues, and additional actors are needed to address the issues. The government has not formalized strategy to engage non-state actors and has limited influence on decision-making related to climate change in Ethiopia (CAT, 2020).

4.3.6. Participation of non-state actors' in climate change governance in the future

According to Nasiritousi et al. (2014), the main participation areas of none state actors include influencing the climate change agenda, Proposing viable solutions to climate change, providing information and experts, influencing decisions and policymakers, raising awareness of climate change among the public, taking actions on climate change mitigation and adaptation, evaluating consequences of policies and measures, representing public opinion on climate change issues and representing marginalized voices. These activities are used to identify where non-state actors have participated during policy formulations and implementations of climate change in cities.

Because of the very weak participation of private sectors and CSOs in climate change response action in the city, we asked the survey respondents (experts) to prioritize or rank the

major governance functions the non-state actors to be involved in the future. From the seven governance functions, the majority of 84 (38.4%) respondents indicated that it is good for non-state actors to be involved in mitigation and adaptation action. Second, 51 (23.3%) respondents prioritized non-state actors' participation in the provision of information and expertise. Third, 44(20.1%) respondents prioritized non- state actors' being involved in problem identification or agenda setting for climate change response action in the city. The rest, representing public opinions, evaluating consequences of policies and measures, awareness raising, and influencing decisions and policy makers, were ranked at 6.8%, 5.4%, 3.7%, and 2.3% respectively.

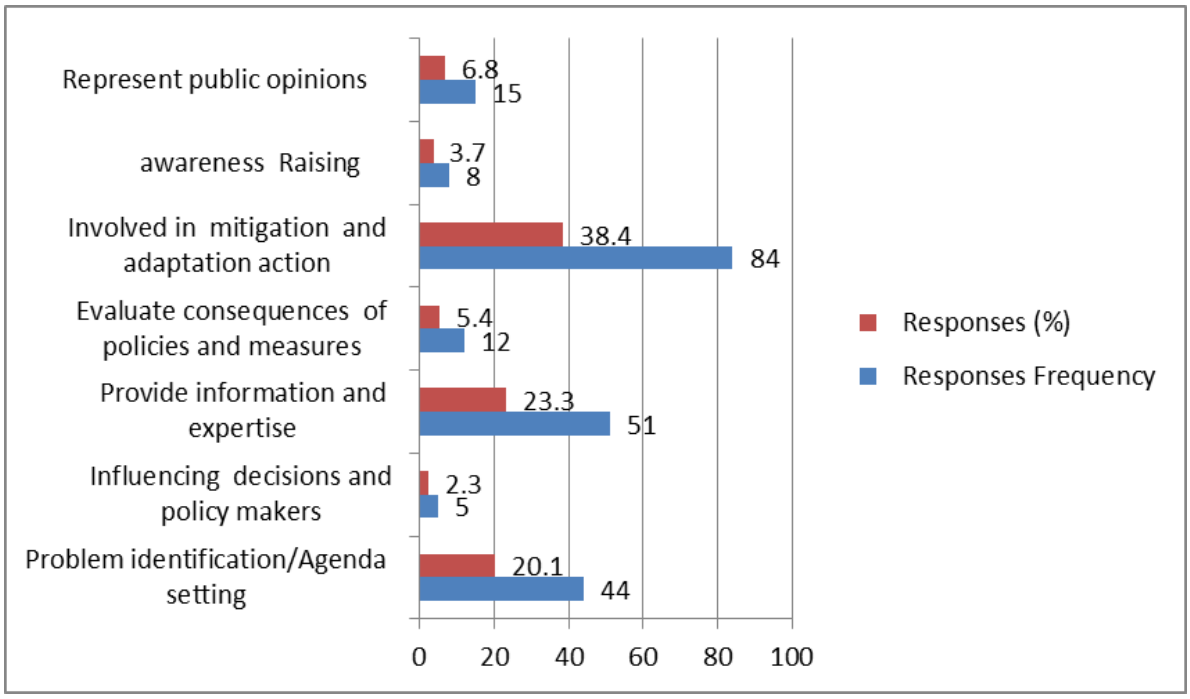

Figure 14: Governance functions perform by none state actors in the future

Source: Survey, 2021

4.3.7. Challenges of non-state actors' participation in climate change governance

There are numerous challenges that non-state actors encounter in participating in the governance of climate change in the city. This section highlights the major challenges that impede different actors other than the government from involving in climate change governance in the city. According to respondents from CSOs and Private sectors, 52% indicated that weak institutional arrangements are the major challenges to participate in climate change issues. Figure 16 show that the second challenge is a lack of information about urban climate change governance, with 27.8% of respondents highlighting this issue.

While, the participation of CSOs especially NGOs, research institutions, and private sectors, in climate change action is very significant, the current understanding about the role of these actors in the Addis Ababa city in climate change governance has been very low.

Climate change and its response measures in the city are still relatively new topic or issues. According to the respondents from CSOs and Private sectors representatives the third challenge in the participation of climate change action is the limitation of policies and regulations 6.7%. The absence of clear legal frameworks is a serious impediment to the involvement of non - state actors (NSAs) in the decision making process. Corruption is also another challenge, accounting for 5.3 %, along with the unwillingness of the government to allow non- state actors' participation in climate change governance, (5.2%), and a lack of capacity of the organization at 3%.

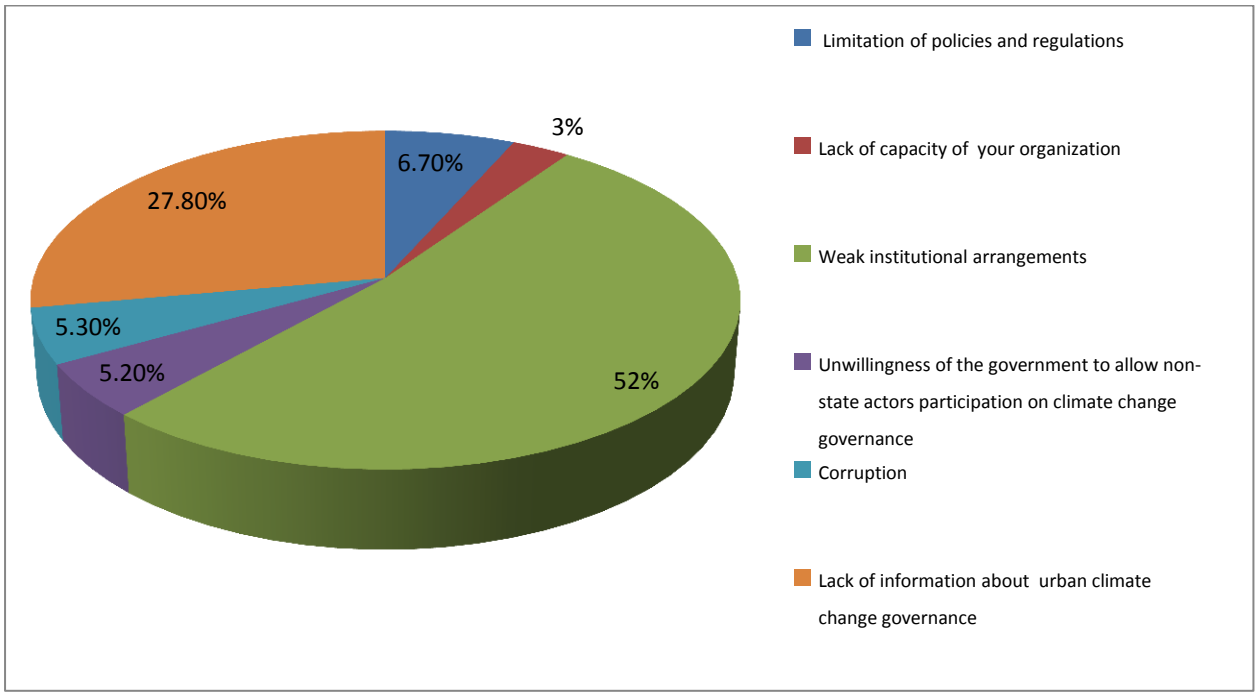

Figure 15: Challenges of non-state actors in climate change governance

4.4. Conclusions

Institutional interactions with different actors are the milestones of climate change governance in cities. This study was conducted in Addis Ababa city on the institutional interaction of both government sectors and non-state actors' roles. The result found that other than waste management and green development offices, the AAEPGDC has very weak interaction or relationship with other government sectors in climate change response action, even though the commission mainstreams climate change issues in more than 22 sectors. Comparatively institutional interaction is good at the city level, while at the sub city and woreda level, it is found in a very poor condition. Institutional arrangements are also major problems in the climate change governance of the city. In the city, energy and climate change are found as a team in AAEPGDC. In other regions of the country climate change is led by the directorate or department level. Energy also lacks attention in the city; even though this sector is the third greenhouse gas emission sector next to waste. The AAEPGDC has also weak vertical integration and cascading of climate action to the sub city and woerda level.

Even though the AAEPGDC has the mandate to control overall environmental issues and mainstream climate change in several institutions, the coordination is very poor to respond to climate change. The AAEPGDC is working on mainstreaming and supporting the sectors, but without implementation, monitoring and evaluation guidelines. However, there is no legal framework, or a memorandum of understanding with mainstreaming sectors indicating which specific issues are accountable to each institution. All those sectors are accountable to the city mayor and municipality, not to AAEPGDC. As a consequence, legally, the relations between these institutions have not been clearly demarcated, and this absence of implementation, monitoring and evaluation guidelines leads to ineffectiveness of climate change action in the city.

Climate change governance activities are expected to be the responsibility of all stakeholders. All stakeholders are expected to initiate collaborative structures to deal with climate change. However, EPGDC is responsible for mobilizing and organizing various sectors into the collaborative platform for climate change action, while other stakeholders may remain uninvolved unless they are encouraged to participate. Some of the most important shifts underway have to do with the poorly understood processes of institutionalizing climate change planning within city agencies, and building effective accountability system. Lack of coordination is the major challenge not only for climate change issues but also other issues in

the city. Because of frequent turnover of responsible bodies, loss of institutional memory is also a challenge for AA EPGDC.

Effective climate change governance involves public, private sectors and CSOs, but in Addis Ababa city, the development of climate change strategies and implementation is highly dominated by state actors. CSOs and the private sectors have played inadequate role. Non states actors' interests are therefore not reflected in climate change response actions in the city. Generally, the city administration, in general, and the AAEPGDC, in particular, has failed to act effectively on climate change issues, leaving little space for non-state actors. The city government does not have a formalized strategy to involve non-state actors and has limited influence on decision-making related to climate change issues.

There are numerous challenges that non-state actors face hindering their participation in the governance of climate change in the city. Among these, weak institutional arrangements, lack of information about urban climate change governance and limitations of policies and regulations are the three major challenges to participate in climate change issues in the city. Thus the city administration should give attention to climate change issues and create strong coordination among government institutions and mobilize non-state actors at city level. The city administration should revise the institutional arrangements of different sectors from city to woreda level, especially related to energy and climate change issues through revision proclamation.

The AAEPGDC should emphasis continuing to inform, consult, and engage with different stakeholders about climate change adaptation and mitigation actions, including government sectors, NGOs, research institution, CBOs, business sectors, residents and others through meetings, workshops and public forums. They should incorporate these stakeholders as partners in the decision-making process to achieve the carbon neutral goal of the city in 2050. Climate change mainstreaming and integration of adaptation and mitigation issues within city sector structure are still at an early stage. Hence, the AAEPGDC should undertake appropriate climate change mainstreaming activates among different stakeholders and monitor and evaluate them by preparing legal frame work, guidelines, or memorandum of understanding.

Chapter Five: Modes of Climate Governance in Addis Ababa City, Ethiopia

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Abstract: Nowadays, local-level climate change measures are crucial for national climate change responses. This research aims to assess climate protection actions in Addis Ababa city, Ethiopia, by using different modes of climate governance such as self-governance, providing, enabling, and regulation. Both primary and secondary sources, as well as quantitative and qualitative research approaches were employed for this study. For data analysis, descriptive was used. The study found that climate change mitigation and adaptation measures are mostly deployed by provisioning and self-governing climate governance modes in the city. When it comes to governing climate change, through enabling and regulation are very weak practices of climate governance modes in Addis Ababa city. While partnership with other actors plays a significant role in climate action, the Addis Ababa city environmental and green development commission lacks cooperation with non-state actors. In addition, climate governing by authority mode is also a poor practice in the city. The legal authority to manage climate change mitigation and adaption action rests with the city administration sectors. Although, different sectors in the city administration have included climate issues in their planning, they are not mandated to do so. Currently, climate change mitigation and adaptation measures remain for the most part a voluntary task of the sectors in the city. There is a lack of regulation, laws, weak enforcement of regulation, lack of strong accountability or use of a sanction system. In this study, we conclude that in the city, the provision of infrastructure and service and self-governance are dominant climate governance mode, whereas governing be authority or regulations and governing through enabling are hardly applied in all sectors of Addis Ababa city. Thus, considering the limited studies on the climate change governance in the city, the Addis Ababa city environmental protection& green development commission should organize a range of actions such as conferences and workshops to raise awareness of climate change and its impact. It should enhance enabling mechanism for non-governmental organizations, research institutions, and private sectors involved in climate change mitigation and adaptation actions. The city administration should also apply strict rules and regulations with strong accountability systems in mitigation and adaptation measures.

Keywords: *Urban climate governance; City administrators; Modes; Mitigation, Addis Ababa.*

5.1. Introduction

An urgent reduction of greenhouse gas GHG) emissions require political and economic responses at global, national and local levels due to the increasing impact of climate change on the world's climate systems (Bulkeley et al., 2009). Local governments are considered to be on the front line of efforts to address climate change impacts by aligning their resources and services to reduce GHG emissions in cities (Bulkeley and Kern, 2006). In order to address the challenges of climate change, attention needs to be focused not only on the international level but also on how climate protection action is taking shape at the local level (Bulkeley and Kern, 2006).

Previous studies have highlighted the need for a response to climate change at the national and internationals, through conventional policies and procedures (Kern and Alber, 2008; Bulkeley et al., 2009). However, recent research has challenged the effectiveness of traditional administrative procedures and methods that rely on international and national regulations, recognizing that GHG emissions need a collective effort at the local and regional levels (Bulkeley & Kern, 2006; Kern and Alber, 2008). Moreover, the Paris agreement emphasised the crucial role of concrete adaptation and mitigation actions in cities (UNFCCC, 2015).

Today, it is acknowledged that local government authorities in cities and non-state actors are necessary to participate in a comprehensive political and regulatory response to climate change, which has specific characteristics like complexity, uncertainty, trans-boundary, temporal, and spatial variability (Bulkeley & Kern, 2006; Broto & Bulkeley, 2012; Bulkeley & Betsill, 2013). To bring clarity to this argument, researchers have emphasized that cities have had a key role in policy areas related to climate change response such as energy, transport, waste management, land-use planning, construction, and others (Bulkeley & Betsill, 2003; Bulkeley & Kern, 2006; Betsill & Bulkeley, 2006; Bulkeley, 2010; Broto & Bulkeley, 2012; Bulkeley & Betsill, 2013).

An increasing number of researchers have now affirmed that local municipalities or city government administration in coordination among different actors in cities has achieved their policy commitments through the governance of climate change. The concept of governance and modes of governance are much contested among academicians. In a broader sense, governance refers to the interactions and decision-making processes among the actors involved in a common problem (Hufty, 2011), and also in the use of particular steering

methods (Sirkku and Lisa, 2011). Climate change governance has been described as a management process that involves cooperation between stakeholders at a particular level and some participatory principles regarding the causes and effects of climate change (Pohlmann, 2011; Rosenzweig et al., 2015).

Modes of governance refer to the way in which public issues are governed by different actors, and indicate different relationships between the state, the market and civil society (Driessen et al., 2012; Yanliu et al., 2015). Some authors use the term governance modes or mechanisms, while others describe them as policy instruments that steer public action (Howlett 2009; Hall 2011). Bouckaert et al. (2010) refer to approaches and strategies, While Lenhart et al.(2015) and Klein et al. (2017) use the terms climate change policy interventions and climate change policy instruments, respectively, when discussing how to manage climate change. These interventions and instruments mostly focus on different sectors of climate change response, such as energy, transport, waste, construction, urban planning, and land use in the city.

Local plans and engagements in reducing GHGs emissions are associated with different modes of climate governance. These modes provide a relevant framework for analysing municipal climate protection programs and the potential for cooperation between city governments and other actors in addressing climate change (Alber & Kern, 2008; Bulkeley & Kern, 2006; Korkmaz, 2019). In their research Bulkely and keran (2006) and Bulkely et al. (2009), propose a valuable framework for comparing, analysing and categorizing urban climate protection initiatives and action. They suggest four different urban climate governance modes or styles. It primarily relates to different forms of urban governance for climate protection, ranging from soft to conventional forms at the local level, such as self-governance, provision, enabling and regulation mode (Bulkely and keran, 2006; Bulkely et al., 2009; Kern and Alber, 2008).

According to Bulkely and keran (2006), the “self-governing” mode refer to the ability and competence level that city administrators or municipalities to apply climate change principles within their own organizations. On the other hand, the “governing by provision” mode reflects the ability of city administrators to deliver the necessary infrastructure and services for taking climate change actionss, using financial and resource mechanisms. The concept of "governing through enabling" is used to describe how local government can support residents and non-state actors in their efforts to implement climate change ideas into their organizations and actions through persuasion, encouragement, and volunteerism, with the city

administrator as facilitator (Kern and Alber 2008). The “governing through authority” or regulation mode reveals entails setting out essentials perspectives or capacities for the appearance of urban climate governance principle by employing direct power, mandatory and legal measures, and sanction (Kern and Alber 2008).

All of the above-mentioned modes of governance have their own advantage on climate change governance (Biesbroek et al., 2010; Broto and Bulkeley, 2013; Mees et al., 2014; Molenveld et al., 2020). Climate governance modes differ from cities to cities depending on the economic, political and social arrangements of the nations. In practice city administrators have arranged one of four modes of governance in their strategies separately or concurrently at a given time for their mitigation and adaptation activities (UN-Habitat, 2011). Furthermore, city administrators most frequently use self-governing, while regulation is rarely used for urban climate governance efforts (Kern and Alber, 2008). Self-governing and enabling are the most popular strategies, especially in industrialized countries, to show a visible and immediate commitment to combating climate change (Bulkely and keran, 2006). Although the provision mode is more prevalent in developing nations since the infrastructure and services are set up to safeguard the city from the effects of climate change (Korkmaz, 2019).

Coordination of efforts to achieve effective climate adaptation and mitigation measures requires the use of a combination of different climate governance modes, policy tools, and management techniques (OECD, 2010; Bouckaert et al., 2010; Molenveld et al., 2020). The recognition of various modes of climate governance, increases our understanding of the ways in which climate change is being governed and the major challenges faced (Bulkeley and Betsill, 2003; Keran and Alber, 2008; Klein et al., 2018; Bednar and Henstra, 2018). Empirical studies shows that, non-government organizations (NGO), city residents, and the business sectors can participated through the use of various modes of governance (Castán Broto and Bulkeley, 2013; Klein et al., 2017; Mees et al., 2015; 2014). Analysing what modes of governance are used to respond to climate change and how are used is the major questions for city officials.

Developing countries City governments face various challenges, such as financial and technical constraints, in responding to climate change (Bulkeley, 2010). The impacts of climate change are expected to be particularly severe in these countries due to their densely populated cities, high vulnerability to natural elements, and limited capacity (Mahendra et al., 2021; Broto, 2017). Even though cities in developing countries are expected to increase GHG

emissions and be affected by climate change impacts, their adaptation capacities, uses of different mechanisms, or climate governance mode are very limited (Rosenzweig et al., 2018; van der Heijden, 2019).

Addis Ababa city is affected by climate change (Jalayer et al., 2013; Arsiso et al., 2017; Tarekegn and Gulilat, 2018; Worku et al., 2021). The city formulated and implemented a climate resilient green development investment plan that incorporates both adaptation and mitigation strategies since 2014. The Addis Ababa City Environmental Protection and Green Development Commission (AAEPGDC) started mainstreaming different activities in different sectors. The city also prepares a climate action plan to respond to climate change action (AAEPGDC, 2020). However, climate change response action is weak in the city (AAEPGDC, 2020; Addis et al., 2022; 2023). In the city there is very weak experience of coordination in the provision of services and infrastructures (AAEPGDC, 2020; Addis Ababa Resilience Project Office, 2020; Karadimitriou et al., 2021). To implement initiatives of mitigation and adaptation strategies, enhancing cooperation through climate governance modes is very necessary in the city.

In this regard, this research aims to identify the four modes of climate governance and their contributions to managing climate change, with a focus on various sectors of climate change response such as energy, transport, waste, green areas, urban planning, and land use. The study aims to determine which mode is more applicable and effective in the city. To achieve this objective, the research analysed the existing literature on climate governance and its modes. The study conducted empirical research, including interviews with key stakeholders, assessed the effectiveness of the identified modes of climate governance in addressing climate change in Addis Ababa. Furthermore, the research assessed the challenges faced by different sectors in implementing climate governance modes, and the factors that hinder the successful implementation of climate change actions in the city. The results of this research will contribute to a better understanding of the most effective climate governance mode and its potential for addressing climate change in Addis Ababa.

5.2. Method of Data Analysis

A descriptive research design and mixed research approach were employed. Data were coded, edited, and cleaned for further analysis being assisted by SPSS (26) software. Thus, the analysis and presentation of the data involved both qualitative and quantitative techniques of data analysis. The qualitative information generated through interviews, field observation,

and document reviews was coded and analyzed using N'Vivo (10.1) software. The results from qualitative studies were summarized in the form of description such as texts, photos, and direct quotes along with the quantitative survey results. The quantitative data were analyzed, summarized and presented in different statistical forms, including descriptive statistics such as frequency, percentage and mean used to describe the results. Thematic analysis was employed to analyze the qualitative data, and the results were then discussed with the quantitative data.

5.3. Results and Discussions

5.3.1. Modes of climate governance in Addis Ababa city Administration

The increasing rate of total GHG emissions, air pollution and climate change impacts necessitate engagement from the city administration to address the issue of climate change in Addis Ababa City (AAEPGDC, 2020). Regarding to GHG missions, the 2012 GHG inventory for Addis Ababa showed that the city generated a total of 4.89 Mt CO2e (4,888,677 tCO2e. The city's second round of the Green House Gas inventory in 2016 showed that the city generated a total of 14.48 Mt CO2e (14,479,132 tCO2e). The total growth has been attributed to the rise in GHG emissions by 9,590.455 tCO2e.

The air pollution has also become a serious concern in the city (AAEPGDC, 2020). The air quality in the city is affected by emissions from transport, dust from traffic roads, and discharge from industrial activities, wastes, construction operations, home heating and cooking and other overall land-use practices (AAEPGDC, 2020). According to (Tarekegn and Gulilat, 2018) the mean value of total suspended particulate matter was about195 μg/m3, which is above the WHO safe guideline value (120 μg/m3).

Although, the city has no specific targets for reducing greenhouse gas emissions, it has prepared various mitigation and adaptation options in different sectors and has formulated city's Climate Change Resilience Green Investment Strategy 2014-2025. However, GHG emissions show an increasing trend, air pollution is on the rise, leading to health problems, and climate change risks continue to increase every year.

To effectively respond to climate change, the exploitation of all policy instruments is crucial. If local governments are to play a significant role in addressing the issue of climate change, it is clear that they will need to use different modes of governing, which may prove more challenging (Bulkeley and Kerin, 2006). In line with the discussion in the introduction, the

Addis Ababa city has implemented local climate change initiatives using various governance frameworks and tools. For this study, the analysis was conducted by customizing and classifying modes of climate governance in to the four types used by (Kern and Alber, 2008; Bulkeley and Kern, 2006; Klein et al., 2018; Korkmaz, 2019). These modes are self-governing, governing by provision, governing through enabling and governing by authority.

Based on the four modes of governance in this case variables, a questionnaire containing 28 questions related with transport, energy, waste, green area, planning and land use was developed and administered. Data were collected from experts using this questionnaire. After collecting the data, the 28 questions were computed and reduced back to the four variables. Descriptive statistics were then obtained and presented under each climate governance mode in the following sections.

5.3.1.1. Self- governing:

As described in the background section as the role of city administrator or the municipality as consumer and role model in controlling emissions from various urban development activities in public sectors such as energy, transportation, waste management, in green area development and other city government owned buildings or offices. According to the Table below (18) the majority of respondents 118 (53.9%) agree that there is a practice of self-governing in the city for climate change action, while 27(12.3%) and 74 (33.8) % of respondents consider it to be neutral and disagree in the implementation of self-governing in climate change action.

The respondents who perceived self-governing in Addis Ababa City may be attributing this to the city government's efforts in green area development with their own buildings. This practice is implemented in different government offices, schools, hospitals, government owned industries and others. The self-governing mode is also evident in the transport sector through the provision of public buses for government employees. Additionally, the city government has provided low-emission electric materials like bulbs, for government buildings, and the waste collection practices are comparatively good in government offices. However, there are still some issues that need to be addressed, such as the implementation of energy efficiency plans and the use of alternative energy sources like solar within city government administration buildings and implementation of energy efficiency standards in new public buildings.

Table 18: Modes of climate governance in Addis Ababa City

Responses	Self- governing		Governing through enabling		Governing by Authority	
	Frequency	%	Frequency	%	Frequency	%
Dis Agree	74	33.8	113	51.6	131	59.8
Neutral	27	12.3	28	1.7	32	14.6
Agree	118	53.9	78	35.6	56	25.6
Total	219					

Source: Survey, 2021.

According to Gotelind and Kern (2009), implementing climate protection measures is relatively straightforward when the municipality has autonomy over decisions and can control its consumption in its own buildings. Self-governing mode is a common focus for many cities' climate protection actions (Kern et al. 2005; Bulkeley and Betsill, 2003). However, self-governing mode alone is not sufficient for effective climate change action, as the local government only governs a small portion of climate actions within its own offices or buildings. In most countries, local authority energy consumption only accounts for between 1% and 5% of total CO2 emissions within municipalities, and it can be higher in the city's residential buildings (Bulkeley and Kern, 2006). In Addis Ababa city, residential areas account for 72% of energy consumption (Abdisa, 2018). Therefore, significant effects can only be achieved when local climate change policy is complemented by other modes of governance (Bulkeley and Kern, 2006).

5.3.1.2. Governing through enabling: -

It is another climate governance mode manifested by city administrators' collaboration with non-state actors, public education, awareness creation campaigns, and wide promotion initiatives. In addition to promotion efforts, governance through enabling entails the formation of public-private partnerships (3Ps) for the supply of infrastructure and services. To assess this mode, eight specific items were used. As we can see in Table 1, the majority of respondents, 113 (51.6%), believe that there is weak involvement of other actors in climate change actions. The poor enabling environment in the participation of businessmen, residents, or NGOs of the government in the city for climate change action is a significant issue.

However, 28 (12.7%) and 78 (35.6%) of respondents respectively consider it to be neutral and agree with the implementation of governing through enabling in climate change action.

The respondents who perceive governing through enabling as poor could be attributed to the low level of participation of other than government actors. The city government lacks awareness creation regarding climate change issues. In addition, the government does not give attention to awareness creation for energy efficiency and involvement of other actors in the provision of alternative energy, even though there is a very high power interruption in the city. According to the energy team leader in the AAEPGDC regarding to alternative energy provision, the leader said that the major problems of the higher officials are the misunderstanding of the alternative energy provision like solar, the leaders assumption that Addis Ababa city has 100% electricity coverage and alternative energy is not the issue of the city [Interview, 6 July 2021]. He added that during the new reestablishment proclamation number 64, 2019 does not consider the energy sector in the city. Another interview with the expert of the Addis Ababa City Environmental and Green Development Commission Climate Change Mainstreaming, the expert said that when the power interruption faced the residents used alternative sources like generators and biomass fuels, which increases GHGs [Interview, 21 June 2021]. Moreover, the city government does not have room for participation of CSOs to contribute to adaptation measures, and non-state actors' participation is also poor during physical planning.

Comparatively, there is participation of actors in the provision of public transport, in the collection and recycling of waste, and in green development schemes. Literature shows that the formation of public-private partnerships for the delivery of services and infrastructures is crucial for climate protection initiatives in developing country cities (Gotelind and Kern 2009; Bulkeley and Betsill, 2006). Many scholars have shown that due to limited resources of the public sector, the government creates an enabling environment and shifts responsibility to other actors for successful climate change action in developing countries' cities (Taylor and Harman, 2016; Wamsler, 2016; Wamsler and Brink, 2018). Governance through partnerships is valuable as it can mean support for activities led by other actors (Castán Broto and Bulkeley, 2013).

5.3.1.3. Governing by authority:

This mode presents city administrators as regulators. City governments have the legal jurisdiction to regulate issues related to urban climate change, particularly through strategic

planning for transportation, waste, green energy, and land use. If these plans include climate change mitigation and adaptation goals, they can have significant effects on reducing greenhouse gas (GHG) emissions and increasing resilience to climate change. According to the respondents' perceptions shown in Table 18 above, a large number of respondents (131, 59.8%) believe that there is a problem with the formulation and implementation of rules, regulations, strategies, and plans of governing by authority. Meanwhile, the remaining 32 (14.6%) and 56 (25.6%) indicated that the implementation of rules and regulations is neutral and agree correspondingly.

The respondents who perceive governing by authority as weak may attribute this to ineffective implementation of regulations that include green areas on buildings and industries. There is a regulation that building permits allocate 30% of the total area of residential buildings, 20% of commercial buildings, and 15% of industrial buildings for green areas, but it is not implemented. In addition, in the Addis Ababa City plan, 30% of the total land coverage of the city is allocated for green areas, 30% for roads, and 40% for buildings, but the city administration does not implement this plan. While there are several issues about the provision of solar energy and energy efficiency in the CRGE, in practice, the city administration or the AAEPGDC has not done much about it, such as setting specific energy efficiency standards for new buildings or promoting energy conservation or solar energy provision. Additionally, there is no solar thermal regulation requiring the installation of solar thermal collectors for lighting and solar water heaters. In Ethiopia, there is no tariff law or rule to produce and grid to the main station and sell to others. In the country, energy is highly centralized, and the only sole provider is the Ethiopian Energy Minister.

The evidence of the GHG inventory shows in the transport sector, where emission reductions are difficult to achieve. Although the transport sector is repeatedly included in climate plans and climate action, such as the introduction of electric vehicles, light rail, public buses, and the construction of cycle paths to promote bicycle use, GHG emissions from transport are increasing at an alarming rate. In the city, the priority given to climate protection in the transport sector compared to its GHG emissions from this sector is relatively low or not enough. Additionally, the city government does not formulate and implement rules about vehicle standards to minimize GHG and fuel consumption and transport management systems, even though the majority of the vehicles are more than 20 years old. Relatively, it is better regarding workplace levies and road user charging. There is a great challenge related to urban development planning and rules to protect sites that are prone to flooding, and

implementation is weak in the city. Addressing climate change through regulation receives less attention in the city, or enforcement is weak.

5.3.1.4. Governing by Provision:

It is a type of climate governance mode where city governments deliver amenities and infrastructures directly to reduce GHG emissions and create a more resilient city. As shown in Table 18 above, a large number of respondents (147 or 67.1%) agree that the city administration is more involved in climate change action through the provision of different infrastructures and services, while 60 (27.3%) and 12 (5.6%) of respondents perceive provision form of governance as weak and neutral, respectively.

The respondents who perceive governing by provisioning as good compared to other modes could be attributed to the following items based on different sectors: One sector that is doing well in minimizing GHG emissions is transportation, where the government provides residents with a less-emitting transport system. Moving forward, the Addis Ababa City Government commits to investing in sustainable transport to tackle climate change. One of the measures to expand the use of non-motorized modes is to develop a citywide walking and cycling network that makes sustainable modes available (Addis Ababa Road and Transport Bureau, 2018). In addition, the provision of light rail, public buses, and electric cars are the major measures taken by the city to minimize GHG emissions and energy consumption. The motivation behind the investment was to improve air quality, reduce pollution, ease traffic congestion, reduce energy consumption, and contribute towards the long-term protection of the city's climate.

a) Electric car

b) Light Rail Transit (LRT)

c) Public bus

d) Cycling

Figure 16: Low emission transport provision in Addis Ababa city

Source: [Sustainable transport in Addis Ababa (metropolis.org)]

Despite the fact that climate policies and climate actions usually include the transportation sector, this sector remains the major GHG-emitting sector where emission reductions are difficult to achieve in Addis Ababa city. Major sources of ambient air pollution in Addis Ababa emanate from vehicles, including emissions from fuel-inefficient, aging vehicles, incomplete combustion from diesel vehicles, and unpaved roads. According to a study conducted by the Addis Ababa Road and Transport Bureau (2018), the city experienced 2,700 premature deaths in 2017 due to air pollution. With no action, this number is projected to grow to 6,200 premature deaths by 2025.

a) Old vehicles b) Traffic congestion

Figure 17: Some causes of GHG emission from transport

Source: Addis Ababa Road and Transport Bureau, 2018

The number of vehicles in the city shows an increasing trend year by year at an alarming rate.

Table 19: Vehicle increment trends in Addis Ababa City

year	Total Vehicles
<2010	370,222
2011	379,167
2012	396,583
2013	413,162
2014	431,656
2015	474,027
2016	521,480
2017	561,293
2018	592,391
2019	604,592
2020	721,180

Source: Addis Ababa City Driver and Vehicle Licensing and Supervision Authority, 2021

Currently, approximately 70% of the vehicles in the country or more than 700, 000 are found in Addis Ababa city. In many nations, it is much more challenging for most communities to come to a political agreement on transportation regulations, especially when those policies seek to limit and minimize the use of cars (Gotelind and Kern, 2008).

Waste is another sector that is mostly the responsibility of the city administration. Private sectors also participate in collection, recycling, and composting activities. However, the major administrative issues are in the hands of the government. Additionally, the city government installs waste-to-energy facilities to manage waste and produce energy from it. To convert municipal solid waste to energy, Addis Ababa City Administration and Ethiopia Electric Power have established and started a waste-to-energy plant. In the first time, in 2019 for a one-year contract with China, the plant had the potential to burn all waste generated in the city, which is 2500 tons per day (interview with Rappi waste-to-energy power plant manager, 2021). But now, the plant has an incineration capacity of 1280 tons and generates 25 MW of electricity per day. This is because waste payment is held in terms of kilogram, and the waste provider includes different materials like metal, stone, liquid waste, and other materials to increase the kilogram and get payment during waste collection, transportation, and provision. This affects the efficiency of the boiler, and the boiler or machine may stop working because of low waste quality.

According to an interview with the waste-to-energy plant manager at Reppie (Koshe), if the machine is stopped for one day, the waste in the city is not collected because there is no alternative waste disposal site, making it difficult for the city. The manager added that there is a great challenge regarding waste quality and skilled manpower for this waste-to-energy project. The Ethiopia Electric Power Agency does not make any profit from this project and loses money. The type of waste brought to the waste-to-energy facility has a significant impact on the facility's operational management, energy efficiency, emission control, and environmental impact issues (Massresha, 2018).

Figure 18: Addis Ababa waste to energy project

Source: photo taken during the fieldwork, 2021

Another sector in which the government is more involved in the provision mode is energy. According to the Addis Ababa City Electricity Utility Provision Directorate (20220, electricity access in Addis Ababa has reached 99%, but power interruptions have become a serious problem in the city. Despite Addis Ababa having over 90% access to electricity, the majority of the population still uses biomass for cooking and heating (AAEPGDC, 2020). The number of outages is very high, and it takes a long time for service restoration. As a result, every aspect of business and non-business activities, as well as the day-to-day lives of city residents, is negatively affected, and there are many complaints about this problem (Abdisa, 2018).

The city government does not provide alternative energy like solar. Many cities in the world use solar energy, including solar water heaters. In our case, only informal settlements have tried to use solar energy for lighting and to use television. In the Addis Ababa City Environmental Protection Office, there are solar water heaters and solar energy to use computers for demonstration purposes. In the GIZ office, solar energy is also used for display purposes.

a) Solar energy sample in GIZ b) Solar water heater sample in AAEPGDC

Figure 19: Solar energy and solar water heater display project found in AAEPGDC and GIZ

Source: photo taken during the fieldwork, 2021

Research conducted in a city in China showed that the provision of solar energy in cities, especially solar water heater (SWH) systems in high-rise buildings, is the best example of low-carbon development (Westman et al., 2019). Efficient utilization of energy is also a major problem in the city. According to the (AAEPGDC, 2021), yearly report on energy audits for 10 institutions (hotels), it was found that 347,321.73Kwh is being wasted by these institutions, and if this can be corrected, 347,321.73 Birr/208.4 tons of CO2 can be minimized.

Another provision mode practice in the city is climate change action through green area development. The city administration has practiced green development in the city, as reflected in the National Urban Green Infrastructure Strategy. When the 10th Addis Ababa City Structural Plan was prepared, it was considered that 30% of the total land use would be allocated for green infrastructures (Addis Ababa City Plan Commission, 2021). The city administrators are trying to reach this plan through planting trees based on the green legacy of the country. Comparatively, due to the terrain features of the area, there are high levels of green areas in the northern part of the city, whereas the southern, eastern, western and inner city have very low levels.

a) Sheger Park b) Hamile19 park c) Beherestegye Park

Figure 20: Some parks in the city

Source: Addis Ababa City Plan commission, 2021

The allocation of space for green area development in the city is inadequate and ineffective in terms of meeting even the minimum standards. The World Health Organization (WHO) standard is 9 m² per person, the United Nations standard is 30 m² per capita, and that of Africa is 7 m² per person. Currently, there are over 18 functional recreational parks in Addis Ababa with total area coverage of 113.7 ha, which puts the current per capita available green space of Addis Ababa at less than 1 m² per person and as one of the lowest by international standards (Addis Ababa City Plan Commission, 2021).

The new structure plan of the city ratified by the Addis Ababa city administration expects to increase the per capita green space from the existing 1m²/inhabitant to 15 m²/inhabitant by the year 2025 (Addis Ababa City Planning Office, 2017). However, it is very difficult to achieve such a high level of green space per person in Addis Ababa because the city is rapidly urbanizing, the amount of green space is decreasing, and there is an increased need for these services (Woldesemayat and Genovese, 2021). This is compounded by the current planning practice, which mainly focuses on lowered green spaces planning to a secondary position and aggravates the problem (Woldesemayat and Genovese, 2021). Research conducted by Eshetuet et al. (2021) states that regulations and directives regarding the development of Addis Ababa's green space are not clearly written by responsible bodies, and weak law enforcement are the major challenges. A recent study by the Addis Ababa Environmental Protection and Green Development Commission (AAEPGD) (2020) has

shown that large tracts of green space are occupied by informal settlements, such as 12,486 residents living in the upper catchment of Ankorcha, 16,519 in Kotebe, 8,981 in Entoto, and 2,470 in Sansusi.

In addition to these large hectares of land of green space changed to other use and occupied by informal settlers, there are other examples such as Adwa City Wide Park, located in Bole sub-city, woreda 13, which covers an area of 100 hectares and is now being used for other purposes, such as the Africa Cancer Centre. Alula City-Wide Park, located in Yeka sub-city, woreda 13, covers an area of 202 hectares and is now occupied by informal settlers with a large residential village expanding illegally (Addis Ababa City Plan Commission, 2021).

According to a study report from the Addis Ababa City Plan Commission in 2021, in Yeka sub-city woreda 10 and 11, in the area known as Salam Technik and Muya, which is designated as a multi-sector forest, 100 hectares have been identified based on data from satellite images and field visits. There are several illegal encroachment areas in violation of the master plan's land use plan as a multi-sector forest. According to the report, more than 462 illegal constructions have been built in the study area after the year 2011, and this number does not include those built recently or currently under construction. The illegal construction activity and escalation of illegal land occupation are supported by basic infrastructure being built in the area, such as roads, electricity, water, and others (Addis Ababa City Plan, 2021).

This area is environmentally sensitive, and even though the planning identifies the environmental risk sites, the implementation is very weak. The delineated site figure (22) below shows the encroachment of forests by informal settlers.

Figure 21: Forest area encouraged by informal settlers

Source: Addis Ababa City Plan commission, 2021

The institution responsible for taking over and protecting the area designated as a multi-purpose forest in the land use plan and developing it according to the plan is the Environmental Protection and Green Development Commission and the Watershed and Green Development Management Agency under it, which is a law enforcement office. However, when the plan was prepared, the green infrastructure area was planned in different parts of the city, and this area is located in the highest part of the city. Therefore, it developed and preserved by multi-sector forestry to maintain the climate balance of the city, protect Addis Ababa city from floods, make it comfortable and suitable for its residents, and make it a national and international recreation and park city. However, the executive bodies at different levels, as well as those who use the plan, have little understanding of green development and environmental protection areas and even consider green areas as wasted land. The main problems of higher officials regarding green spaces in Addis Ababa city are: land use change, carrying out illegal construction and encroachment, and spending on unwanted services (Addis Ababa City Plan Commission, 2021).

The vision of Addis Ababa city set by AAEPGDC is to be one of the preferred cities in Africa, free of GHG emissions and rich in green development in 2030 (AAEPGDC, 2021). However, illegal invasion of green spaces for other activities and the government's ignorance of green areas is a great challenge to minimize GHG emissions. The amount of greenhouse gases produced and released into the environment in 2021 was 11.71 MtCO2eq, and the major source of GHG emissions in the city comes from three sectors, including transport, waste, and energy (AAEPGDC, 2021). While provisioning is a more commonly used approach in developing countries (UN-Habitat, 2011), it is diminishing and being substituted by enabling in developed countries due to liberalization and privatization (Bulkeley and Kern 2006; Gotelind and Kern, 2008).

The above approaches are different in terms of their governing abilities and range from soft forms of governing to traditional forms of state intervention (Bulkeley and Kern 2006). All four climate governance modes are relevant for formulating and implementing mitigation and adaptation policies for cities (Gotelind and Kern, 2009; Adenle, et al, 2017). Optimized policy instruments and appropriate selection of these governance modes are necessary with respect to climate change response (Xiaochen et al., 2020; Arriagada et al., 2018). When we compare developed and developing countries regarding climate governance mode practices, researchers argue that self-governing and enabling forms are widespread in developed

countries, while provision is a more commonly used approach in developing countries cities (UN-Habitat, 2011; Korkmaz, 2019).

This study provides an overview of the current state of modes of governance used in climate interventions in Addis Ababa city, something that the literature so far has lacked. The city has relied on a mix of governance modes. When it comes to governing mode, regulation is not a very common mode across the world and also in Addis Ababa City. Participation and partnerships with the private sector and CSOs is being most popular climate governance mode in the literature but, in Addis Ababa City lacks cooperation with non-state actors. According to Klein et al. (2017), harder instruments may follow as the governance of the issue becomes more mature. Alternatively, this use of softer modes like enabling mode may be a sign of shifting responsibilities away from the state/public sector in order to distribute the cost and responsibilities of preparing for climate change to various actors. Generally, this study shows that the dominant climate governance modes in the city are the provision of infrastructure and services and self-governance.

5.4. Conclusions

Cities play a crucial role in local climate protection initiatives, given their significant influence on urban policies such as transport, waste, energy, land use, housing, and settlement planning. Addis Ababa is one such city that has adopted climate change initiatives for both mitigation and adaptation. In this context, understanding different forms of governance is essential for implementing climate initiatives collaboratively across the city. This research provides valuable insights into climate action instruments for Addis Ababa's city administrators. The analysis focused on four major climate governance modes: self-governing, provision, enabling, and authority.

Our research found that in Addis Ababa, climate protection activities are mainly implemented through the provision mode of governance. The city administration has engaged in almost all infrastructure and service provision by its own contribution. Regarding sector-specific actions, the main sectors of climate change action taken are transportation, waste, and green area development. The actions executed in the city for climate change protection include recycling, composting, waste-to-energy, and provision of public transport. However, low-carbon transportation activities such as bicycle paths and railways are limited, and protecting green areas remains a significant challenge for the city.

Self-governing is the second climate protection mode practiced in the city administration, which is implemented in their own organizations. On the other hand, the enabling and regulation modes of governance are weak in Addis Ababa. While partnership with other actors plays a crucial role in climate protection action, the city government in different sectors lacks cooperation with non-state actors. Furthermore, weak awareness creation campaigns and lack of encouragement for non-governmental organizations, business sectors, and residents to participate in climate change issues are significant problems in the city.

The authority mode of climate governing is also weak in the city. Although different sectors in the city administration have included climate issues in their planning, they are not obligated to do so. Hence, climate change issues remain a voluntary task for the most part, with a lack of regulation, laws, weak enforcement of regulations, lack of strong accountability, and the use of sanction systems.

In conclusion, this study shows that the dominant climate governance modes in the city are the provision of infrastructure and services and self-governance. Considering the limited studies on climate change governance in the city, city administrators should organize conferences and workshops to raise awareness of climate change and its impact at the local level. They should also enhance enabling mechanisms for non-governmental organizations, research institutions, private sectors, and residents to participate in the policy process and implementation of climate change issues. Additionally, the city administration should apply strict rules and regulations in mitigation and adaption measures, provide alternative energy provision such as solar energy, create an enabling environment for non-state actors to be involved in the provision of this, and promote engagement in solar technology research and proper implementation of the city's plan for 30% land for green areas.

Chapter Six: General Discussions, Conclusions and Recommendations

6.1. Introduction

Unless effective coordination of different actors in climate change adaptation and mitigation actions is implemented (Bernauer, 2012; Yazar and York, 2021), the impacts of climate change in cities are likely to be disastrous in the future (Grafakos et al., 2020; IPCC, 2021). In developing countries, development needs are usually prioritized, while climate action is viewed as an unaffordable luxury (Romero-Lankao, 2012; 2018). Moreover, the lacks of research attention in developing country cities, even if the impact is devastating effect (van der Heijden, 2019). Various studies have shown that Addis Ababa city is highly vulnerable to climate change impacts (Feyissa et al., 2018; Jemberie and Melesse, 2021). In the city, climate change and its impacts are aggravated by an unprecedented rate of urbanization and rapid population growth, built-up-area expansion, less green-area coverage, and land use change (Worku, 2017; AAEPGDC, 2020).

Thus, this section brings together four papers with the objective of analyzing climate change governance in Addis Ababa City. Hence, the synthesis of the major findings with respect to the research objectives, the existing climate change governance, factors that hinder climate change response actions, and institutional interaction and their roles of actors are briefly presented in the following sections. The major modes of climate governance that are practiced in the city have also been discussed.

Finally, conclusions are drawn from the discussions of the synthesis and recommendations as well as contributions and further research gaps are also pointed out. However, it was found quite difficult to show the similarities and differences between these studies and previous studies due to the absence of prior studies on the same topic in the country in general and in the city in particular. But we tried synthesis with the previous studies conducted in developing countries' cities and the general governance issues in Addis Ababa city.

6.2. Discussion of major findings

Climate change governance in cities can be studied in various ways. In this regard, this study first aimed to evaluate the effectiveness of climate change governance in Addis Ababa City. To accomplish this, the study utilized key indicators of effectiveness derived from various theoretical and empirical literatures, such as participation, accountability, equity, awareness raising, institution, actors, climate change law, law enforcement, and partnership. The study

developed a composite index to measure the effectiveness of climate change governance and determine whether the current governance practice was effective or not. The study found that implementation of and adherence to the nine key indicators was inadequate, leading to the conclusion that climate change governance in the city was ineffective in terms of implementing most of the key indicators.

The study results reveal that existing environmental policies, strategies, regulations, proclamations, laws, and implementations in the city face significant challenges due to weak accountability, poor enforcement of regulation, and failure to involve key actors, such as NGOs, residents, and private sectors (Addis et al., 2021: chapter 3). These shortcomings were characterized by a weak institutional setup and a lack of formal systems to enable these actors to interact to respond to climate change. Thus, the study found that climate change governance in Addis Ababa City was ineffective in terms of accountability, participation, law enforcement, equity, institutions, the role of actors, and partnership (Addis et al., 2021). This research finding is consistent with the findings of Averchenkova et al. (2019) and Kareem et al. (2020), which highlight insufficient coordination and weak law enforcement as the main challenges of climate change governance in African cities. Similarly, research conducted in Addis Ababa City by Mohamed et al. (2020) and Addis Ababa Resilience Project Office (2020) revealed that weak accountability and the absence of mechanisms to engage non-governmental stakeholders, as well as the lack of relationship between implementing intended plans and actual practice, are major obstacles to effective urban governance in the city.

Furthermore, qualitative data collected from different sectors and actors in the city, along with evidence from similar empirical studies and reports, supported the finding that the implementation of the Addis Ababa City Resilience and Green Economy (AACRGE) plan faced significant challenges in terms of weak accountability, poor enforcement of laws, regulations, plans, and strategies, as well as weak participation of actors.

The second objective of this study was to analyze the major factors that hinder the effectiveness of climate change governance in the city. Literature shows that there are numerous factors that hinder climate change governance. For this study, seven independent variables were identified to determine climate change response action, and they streamlined our analysis. These variables are coordination, political will and leadership, finance, policy, strategies and regulation, human resources, information and technologies.

The study has shown that the lack of coordination and political will are the major factors that hinder the practice of climate change adaptation and mitigation action in the city (Addis et al., 2022; Chapter 4). Our findings in this regard are supported by studies conducted in two African cities, Karonga in Malawi, and Dar es Salaam in Tanzania, and world cities (Diep et al., 2016; Aylett, 2014; Mukhlis and Perdana, 2022) finding that climate change governance is hindered by weak coordination, leadership, and political willingness of leaders in different sectors and levels. Various theoretical concepts, such as urban regime theory, social network theory, and interaction theory, also underpin the coordination of state and non-state actors to mobilize resources, generate knowledge and information, and build commitment among its members to address urban problems (Stone, 1989; Mossberger and Stoker, 2001; Sirkku and Westerhoff, 2011; Oberthür and Gehring, 2006; Sanderink et al., 2020).

The study has also found that inadequate financing, shortage of knowledgeable experts, weak implementation of strategies and regulations, and lack of access to information and technologies are also challenges faced by climate change governance in the city. These findings are consistent with various empirical studies conducted in African cities, such as Diep et al. (2016), Taylor et al. (2021), and Hickmann and Stehle (2019), which have identified weak enforcement of strategies, regulations, and plans, inadequate laws and legislation, shortage of financing, and lack of experts knowledgeable in climate issues as major constraints.

Chapter 4 of the study assessed institutional interaction in climate change mitigation and adaptation measures in Addis Ababa City, as well as the role of state and non-state actors in climate change response actions. The results indicated very weak interaction between the Addis Ababa City Environmental Protection and Green Development Commission and other city government sectors in climate change response action, despite the mainstreaming of climate change mitigation and adaptation measures in different sectors.

The AAEPGDC exhibits weak vertical interactions and lacks cascading of climate change measures to the sub city and woreda level. The study conducted by Addis et al. (2021) and Chapter 4 found that the AAEPGDC has weak interaction with other government sectors such as transport, planning, energy, land management, and construction. As a result, sharing of human, financial resources and knowledge is also affected. This finding coincides with Muhammad et al. (2020), who also identified weak interaction among institutions in sustainable governance of the city. Furthermore, the commission focuses on mainstreaming and supporting sectors without providing implementation, monitoring, and evaluation

guidelines. The study also agrees with Woldesenbet (2020) finding that lack of legal frameworks among institutions is a major problem in water governance in the city.

Strong interaction among urban planning, transport, river basins, green areas development, construction, waste, energy, and land management sectors is crucial for effective climate change actions. Urban planning, in particular, plays a major role in creating a livable and healthy city. New urbanism theory, which emerged to address climate change mitigation and adaptation measures through planning, advocates relatively compact and mixed land use, integrates working areas, living areas, schools, hospitals, entertainment areas, and other amenities in close proximity (Manea et al., 2014). This promotes walking and cycling, discourages individual automobile use (Parker, 2004), and leads to a reduction in energy consumption and carbon emissions. New urbanism also considers developing green infrastructure, including policies about green roofs and wells in buildings (Manea et al., 2014). Green city concepts also promote the integration of blue, brown, and green infrastructures (Angel, 2012).

In Addis Ababa city, effective climate change governance involves public, private sectors, and CSOs. However, the development of climate change strategies and implementation is highly dominated by state actors, leaving little space for non-state actors. The study agrees with the finding of CAT (2020), which reported that non-state actors have limited influence on decision-making in climate change governance in Ethiopia. CSOs and private sectors have played an inadequate role, and their interests are not adequately reflected in climate change response actions in the city. Non-state actors face numerous challenges that hinder their participation in the governance of climate change in the city, including weak institutional arrangements, lack of information about urban climate change governance, and limitations of policies and regulations.

A notable advance made in this study is the assessment of various climate governance modes (Chapter five). The study found that climate change mitigation and adaptation measures are mostly implemented through provisioning and self-governing climate governance modes in the city. However, the enabling and regulation practices of climate governance modes in Addis Ababa city are weak. Additionally, climate governing by authority mode is also a poor practice in the city. The lack of regulation, laws, weak enforcement, and lack of strong accountability or use of a sanction system contribute to this result. This finding is consistent with the results of previous studies (UN-Habitat, 2011; Korkmaz, 2019), which reported that

enabling forms are widespread in developed countries, while provisioning is a more commonly used approach in developing country cities.

6.3. Conclusions

Addis Ababa is a developing city that is significantly affected by climate change. Several studies have indicated that the city is currently experiencing an alteration in climate, with increased flooding, droughts, heat waves, and landslides being some of the major impacts of climate change. Governance has become a critical mechanism to address the reduction of greenhouse gas emissions and vulnerability to climate change in the city.

However, the current practice of climate change governance in the city has been deemed ineffective based on key performance indicators. This study has concluded that the implementation of almost all key indicators has been ineffective. Environmental policy, law, regulation, and proclamation implementation in the city have also faced significant challenges such as weak accountability, poor regulation enforcement, and failure to involve key actors like NGOs, communities, and private sectors due to a weak institutional setup and a lack of formal systems for actors to interact. Additionally, there is a lack of capacity building and awareness creation campaigns about climate change and its response for city residents, especially among the sub-city- and Woreda-level experts.

This study has demonstrated that the current practices of climate change governance have been significantly impacted by responses, action, and drivers behind environmental decisions. Despite the formulation and implementation of a climate change investment plan that incorporates climate change mitigation and adaptation responses in different sectors in the city, the actual practice has been stifled by various issues such as lack of political support, coordination, inadequate finance and policy, strategy, and regulations.

The shortage of knowledgeable experts and lack of access to information and technologies also contribute to the ineffectiveness of climate change governance, with feeble execution capacity being a major problem in the city's response action. Actor engagement and lack of a clear legal framework for actor engagement in general has not allowed the participation of CSOs and private sectors, while city residents' participation in climate change measures is almost non-existent.

One study examined the institutional interactions between AAEPGDC and other sectors within the city administration; including transport, waste, energy, green area development,

planning, land management, construction, and others. Without waste management and green development offices, AAEPGDC has weak interaction with other government sectors in climate change response actions. Thus, weak AAEPGDC institutional arrangements and interaction with other actors, coupled with poor actor engagement, have contributed significantly to the ineffectiveness of climate change governance in the city.

Institutional arrangements are a major problem in the city's climate change governance. In the city, the energy and climate change sectors are combined in AAEPGDC. Even though the energy sector is the third-largest greenhouse gas emission sector after waste, it does not have an independent institution in the city. Although floods have a significant impact in the city, they receive little attention in the city administration and are managed by the Addis Ababa City Disaster Risk Management Commission, not AAEPGDC. The Addis Ababa City Disaster Risk Management Commission has several issues and focuses more on fire risks. Green area development addresses both mitigation and adaptation issues in the city, but green space development lacks attention from officials.

AAEPGDC also has weak vertical integration and cascading of climate action to the sub-city and woreda level. Although AAEPGDC is working on mainstreaming and supporting the sectors, there are no implementation, monitoring, and evaluation guidelines. Furthermore, there is no specific proclamation, legal framework, or even a memorandum of understanding with mainstreaming sectors indicating which specific issues are accountable to each institution. All these sectors are accountable to the city mayor and municipality, not AAEPGDC.

In general, the city administration, including AAEPGDC, has failed to effectively address climate change mitigation and adaptation actions, leaving little room for non-state actors. The city government lacks a formal strategy for involving non-state actors and has limited influence on decision-making related to climate change. Non-state actors face numerous challenges hindering their participation in climate change governance in the city, including weak institutional arrangements, limited information about urban climate change governance, and restrictive policies and regulations.

Understanding different forms of governance is crucial for implementing climate initiatives collaboratively across the city. This research identifies four major climate governance modes: self-governing, provision, enabling, and authority. Our research found that in Addis Ababa, climate protection activities are mainly implemented through the provision mode of

governance. The city administration has been primarily responsible for infrastructure and service provision. The self-governing mode is the second climate protection mode practiced within the city administration, which is implemented within their own organizations. However, the enabling and regulation modes of governance are weak in Addis Ababa. Furthermore, weak awareness campaigns and a lack of encouragement for non-governmental organizations, business sectors, and residents to participate in climate change issues are significant problems in the city.

The authority mode of climate governance is also weak in the city. Although different sectors in the city administration have included climate issues in their planning, they are not obligated to do so. Hence, climate change issues remain a voluntary task for the most part, with a lack of regulations, laws, weak enforcement of regulations, lack of strong accountability, and the use of sanction systems. In conclusion, this study shows that the dominant climate governance modes in the city are the provision of infrastructure and services and self-governance.

6.4. Contribution of the study

As the study deals with the issue of climate change mitigation and adaptation actions, which are among the major policy priorities in developing country cities, Addis Ababa is a city where GHG emissions are showing an increasing trend. Climate change vulnerability and impacts affect the lives and livelihoods of residents and infrastructure, but lack of empirical evidence has made it challenging for policymakers and implementers to make informed decisions. Therefore, this research finding is believed to have a significant contribution both empirically and methodologically.

Empirically, the study provides data that directs city government strategy to reduce GHG emissions and address climate change impacts. For this rapidly growing and least studied field of study, nine indices have been chosen to measure the level of effectiveness of governance related to climate change. The indices are accountability, participation, equity/fairness, awareness raising, institution, actors, climate change law, law enforcement, and partnership. Developing these measurement indices to measure the effectiveness of climate change governance can be regarded as a significant empirical contribution of the study. In addition, it helps execute the Addis Ababa City Climate Resilience Green Development Investment Plan and the research will be used as an essential source of

information for the government, urban planners, researchers, stakeholders, NGOs, and academics that are working on urban climate change governance.

Currently, this study's result is used as a starting point for leaders to hold discussions related to climate change issues. For example, the Addis Ababa City Resilience Project office used our research findings for workshop discussions of different stakeholders found in Addis Ababa City Administration regarding climate change governance in the city held on 6 Dec 2022, acknowledging the source by this link: (https://resilientaddis.org/author/daniel/). Additionally, a C40 representative invited me to participate in the preparation of Addis Ababa City's climate change adaptation and mitigation mainstreaming strategy based on our published articles they found online.

Methodologically, the study assessed a wide range of primary and secondary sources and relied mainly on firsthand information. The analysis considered the key variables that hinder climate change governance. Based on the theoretical and empirical literature, seven variables were selected to analyze the factors that hindered governance related to climate change. These factors include policies, strategies, and regulations; finance; human resources; technologies; political willingness and leadership; information; and coordination. The study shows the interactive effect of these various factors on the effectiveness of climate change response actions using descriptive statistics and regression models.

Several global scientific research works have been conducted in this regard. However, those studies focused on qualitative comparative analysis in developed cities and failed to examine quantitatively in developing country cities. Studies on cities in developing countries conducted by different scholars also used only qualitative analysis methods by using secondary sources. Thus, this research makes a methodological contribution to bridging this gap by identifying the factors and applying a mixed methods approach. To this end, the findings present a notable advance in implementing regulations, strategies, and plans, and provide intervention mechanisms to policymakers.

6.5. Recommendations

As established by the results of the analysis of the four specific objectives, climate change mitigation and adaptation actions are ineffective in Addis Ababa City. Based on the findings and conclusions made so far, the following recommendations are expected to decrease

greenhouse gas (GHG) emissions, reduce climate change vulnerability impacts, and create a livable city.

Since climate change governance suffers from limited actor engagement and lacks participation of non-state actors across different levels, legal frameworks that clearly define the types and roles of multiple actors at all levels should be put forth to bring about actor involvement. Thus, participation should be one that realizes governance in which states, civil society organizations, and private sectors are involved. One of the study results shows that a very weak practice of accountability is one of the most severe problems of climate change governance in Addis Ababa City. Hence, Addis Ababa city administrators should give due attention to climate change response through established strong accountability systems to enforce regulation, rules, proclamations, laws, policies, and strategies in different sectors.

This study identified that lack of coordination, political will, inadequate finance, strategy, and regulation, weak enforcement of existing strategy and plans, and shortage of knowledgeable experts are major factors that hinder the practice of governance in the city. Therefore, to address the problems, the city administration should place emphasis on climate change, giving it comparable weight to other cross-cutting issues. In addition, the city administration should take aggressive measures, including revising or formulating new policies, strategies, or regulations, and even creating an independent institution for climate change issues. Furthermore, the Addis Ababa City Environmental Protection and Green Development Commission should create an enabling environment to attract non-state actors, in general, and NGOs, in particular, and should assign one directorate to mobilize finance.

Institutional arrangements have their own problems in climate change actions. Climate change is managed at the team level, and the Climate Change Protection Strategy Implementation and Monitoring team is mandated to manage the city's climate change issues and work on climate action mainstreaming. The team works in line with other city institutions in planning, measuring, monitoring, and reporting climate action. However, working with other institutions is difficult when climate issues are managed at the team level, indicating that climate issues lack attention from the EPGDC itself. It should be found at the city, at least at the directorate level in EPGDC.

Another team from the Environmental Pollution and Climate Change Directorate is energy. However, this sector also lacks attention from the city administration; even though it is the third greenhouse gas emission sector next to waste. Therefore, the city administration should

revisit it to be found at the agency level and give attention to providing alternative energy provision such as solar energy. Another crucial issue in the city is flood management. In the case of Addis Ababa, flood issues are managed by the Addis Ababa City Disaster Risk Management Commission. The interaction between AAEPGDC and AADRMC is weak in managing floods, which creates a devastating effect in the city. Therefore, there should be strong coordination between AAEPGDC and AADRMC or give the mandate for this issue to AAEPGDC.

The EPGDC has faced challenges in horizontal interaction with other city sectors, including transport, waste, housing, planning, and land use. It also has weak vertical integration and cascading of climate action to the sub-city and woreda levels. Therefore, the AAEPGDC should interact strongly with stakeholders by preparing shared visions, strategies, legal frameworks, or memorandums of understanding and sharing resources such as technological, human, financial resources, and knowledge.

The major climate change response actions for both mitigation and adaptation involve the development of green areas. However, the allocation of space for green area development in the city is inadequate and ineffective in terms of meeting even the minimum standards. Therefore, the city administration should properly implement the city's plan for 30% land for green areas and apply new urbanism and green city concepts.

Finally, considering that there are limited studies on climate change governance in the city, city administrators should organize continuous conferences, training, and workshops to raise awareness of climate change, its impacts, and measures at different levels.

6.6. Future Research Directions

Despite extensive coverage of this study on the four topics, there are still areas for future research that remain uncovered. This study attempted to explore an area that has seldom been studied in the context of Addis Ababa. However, due to limitations in scope, methodology, data availability, and COVID-19 challenges, the study did not fully and adequately address the complex nature of governance issues. One of the study's obvious limitations is that the survey data was collected only from environmental experts; the expected focus group discussions (FGD) were not conducted, and lack quantitative evidence from city dwellers, especially in adaptation. Further studies can bridge this gap by conducting a wide-scale survey inclusive of city residents.

The study revealed that energy is the third highest sector contributing to greenhouse gas emissions and lacks attention from city administrators. Furthermore, there are frequent power interruptions in the city, and residents resort to alternative energy sources like generators and charcoal, which increase air pollution and greenhouse gas emissions. Therefore, the study suggests that future research should assess the challenges of alternative energy provisions like solar energy in the city.

The current study focused on climate change governance in Addis Ababa city, and the conclusions reached are valid for other cities and towns in the country. Additionally, since there are limited studies on climate change governance, we invite other researchers to explore this topic in other cities and also at a wider or country level.

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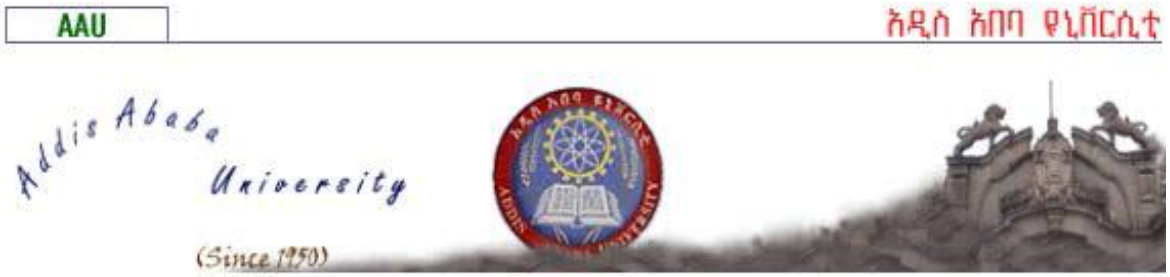
Appendixes:



School of Graduate Studies

College of Development Studies

Center for Environment and Development

Appendix 1: Questionnaire for Experts

Introduction

I am Tigezaw Lamesegin and am a PhD candidate in Environment and Development at Addis Ababa University. The purpose of this questionnaire is to collect data about urban climate change governance, especially focusing on effectiveness of urban climate change governance at Addis Ababa City Administration. The research will be focused on the following major areas: existing situation of urban climate change governance, institutional interaction, contribution of non- state actors in climate change governance, modes of urban climate change governance and determinant factors of climate change governance in the City Administration. You are selected for this survey and your participation is based on your willingness to take part.

Thus, the sincerity and accuracy of your answers are critical to the success of the research. The answer responses from the survey questionnaire are strictly use for research purpose. All information provided by you will be kept strictly confidential. Finally, thank you in advance for your unreserved co-operation and the patience that you show in filling the questionnaire.

Sincerely yours

Tigezaw Lamesegin

Tel No 0912147399/0900814306

e-mail : tigezaw2013@gmail.com

General Information

1. Date of data collection: _____
2. City Administration level: _____
3. Study Sub City: _____
4. Study Wereda: _____
5. Signature of respondent: _____

Part I: Background Information of Respondents

1. Sex: 1. Male 2. Female
2. Age: _____
3. Educational Level/Status: _____
4. Educational/ Professional Background: _____
5. Current Position_____

6. Name of Organization/ Office: _____
7. Work experiences related to environment: _____
8. Length of years in the current residence: _____

Part II: Objectives Related Questions

2.1 Effectivenes of Urban Climate Change Governance

2.1.1 The questions in the following table are designed to assess climate change governance in the city of Addis Ababa. Please answer by marking (√) in the space provided corresponding to each indicator to highlight your response of climate change governance in the city. The numeric response values are defined as follows: 1=strongly disagree, 2=disagree, 3=neutral, 4=agree, and 5=strongly agree.

	Indicators of Climate Change Governance	**Responses**				
		1	2	3	4	5
1. Participation						
1.1	Your office invited private sectors in planning of climate change governance measures					
1.2	Civic associations are involved in planning of climate change governance measures					
1.3	Your office invited actors in identification of climate change governance problems					
1.4	Private sectors are involved in the implementation of adaptation and mitigation measures					
1.5	Your office participates civic associations in the implementation of adaptation and mitigation measures					
1.6	Your office prepared Public forum about climate change issues					
1.7	Other government offices are involved in Climate Change Governance (CCG)					
1. **Accountability**						
2.1	The roles of your office is clear in terms of mitigation measures					
2.2	The roles of your office is clear in terms adaptation measures					
2.3	Your office are responsible when they deviate climate change protection law					
2.4	Your office timely responds to vulnerable community to climate					

	change					
2.5	There are clear performance audit of your office budget for climate change activity					
2.6	Decisions in your office in terms of CCG (climate change governance) are consistent with the respective climate laws					
	2. **Equity**					
3.1	There are pro-poor policy to climate change response					
3.2	Your office allows to participate women actively in climate change governance					
	3. Awareness Raising					
4.1	There are awareness raising practice for actors about adaptation measures					
4.2	There are awareness raising practice for actors about mitigation measures					
4.3	You are well aware about adaptation measures					
4.4	You are well aware about mitigation measures					
4.5	You are allowed to participate in trainings/meetings related to climate change governance					
4.6	Training efforts have been able to change your attitudes about climate change governance					
	4. Institution					
5.1	There are adequate Environmental Institutions in the locality with clear mandate to coordinate Environmental protection					
5.2	Climate change governance decisions are carried out solely by local level institutions or without intervention of upper levels					
5.3	Climate change governances are carried out with adequate support from the upper level government					
5.4	Your office has adequate resource capacity to coordinate climate change governance					
5.5	CBOs (community based organizations) have significant role in climate change governance					
	5. Actors					

6.1	Climate change governance is supported by participation of NGOs					
6.2	Climate change governance is supported by community based organizations					
6.3	Climate change governance is carried out by participation of local communities					
6.4	Climate change governance process engages private sectors					
6.5	Environmental protected area is conserved by collaboration of actors					
6. Climate Change Law						
7.1	There are adequate climate change governance rules or regulations at your office					
7.2	You are well informed about climate change protection regulations					
7.3	Besides government regulations, local community regulations has also been used for climate change protection					
7. Laws Enforcement						
8.1	The existing climate change protection rules and regulations are easy for implementation					
8.2	Climate change protection regulations are implemented by participation of private sector					
8.3	Climate change protection regulations are implemented by participation of civil society organizations					
8.4	Climate change protection regulations are implemented by participation of community based organizations					
9. Partnership						
9.1	Your office has strong partnership with community based organizations					
9.2	Your office has strong partnership with other government offices					
9.3	Your office has strong partnership with NGOs					
9.4	Climate change governance is done in partnership with private sectors					
9.5	Climate change governance is done in partnership with research institutions					

Institutional Interactions of actors for Climate Change Governance

2.2.1 The following table encompasses items that are utilized to assess the level of institutional interactions of actors, and thus realize climate change governance. Therefore, you are kindly requested to give your answer by marking (√) under your choice for each actor. The choices are 1= Very low (hardly connected), 2= Low, 3= Moderate, 4= High, and 5= Very high (closely connected).

No	Indicators and questions	Response				
Decision making process						
1.1	How do you rate existence of shared climate change policies or					
A	Waste management office					
B	Green development office					
C	Land management					
D	Transport					
E	Construction					
F	Energy					
G	Urban planning					
H	Civil Society Organizations					
I	Private Sectors					
1.2	How do you rate institutional arrangements that promote mutual benefit about climate change governance with					
A	Waste office					
B	Green development office					
C	Land management					
D	Transport					
E	Construction					
F	Energy					
G	Urban planning					
H	Civil Society Organizations					
I	Private Sectors					
1.3	How do you rate existence of collective decisions making process like memorandums of understanding for CCG(Climate change Governance)with					
A	Waste management office					
B	Green development office					
C	Land management					
D	Transport					
E	Construction Sector					
F	Energy					
G	Urban planning					
H	Civil Society Organizations					
I	Private sectors					
1.4	How do you rate existence of consultation mechanism with other sectors before that sector decides its annual plan or any programme regarding to climate change governance with					
A	Waste management office					
B	Green development office					
C	Land management					
D	Transport					
E	Construction Sector					
F	Energy					
G	Urban planning					
H	Civil Society Organizations					
I	Private sectors					
1.5	How do you rate existence of clear responsibilities to govern climate change with					
A	Waste management office					
B	Green development office					
C	Land management					

D	Transport					
E	Construction sector					
F	Energy					
G	Urban planning					
H	Civil Society Organizations					
I	Private Sectors					
1,6	How do you rate practice of accountability mechanisms that deviate rules or regulation with					
A	Waste management office					
B	Green development office					
C	Land management					
D	Transport					
E	Construction Sector					
F	Energy					
G	Urban Planning					
H	Civil Society Organizations					
I	Private Sectors					
1.7	How do you rate existence of shared performance measurement system to evaluate the implementation of strategies or plans with					
A	Waste management office					
B	Green development office					
C	Land management					
D	Transport					
E	Construction					
F	Energy					
G	Urban planning					
H	Civil Society Organizations					
I	Private Sectors					
Information and Knowledge						
2.1	How do you rate sharing of information about climate change issue with					
A	Waste management office					
B	Green development office					
C	Land management					
D	Transport					
E	Construction					
F	Energy					
G	Urban Planning					
H	Civil Society Organizations					
I	Private Sectors					
2.2	How do you rate existence of information transmission means to exchange information about climate change issues with					
A	Waste management Office					
B	Green Development					
C	Land management					
D	Transport					
E	Construction					
F	Energy					

G	Urban Planning					
H	Civil Society Organizations					
I	Private Sectors					
2.3	How do you rate exchanging of climate change governance modes with					
A	Waste management office					
B	Green development					
C	Land management					
D	Transport					
E	Construction					
F	Energy					
G	Urban Planning					
H	Civil Society Organizations					
I	Private Sectors					
2.4	How do you rate sharing of knowledge about adaptation and mitigation measures with					
A	Waste management office					
B	Green development Office					
C	Land management					
D	Transport					
E	Construction					
F	Energy					
G	Urban planning					
H	Civil Society Organizations					
I	Private Sectors					
Resources						
3.1	How do you rate sharing of expertise related to climate change governance with					
A	Waste management office					
B	Green development office					
C	Land management					
D	Transport					
E	Construction					
F	Energy					
G	Urban planning					
H	Civil Society Organizations					
I	Private Sectors					
3.2	How do you rate sharing of finance to support climate change policy measures with					
A	Waste management office					
B	Green development office					
C	Land management					
D	Transport					
E	Construction					
F	Energy					
G	Urban planning					

H	Civil Society Organizations					
I	Private Sectors					
3.3	How do You rate sharing of technologies to minimize climate change with					
A	Waste management Office					
B	Green development office					
C	Land management					
D	Transport					
E	Construction					
F	Energy					
G	Urban planning					
H	Civil Society Organizations					
I	Private Sectors					
3.4	How do you perceive existence of efficient utilization of resources with					
A	Waste management office					
B	Green development office					
C	Land management					
D	Transport					
E	Construction					
F	Energy					
G	Urban planning					
H	Civil Society Organizations					
I	Private Sectors					

2. 3. In your organization, in which climate change governance functions, non-state actors wants to participate more in the future? (Prioritize or Rank them starting from 1, the most comfortable, to 8, the least comfortable)

NO	Governance Functions	Rank
1	Problem identification/Agenda setting	
2	Influencing decisions and policy makers	
3	Provide information and expertise	
4	Evaluate consequences of policies and measures	
5	Involved in mitigation action	
6	Involved in adaptation action	
7	Raising awareness	
8	Represent public opinion	

Modes of urban climate governance contribution to climate change response

2.4.1 The questions in the following table are, designed to assess the modes applied on climate change governance in the city. Thus please answer by marking (√) in the space provided for each component. The response keys representation is as follows: 1= strongly disagree, 2= Disagree, 3. Neutral, 4= Agree, 5= strongly agree.

Climate Change Governance Modes		Responses				
		1	2	3	4	5
1. Self-governing						
1.1	Green development techniques are implemented with in government buildings(e.g schools, offices, hospitals…) in the city					
1.2	The city government has implemented energy efficiency plans and use of alternative energy sources like solar energy within city government administration buildings (e.g schools, offices, hospitals…)					
1.3	The city government provides low-emission electric material like bulb, for gov,t buildings					
1.4	The city government Provides public transport for government employees					
1.5	There is appropriate waste collection sachems in government offices					
1.6	Implemented energy efficiency standards in new public buildings					
2. Governing through enabling						
2.1	Non state actors are participated in the green development scheme					
2.2	Awareness creation regarding to energy efficiency is practiced					
2.3	The local government encourages non state actors in the provision of alternative Energy					
2.4	There is Participation of actors in the provision of energy efficient materials					
2.5	There is Public- private partnerships to provide public transport					
2.6	Non state actors Participate in collection and recycling of wastes					

2.7	Non state actors Participate in urban planning					
2.8	The city government Promotes CSOs to do their share in the area of adaptation					
3. Governing by Provisions						
3.1	The city administration practiced green development in the city					
3.2	The city government provide alternative energy like solar					
3.3	The city government provides Public transport services for the public					
3.4	The city government works on the provision of infrastructure for alternative forms of transport(Bicycle, walking)					
3.5	Appropriate Waste collection service provided by the city administration					
3.6	The city government installs recycling, composting and 'waste to energy' facilities					
3.7	Environmental risk sites are properly preserved in the city					
4. Governing by Authority						
4.1	regulation on inclusion of green areas on buildings and industries are implemented effectively					
	There is effective implementation of planning for green area development					
4.2	There is effective implementation of planning for green area development					
4.3	There is transport planning to limit car use and provide walking and cycling infrastructure					
4.4	Workplace levies and road-user charging are properly implemented by the government					
4.5	The city government formulates and implemented rules about Vehicle standard					

4.6	The city government implemented strict rules on the collection, reusing and recycling of wastes					
4.7	urban development planning and rules to protect sites that are prone to flood are implemented effectively					

2.5 Factors Affecting Climate Change Governance

The table below includes items related to factors that affect and hinder climate change governance effectively. Please put your answer using this (√) mark under your choice from the given options. The options are 1=Very Low, 2=Low, 3=Moderate, 4= high, and 5= very high.

No	Factors	1	2	3	4	5
1. Strategies and Regulations						
1.1	Lack of strategies or regulations options to tackle climate change					
1.2	Weak enforcement of laws/regulations					
1.3	Lack of existing planning to respond to the ever increasing climate change					
1.4	Absences of performance measurement system to evaluate the implementation of strategies at the local level					
1.5	Poor community consultation whenever projects are implemented on matters that affects (positive or negative) on the environment					
1.6	Lack of clear accountability mechanism that deviate rules, laws or regulation					
1.7	Local government lacks authority over key policies or issues					
2. Finance						
2.1	Lack of permanent sources of finance					
2.2	In adequate finance for implementation of plans or programs					
2.3	Inefficient utilization of budget					
2.4	Lack of funding to hire sufficient staff					
3. Human power						

3.1	Inadequate numbers of employees					
3.2	Shortage of knowledgeable experts related to CCG					
3.3	High turnover of experts					
4. Technologies						
4.1	Lack of access to necessary technology for climate planning and implementation					
4.2	Discrepancy between available technologies and climate governance strategies and action plans					
4.3	Inadequate knowledge to use technologies for climate planning					
4.4	Lack of training about technologies					
5. Polletical will &Leadership						
5.1	Lack of strong leadership on climate change governance in the local government					
5.2	Focus on short-term goals that are politically motivated					
5.3	Lack of leaders who encourage collaboration among different actors					
5.4	Lack of leaders that encourage actions and undertakings; leadership by example					
6. Information						
6.1	Lack of information about local GHG emissions					
6.2	Lack of information on local impacts of climate change					
6.3	Lack of trust in available information between local government management staff and experts					
6.4	Lack of understanding of local government about climate change responses					
7. Coordination's						
7.1	Lack of mainstreaming climate change issue into different sectors					
7.2	Lack of strategies that require collaboration among local government agencies					
7.3	Lack of horizontal interaction of actors in climate change governance Process					

7.4	Lack of vertical interaction of actors,(hierarchical levels) in climate change governance					

Thank you for your cooperation!!!

Appendix 2: **Questionnaire for Non – state Actors (CSOs and Private sectors)**

Introduction

I am Tigezaw Lamesegin and am a PhD candidate in Environment and Development at Addis Ababa University. The purpose of this questionnaire is to collect data about urban climate change governance, especially focusing on effectiveness of urban climate change governance at Addis Ababa City Administration. The research will be focused on the following major areas: Contribution of non- state actors in climate change governance, modes of urban climate change governance, institutional interaction, effectiveness of urban climate change governance and determinant factors of climate change governance in the City Administration. You are selected for this survey and your participation is based on your willingness to take part. Thus, the sincerity and accuracy of your answers are critical to the success of the research. The answer responses from the survey questionnaire are strictly use for research purpose. All information provided by you will be kept strictly confidential. Finally, thank you in advance for your unreserved co-operation and the patience that you show in filling the questionnaire.

Sincerely yours

Tigezaw Lamesegin

Tel No 0912147399/0900814306

e-mail : tigezaw2013@gmail.com

General Information

6. Date of data collection:_____
7. City Administration Level:_____
8. Study Sub City: _____
9. Study Wereda: _____
10. Signature of Respondent:_____

Part I: Background Information of Respondents

9. Sex: 1. Male 2. Female
10. Age: _____
11. Educational Level/Status: _____
12. Educational/ Professional Background: _____
13. Current Position_____
14. Name of Organization/ Office: _____
15. Work experiences: _____
16. Length of years in the current residence: _____

2, 3: Contribution of Non -State Actors in Climate Change Governance

2.3.1 The questions in the following table are, intended to assess the contribution of non-state actor's in climate change governance in the city. Thus please answer by circling the right answers for each question.

No	Questions	Response Code
1	Does your organization participate on climate change governance?	1= Yes 2= No
2	If yes for QN # 1, What are your motivations for participation?	1= The aim of the organization 2= The city government 3= for profit making 4= Other, specify
3	Is there any resource contribution for climate change governance?	1 = yes 2= No
4	If yes for QN # 3, What type of resources contributed for CCG?(Multiple response is possible)	1= Finance 2= Human resource 3= Technology 4= Material 5= Other specify
5	If your response is financial contribution for QN # 4, Is this permanent or temporarily?	1=permanent 2= temporarily
6	How do you rate the contribution of your organization for climate change governance?	1=Very low, 2=Low, 3=Moderate, 4=High, 5=Very High
7	Are there clear responsibilities of non - state actors in climate change governance?	1= Yes 2= No
8	Does a consultation mechanism exist where one government sector consults non state actors before that sector decides its annual plan or any programme?	1= Yes 2= No
9	Would you believe that the non- state actors are involved effectively in urban climate change governance?	1= Yes 2= No
10	Is there any legal arrangement between the local government (state) and the non- state actors for climate change governance issue?	1= Yes 2= No

11	How do you rate the cooperation between the state actors and non- state actors for climate change governance?	1= Very low 2= Low 3= Medium 4= High 5= Very high
12	In your opinion, what is the level of understanding of the non - state actors about climate change policies or strategies of the city	1= Very low 2= Low 3= Medium 4= High 5= Very high
13	The city administration encourages the non- state actors to involve in the preparation process of climate change policy, strategy or plan	1=Strongly disagree 2= Disagree. 3= Natural 4= Agree 5= Strongly Agree

2.3.2 What are the factors that impede participation of none state actors in climate change governance? Please put your answer using this (√) mark under your right choice from the given alternatives (key1=Very Low, 2=Low, 3=Moderate,4= high and 5= very high)

No	Factors	1	2	3	4	5
1	Lack of policies and regulations					
2	Lack of interest of the Organization					
3	Lack of capacity of the organization					
4	Government Interference					
5	Weak institutional arrangements					
6	Unwillingness of the government to allow non- state actors participation on climate change governance					
7	Corruption					
8	Lack of information about urban climate change governance					
9	Other factors (specify)					

Thank you for your cooperation!!!

Appendix 3: Interview Guide for Federal Environment, Forest and Climate Change Commission, Climate Change Department

Dear, interviewee, the following interview questions are designed to purposively selected respondents of EFCCC, climate change Department. The main objective of the interview is to collect data associated with effectiveness of climate change governance at Addis Ababa city administration. The collected data will be used merely for scientific research which to be used for the partial fulfillment of PhD degree in Environment and Development studies at college of development studies of Addis Ababa University, Ethiopia. Your responses are,

therefore, vital for the quality and reliability of the study. Thus you are kindly requested to give your factual responses without any restriction. I assured that your responses will be utilized for research purpose only with high confidentiality.

Part I: Background information

1. Name of Respondent: _____
2. Name of Organization:_____
3. Current Position of Interviewee: _____
4. Educational Background: _____
5. Education Status: _____
6. Work experience: _____
7. Phone Number: _____
8. Date: _____

Part II: Guiding questions (F)

1. How do you evaluate climate change trend and impacts in urban areas in Ethiopia?
2. Has Ethiopia Clear urban climate change policy / Strategy or plan?
3. Would you believe that the Ethiopian Urban Environmental policy has paid a keen attention to urban climate change governance?
4. In your understanding how do evaluate the measure taken by the government to tackle climate change in urban areas (Addis Ababa city)?
5. What institutions and actors were involved in climate change response in cities? What was their role? What were the challenges?
6. Would you believe that the non- state actors (CSOs, Private Sectors, and community) are involved effectively in urban climate change governance?
7. If not, what are the main challenges to non-state actors to involve in urban climate change governance effectively?
8. What governing methods apply the federal government to address climate change in cities?
9. What are the contributions of the climate governance activities in the city to handle climate change and its impacts in the city?
10. How does explain the arrangement of the institution(from federal to local levels) both in terms of regulation, capacity and independence for climate change response in urban Ethiopia?
11. How do you describe the current organizational structure (from federal to local) to implement environmental policy in general and climate change response in particular? How do You Support the AAECGDC?
12. How do you explain the CCG performance in Ethiopia cities with respect to achieving accountability, participation, role of actors, institutions, climate change law, partnership, and other indicators? What are the problems in this regard and why?
13. In your opinion, what are the major factors that constrain urban climate change governance at the local, national and global level?
14. What do you suggest for effective urban climate change governance in Ethiopia?

Thank you for your cooperation!!!

Appendix 4: Interview Guide for Federal MUDC

Dear, interviewee, the following interview questions are designed to purposively selected respondents of MUDC. The main objective of the interview is to collect data associated with

effectiveness of climate change governance at Addis Ababa city administration. The collected data will be used merely for scientific research which to be used for the partial fulfillment of PhD degree in Environment and Development studies at college of development studies of Addis Ababa University, Ethiopia. Your responses are, therefore, vital for the quality and reliability of the study. Thus your are kindly requested to give your factual responses without any restriction. I assured that your responses will be utilized for research purpose only with high confidentiality.

Part I: Background information

1. Name of Organization: _____

2. Current Position of Interviewee: _____

3. Educational Background: _____

4. Education Status: _____

4. Work experience: _____

5. Federal: _____

6. Date: _____

Part II: Guiding questions

1. How do you evaluate climate change, trend Cause and impacts in urban areas in Ethiopia (Addis Ababa City)?
2. Has Ethiopia Clear urban climate change policy / Strategy or plan? Would you believe that the FDRE urban development policy has paid a keen attention to urban climate change governance?
3. In your understanding how do evaluate the measure taken by the government to tackle climate change in urban areas (Addis Ababa city)?
4. What Sectors and actors were involved in climate change response in cities? What was their role? What were the challenges?
5. Would you believe that the non- state actors (CSOs, Private Sectors, and community) are involved effectively in urban climate change governance?
6. If not, what are the main challenges to non-state actors to involve in urban climate change governance effectively?
7. In your opinion, what are the major factors that constrain urban climate change governance at the local, national and global level?
8. What do you suggest for effective urban climate change governance in Ethiopia?

Thank you for your cooperation!!!

Appendix 5: Interview Guide for Addis Ababa City Government Environmental Protection and Green Development Commission

Dear, interviewee, the following interview questions are designed to purposively selected respondents of Environmental Protection and Green Development Commission. The main objective of the interview is to collect data associated with climate change governance at Addis Ababa city administration. The collected data will be used merely for scientific research which to be used for the partial fulfilment of PhD degree in Environment and

Development studies at college of development studies of Addis Ababa University, Ethiopia. Your responses are, therefore, vital for the quality and reliability of the study. Thus you are kindly requested to give your factual responses without any restriction. I assured that your responses will be utilized for research purpose only with high confidentiality.

Tigezaw Lamesegin Tel No : 0912147399 e-mail : tigezaw2013@gmail.com

Part I: Background information

1. Name of Interviewee :_____
2. Name of organization: _____
3. Current Position of Interviewee: _____
4. Educational Background :_____
5. Education Status : _____
6. Work experience : _____
7. Phone Number : _____
8. Date : _____

Part II: Guiding questions

1. How do describe the trend of climate change in Addis Ababa city?
2. What were the major Causes and adverse effects of the changing climate in the city?
3. What are the measures taken by your organization to tackle climate change?
4. What are their motivations to promote climate action in the city?
5. Does the city have climate change Policy? How does national level climate policy relate with urban local climate action in the city?
6. What formal rules, laws and regulations are there to tackle Climate change (GHG emission)? How are these instruments being implemented? What problems are there and why?
7. Do climate change policy /strategy address both climate change mitigation and adaptation related issue? Which is more Apply? Why?
8. What governing modes (Self-governing, Governing by provision, Regulation Enabling) apply the local authorities to address climate change?
9. Did climate change issue mainstreaming or connected with other priority areas of the city (energy, transportation, Waste, Housing, and Education, planning …)?
10. Are the existing institutional interactions at different level (federal, City mayor, City level, Sub city, Wereda) capable of tackling the ever-increasing climate change in the city? What institutional structure change needs in the future? What looks like the current organizational structure from commission, sub city, Woreda level? How do you support the local level? Coordination of actors and sectors? Attraction mechanisms of CSOs?
11. Who are the major actors and what key role did in the prevention of climate change?
12. Would you believe that the non-state actors (CSOs, Private Sector, and community) are involved effectively in urban climate change response process?
13. If not, what are the main challenges to non-state actors to involve in urban climate change response?
14. How did resource (Human, Financial, technological…) allocation for climate change action?
15. How did membership in national and transnational urban networks of city government for climate change Response (like C 40)?
16. How do you describe existing practice of climate change governance in the city?
17. What are the factors that impede effective climate change governance in the city?
18. What do you suggest for effective climate change governance in the city?

Thank you for your cooperation!!!

Appendix 6. Interview Guide for Addis Ababa City Government Mayor Office

Dear, interviewee, the following interview questions are designed to purposively selected respondent of City Mayor. The main objective of the interview is to collect data associated with climate change governance at Addis Ababa city administration. The collected data will be used merely for scientific research which to be used for the partial fulfilment of PhD degree in Environment and Development studies at college of development studies of Addis Ababa University, Ethiopia. Your responses are, therefore, vital for the quality and reliability of the study. Thus you are kindly requested to give your factual responses without any restriction. I assured that your responses will be utilized for research purpose only with high confidentiality.

Tigezaw Lamesegin Tel No: 0912147399 e-mail : tigezaw2013@gmail.com

Part I: Background information

1. Name of Respondent: _____
2. Name of Organization:_____
3. Current Position of Interviewee: _____
4. Educational Background: _____
5. Education Status: _____
6. Work experience: _____
7. Phone Number: _____
8. Date: _____

Part II: Guiding Questions

1. How do you describe the trend, causes, impact of climate change in Addis Ababa city? Is there steering committee to respond to climate change? What role they do? What are the challenges?
2. In your understanding, how do evaluate the measure taken by the city government to tackle climate change or to minimize GHG emission related to clear regulation or standard about Vehicles age, fuel quality, to improve Waste management system, informal settlement in Addis Ababa city?
3. How do you describe existing practice of alternative energy provision in the city? Is there clear organizational structure from city to local level about energy?
4. In the present time, how much parentage of land allocated for open space (green areas)? Is there any condition that shift green space to another land use? What is the reason? For what purpose?
5. What sectors and actors (CSOs, private sector, communities) were involved in climate change response in cities? What was their role? What were the challenges?
6. What are the participation mechanisms of CSOs to involve Environmental Issue (climate Change) in the city?
7. How do you support the Addis Ababa city Environmental protection and green development commission?
8. How do you evaluate coordination with other foreign cities governmental and non-governmental organizations for climate change Response in the city**?**
9. How do you explain the climate change response performance in the city with respect to achieving accountability, participation, role of actors, institutions, climate change law, climate change law enforcement, partnership? What are the problems in this regard?

10. In your opinion, what are the major factors that constrain urban climate change response in the city? Finally, what do you suggest for effective urban climate change governance in the city?

Thank you for your cooperation!!!

Appendix 7: Interview Guide for Addis Ababa City Transport Bureau

Dear, interviewee, the following interview questions are designed to purposively selected respondents of Transport Bureau. The main objective of the interview is to collect data associated with climate change governance at Addis Ababa city administration. The collected data will be used merely for scientific research which to be used for the partial fulfilment of PhD degree in Environment and Development studies at college of development studies of Addis Ababa University, Ethiopia. Your responses are, therefore, vital for the quality and reliability of the study. Thus you are kindly requested to give your factual responses without any restriction. I assured that your responses will be utilized for research purpose only with high confidentiality.

Tigezaw Lamesegin Tel No: 0912147399 e-mail : tigezaw2013@gmail.com

Part I: Background information

1. Name of Respondent : _____
2. Name of Organization: _____
3. Current Position of Interviewee: _____
4. Educational Background_____
5. Education Status_____
6. Work experience_____
7. Phone Number : _____
8. Date: _____

Part II: Guiding Questions (T)

1. How do you describe the trend of transport planning and management in Addis Ababa city?
2. How do you evaluate the trend of (GHG) emission from transport sector in the city?
3. Is there clear regulation or standard about Vehicles age, fuel quality, fuel efficiency?
4. Does the city have transport policy, strategy or plan? How to implement it in the city?
5. What formal rules and regulations are there to minimize GHG? How are these instruments being implemented? What problems are there and why?
6. Is there mechanism of mainstreaming of climate change or environmental issues in the planning or decision making process?
7. Are there mechanisms that the city government Provides public transport for government employees? (Self-governing)
8. How do you describe the non-state actors (Private sectors, CSOS) and Stakeholders Participation in provision of public transport and GHG emission reduction plan?
9. How do you encourage walking and cycling transportation system in city?(Enabling)
10. How adequate were the provision of Public transport services in the city?
11. Are there appropriate provision of infrastructure for alternative forms of transport system such as walking and cycling in the city? (Provision)
12. Are there rules or regulation to limit car use, workplace levies, road-user charging or others to discharge car usage?

13. Would you believe that the non-state actors are involved effectively in transport sector? If not, what are the main challenges to involve?
14. Are there institutional interactions at horizontal and vertical level about transport management?
15. What are the challenges that impede effective management of transport system in the city?
16. What do you suggest for effective transport planning and management to minimize GHG in the city?

Thank you for your cooperation!!!

Appendix 8: Interview Guide for Addis Ababa City Waste Management Agency

Dear, interviewee, the following interview questions are designed to purposively selected respondent of Waste Management Agency. The main objective of the interview is to collect data associated with climate change governance at Addis Ababa city administration. The collected data will be used merely for scientific research which to be used for the partial fulfilment of PhD degree in Environment and Development studies at college of development studies of Addis Ababa University, Ethiopia. Your responses are, therefore, vital for the quality and reliability of the study. Thus you are kindly requested to give your factual responses without any restriction. I assured that your responses will be utilized for research purpose only with high confidentiality.

Tigezaw Lamesegin Tel No: 0912147399 e-mail: tigezaw2013@gmail.com

Part I: Background information

1. Name of Respondent : _____
2. Name of Organization: _____
3. Current Position of Interviewee: _____
4. Educational Background_____
5. Education Status_____
6. Work experience_____
7. Phone Number : _____
8. Date: _____

Part II: Guiing questions (W)

1. How do describe the trend of waste management in Addis Ababa city?
2. How do evaluate methane (GHG) emission from waste in the city?
3. Does the city have waste management strategy or plan? Does the plan incorporate climate issue? How to implement it in the city?
4. What are the measures taken by your organization to improve waste management?
5. What formal rules and regulations are there to improve waste management? How are these instruments being implemented? What problems are there and why?
6. Are there appropriate waste collection sachems in government offices (e.g., hospital different public office, schools)? Self Governing)
7. How do you describe the non-state actors (Private sectors, CSOS) Participation in waste management scheme (recycling, composting and ‘waste to energy activity)? Enabling)
8. Is there any regulation that encourage the private sectors and CSOs to involve in the waste management scheme

9. Is there awareness creation public Campaigns for reducing, reusing and recycling of waste (Enabling)
10. How adequate were the installations for disposing, recycling, composting and 'waste to energy' facilities in the city)
11. Are there appropriate Waste collection service provided by your office? (Provision)
12. Are there institutional interactions at horizontal and vertical level about waste management?
13. What are the challenges that impede effective management of waste in the city?
14. What do you suggest for effective waste management in the city?

Thank you for your cooperation!!!

Appendix 9. Interview Guide for Addis Ababa City Administration Resilience Project Office

Dear, interviewee, the following interview questions are designed to purposively selected respondents of Resilience Project Office. The main objective of the interview is to collect data associated with climate change governance at Addis Ababa city administration. The collected data will be used merely for scientific research which to be used for the partial fulfilment of PhD degree in Environment and Development studies at college of development studies of Addis Ababa University, Ethiopia. Your responses are, therefore, vital for the quality and reliability of the study. Thus you are kindly requested to give your factual responses without any restriction. I assured that your responses will be utilized for research purpose only with high confidentiality.

Tigezaw Lamesegin

Tel No : 0912147399

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Part I: Background information

1. Name of Respondent : _____
2. Name of Organization: _____
3. Current Position of Interviewee: _____
4. Educational Background_____
5. Education Status_____
6. Work experience_____
7. Phone Number : _____
8. Date: _____

Part II: Guiding Questions

1. What are the main objectives of this organization?
2. Does your organisation have strategy or plan? Does the strategy or plan incorporate Environmental or climate issue?
3. In which issues are more participated, (related to transport, energy, waste, green area development, urban plan, or other)? Why?
4. What are the measures taken by your organization to take mitigation and adaptation action?
5. What Sectors and actors are involved in climate change response in the city? What is their role? What are the challenges?

6. Is there clear organizational structure from federal to local level to implement your plan effectively?
7. In your opinion, what are the major challenges that impede to implement your strategy or plan? Finally, what do you suggest for effective implementation of your strategy in the city?

Thank you for your cooperation!!!

Appendix 10. Interview Guide for Addis Ababa City Government River Basin and Green Development Agency

Dear, interviewee, the following interview questions are designed to purposively selected respondents of River Basin and Green Development Agency. The main objective of the interview is to collect data associated with climate change governance at Addis Ababa city administration. The collected data will be used merely for scientific research which to be used for the partial fulfilment of PhD degree in Environment and Development studies at college of development studies of Addis Ababa University, Ethiopia. Your responses are, therefore, vital for the quality and reliability of the study. Thus you are kindly requested to give your factual responses without any restriction. I assured that your responses will be utilized for research purpose only with high confidentiality.

Tigezaw Lamesegin

Tel No : 0912147399

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Part I: Background information

1. Name of Respondent : _____
2. Name of Organization: _____
3. Current Position of Interviewee: _____
4. Educational Background_____
5. Education Status_____
6. Work experience_____
7. Phone Number : _____
8. Date: _____

Part II: Guiding Questions (G)

1. How do you describe existing practice of green development and management in Addis Ababa city?
2. How do you evaluate green area coverage and green space per capita in the city?
3. Does the city have Green development strategy or plan? How does national level stratage or plan relate with urban strategy in the city? Does the strategy or plan incorporate climate issue or sequestration of GHG?
4. What are the measures taken by your organization to improve the management of green area?
5. What formal rules and regulations are there to implement green areas provision in new buildings (housing, Industrials sites, and Commercial areas? How are these regulations being implemented? What problems are there and why?
6. Does green area development and management strategy or plan address all sub cities equally? Provision)

7. Is there Green development practice with in government buildings(e.g schools, different public offices, hospitals…) Self-Governing
8. Is there green area coverage requirements implementing new buildings? (Authority or regulation)
9. Would you believe that the non-state actors (CSOs, Private Sectors,) are involved in green area development process? (Enabling)
10. If not, what are the main challenges the non-state actors to involve?
11. Are there institutional interactions at horizontal and vertical level about green area development and management?
12. What are the Challenges that impede effective provision of green infrastructure in the city?
13. What do you suggest for effective development and management of urban greenery in the city?

Thank you for your cooperation!!!

Appendix 11. Interview Guide for Ministry of Water, Irrigation and Energy

Dear, interviewee, the following interview questions are designed to purposively selected respondents of Ministry of Water, Irrigation and Energy**.** The main objective of the interview is to collect data associated with climate change governance at Addis Ababa city administration. The collected data will be used merely for scientific research which to be used for the partial fulfilment of PhD degree in Environment and Development studies at college of development studies of Addis Ababa University, Ethiopia. Your responses are, therefore, vital for the quality and reliability of the study. Thus you are kindly requested to give your factual responses without any restriction. I assured that your responses will be utilized for research purpose only with high confidentiality.

Tigezaw Lamesegin Tel No : 0912147399 e-mail : tigezaw2013@gmail.com

Part I: Background information

1. Name of Resepondant : _____
2. Name of Organization: _____
3. Current Position of Interviewee: _____
4. Educational Background_____
5. Education Status_____
6. Work experience_____
7. Phone Number : _____
8. Date: _____

Part II: Guiding questions

1. How do you describe existing practice of alternative energy provision in the urban areas?
2. Does the country have urban energy Policy or strategy? Does the strategy or plan incorporate climate issue (Reduction of GHG emission from energy)?
3. What are the measures taken by your organization to improve energy efficiency?
4. What formal rules and regulations are there to improve energy efficiency? How are these instruments being implemented? What problems are there?
5. Is there Energy efficiency plan and provision of energy-efficient materials within buildings
6. Are there Awareness creation campaigns about energy efficiency for the public?

7. Does the government address provision of incentives for energy-efficiency measures?
8. Is there Energy efficiency requirements in new buildings?
9. Would you believe that the non-state actors (CSOs, Private Sector,) are involved in energy provision process? If not, what are the main challenges the non-state actors to involve?
10. Are there clear organizational structures from federal to local level?
11. What are the Challenges that impede effective provision of alternative energy in urban areas? What do you suggest for effective provision of alternative energy in Addis Ababa city?

Thank you for your cooperation!!!

Appendix: 12 Interview Guide for Addis Ababa City Plan Commission

Dear, interviewee, the following interview questions are designed to purposively selected respondents of Addis Ababa City Plan Commission. The main objective of the interview is to collect data associated with climate change governance at Addis Ababa city administration. The collected data will be used merely for scientific research which to be used for the partial fulfilment of PhD degree in Environment and Development studies at college of development studies of Addis Ababa University, Ethiopia. Your responses are, therefore, vital for the quality and reliability of the study. Thus you are kindly requested to give your factual responses without any restriction. I assured that your responses will be utilized for research purpose only with high confidentiality.

Tigezaw Lamesegin

Tel No: 0912147399

e-mail: tigezaw2013@gmail.com

Part I: Background information

1. Name of Organization: _____

2. Current Position of Interviewee: _____

3. Educational Background: _____

4. Education Status: _____

5. Work experience:_____

6. City A /Sub city/ Wereda: _____

7. Date: _____

Part II: Guiding Questions

1. How do you prepare urban Plan? How do you incorporate Environmental (climate) issue to minimize GHG in city planning?
2. How do you implement strategic land use planning to minimize GHG emission and to promote environmentally friendly transportation system (walking and biking)?
3. How do you implement building regulation about greening, building design, building standard of energy efficiency?
4. Is there any mechanism, about integration of vegetation into the design of individual buildings, such as greening roofs and walls, parks, and planting of trees in courtyards?

5. How to preserve flood prone areas, wetlands and other environmental hazard areas through planning?
6. Are there development of mixed-use areas strategy , which integrate residential housing, work areas, commercial areas, facilities and entertainment in close proximity, to promote waking and cycling (to minimize GHG)?
7. In the present time, how much parentage of land allocated for open space (green areas)? Is there any condition that shift green space to another land use? What is the reason? For what purpose? How much hectare of land changed?
8. Are the existing institutional arrangements at different level (from Federal to local) capable to develop and implement the plan of the city?
9. Who are the major actors in city planning? What key role did?
10. How do you evaluate the current practice of planning in the city?
11. In your opinion, what are the main factors that impede to prepare and implement good plan? Finally, what do you suggest for preparing and implementation of good spatial planning in the city?

Thank you for your cooperation!!!

Appendix: 13 Interview Guide for Civil Society Organizations Representative

Dear, interviewee, the following interview questions are designed to purposively selected respondent of Guide for Civil Society Organizations Representative. The main objective of the interview is to collect data associated with climate change governance at Addis Ababa city administration. The collected data will be used merely for scientific research which to be used for the partial fulfilment of PhD degree in Environment and Development studies at college of development studies of Addis Ababa University, Ethiopia. Your responses are, therefore, vital for the quality and reliability of the study. Thus you are kindly requested to give your factual responses without any restriction. I assured that your responses will be utilized for research purpose only with high confidentiality.

Tigezaw Lamesegin Tel No : 0912147399 e-mail : tigezaw2013@gmail.com

Part I: Background information

1. Name of Respondent : _____
2. Name of Organization: _____
3. Current Position of respondent: _____
4. . Educational Background: _____
5. Educational Status: _____
6. Work experience: _____
7. Phone Number :_____
8. Date: _____

Part II: Guiding Questions

1. What are the major objectives of your organization? Why you choose this activity?
2. Is the existing legal framework encourage or discourage CSOs to involve in the climate change responses?
3. How do you see the political environment of the city to participate CSOs in climate change issue?
4. What are the main Challenges that impede the participation of CSOs in climate change action in the city?
5. What do you suggest for effective Participation of CSOS in climate change response in Addis Ababa city Administration?

Thank you for your cooperation!!!

Appendix: 14 Interview Guide for Addis Ababa City Electricity provision Office

Dear, interviewee, the following interview questions are designed to purposively selected respondents of Addis Ababa City Electricity provision Office. The main objective of the interview is to collect data associated with climate change governance at Addis Ababa city administration. The collected data will be used merely for scientific research which to be used for the partial fulfilment of PhD degree in Environment and Development studies at college of development studies of Addis Ababa University, Ethiopia. Your responses are, therefore, vital for the quality and reliability of the study. Thus you are kindly requested to give your factual responses without any restriction. I assured that your responses will be utilized for research purpose only with high confidentiality.

Tigezaw Lamesegin Tel No: 0912147399 e-mail: tigezaw2013@gmail.com

Part I: Background information

1) Name of Resepondant : _____
2) Name of Organization: _____
3) Current Position of Interviewee: _____
4) Educational Background_____
5) Education Status_____
6) Work experience_____
7) Phone Number : _____
8) Date: _____

Part II: Guiding questions

1. How do describe the trend of electricity provision in Addis Ababa city?
2. What are the major sources of energy in the city? Renewable or non-renewable sources? Which is more dominate?
3. Is there electricity provision plan from alternative energy (solar, wind) sources provision scheme in the city
4. What are the measures taken by your organization to improve efficient utilization of electricity and provision of energy-efficient materials?
5. Are there Awareness creation campaigns about electricity saving (efficiency) for the public?
6. Does the city have energy Policy or strategy or plan? Does the strategy or plan incorporate environment or climate issue? (Reduction of GHG emission from energy)
7. What formal rules and regulations are there to improve energy efficiency? How are these instruments being implemented? What problems are there?
8. Do energy policy /strategy address the low income group sand informal settlements?
9. Are there electricity efficiency requirements during new buildings construction?
10. What Sectors and actors are involved in the provision of electricity in the cities? What is their role? What are the challenges?
11. Is there clear organizational structure from federal to local level to provide the service effectively?

12. What are the Challenges that impede effective provision of electricity from alternative energy source in the city? What do you suggest for effective provision of electricity provision (especially alternative energy) in Addis Ababa city?

Thank you for your cooperation!!!

Appendix: 15 Interview Guide for Addis Ababa City Environmental Protection and Green Development Commission, Air Pollution and Climate Change Department

Dear, interviewee, the following interview questions are designed to purposively selected respondent of Addis Ababa City Environmental Protection and Green Development Commission Climate Change Department. The main objective of the interview is to collect data associated with climate change governance at Addis Ababa city administration. The collected data will be used merely for scientific research which to be used for the partial fulfilment of PhD degree in Environment and Development studies at college of development studies of Addis Ababa University, Ethiopia. Your responses are, therefore, vital for the quality and reliability of the study. Thus you are kindly requested to give your factual responses without any restriction. I assured that your responses will be utilized for research purpose only with high confidentiality.

Tigezaw Lamesegin Tel No : 0912147399 e-mail : tigezaw2013@gmail.com

Part I: Background information

1. Name of Interviewee :_____
2. Name of organization: _____
3. Current Position of Interviewee: _____
4. Educational Background :_____
5. Education Status : _____
6. Work experience : _____
7. Phone Number : _____
8. Date : _____

Part II: Guiding Questions

1. How do describe the trend of climate change in Addis Ababa city?
2. What were the major Causes and adverse effects of the changing climate in the city?
3. What are the measures taken by your organization to tackle climate change?
4. Does the city have Pollution control rules or strategies? How does national level rules relate with local pollution control action in the city?
5. What formal rules, laws and regulations are there to tackle Climate change (GHG emission)? How are these instruments being implemented? What problems are there and why?
6. Do climate change policy /strategy address both climate change mitigation and adaptation related issue? Which is more Apply? Why?
7. What governing modes (Self-governing, Governing by provision, Regulation Enabling) apply the local authorities to address climate change?
8. Did climate change issue mainstreaming or connected with other priority areas of the city (energy, transportation, Waste, Housing, and Education, planning …)?
9. Are the existing institutional arrangements at different level (federal, City mayor, City level, Sub city, Wereda) capable of tackling the ever-increasing climate change in the city? What institutional change needs in the future?

10. Who are the major actors and what key role did in the prevention of climate change?
11. Would you believe that the non-state actors (CSOs, Private Sector, and community) are involved effectively in urban climate change response process?
12. If not, what are the main challenges to non-state actors to involve in urban climate change response?
13. How did resource (Human, Financial, technological…) allocation for climate change and pollution control action?
14. How did membership in national and transnational urban networks of city government for climate change Response?
15. How do you describe existing practice of climate change governance in the city?
16. What are the factors that impede effective climate change governance in the city?
17. What do you suggest for effective climate change governance in the city?

Thank you for your cooperation!!!

Interview Guide for Addis Ababa City Government Gullele Botanic Garden

Appendix: 16 Addis Ababa City Gullele Botanic Garden Office

Dear, interviewee, the following interview questions are designed to purposively selected respondents of **Gullele Botanic Garden**. The main objective of the interview is to collect data associated with climate change governance at Addis Ababa city administration. The collected data will be used merely for scientific research which to be used for the partial fulfilment of PhD degree in Environment and Development studies at college of development studies of Addis Ababa University, Ethiopia. Your responses are, therefore, vital for the quality and reliability of the study. Thus you are kindly requested to give your factual responses without any restriction. I assured that your responses will be utilized for research purpose only with high confidentiality.

Tigezaw Lamesegin

Tel No : 0912147399

e-mail : tigezaw2013@gmail.com

Part I: Background information

1. Name of Respondent : _____
2. Name of Organization: _____
3. Current Position of Interviewee: _____
4. Educational Background_____
5. Education Status_____
6. Work experience_____
7. Phone Number : _____
8. Date: _____

Part II: Guiding Questions (G)

1. How do you describe existing practice of green development and management in Addis Ababa city?
2. How do you evaluate green area coverage and green space per capita in the city?
3. Does the city have Green development strategy or plan? How does national level stratage or plan relate with urban strategy in the city? Does the strategy or plan incorporate climate issue or sequestration of GHG?
4. What are the measures taken by your organization to improve the management of green area?

5. What formal rules and regulations are there to implement green areas provision in new buildings (housing, Industrials sites, and Commercial areas? How are these regulations being implemented? What problems are there and why?
6. Does green area development and management strategy or plan address all sub cities equally? Provision)
7. Is there Green development practice with in government buildings(e.g schools, different public offices, hospitals…) Self-Governing
8. Is there green area coverage requirements implementing new buildings? (Authority or regulation)
9. Would you believe that the non-state actors (CSOs, Private Sectors,) are involved in green area development process? (Enabling)
10. If not, what are the main challenges the non-state actors to involve?
11. Are there institutional interactions at horizontal and vertical level about green area development and management?
12. What are the Challenges that impede effective provision of green infrastructure in the city?
13. What do you suggest for effective development and management of urban greenery in the city?

Thank you for your cooperation!!!

Appendix: 17 Interview Guide for Community Representatives in the City

Part I: Background information

1. Name of respondent: _____
2. Position of respondent: _____
3. Educational Background & Status: _____
4. Living Time: _____
5. Sub city: _____
6. Wereda : _____
7. Date: _____

Part II: Guiding questions

1. How do you describe the trend of climate change in the Addis Ababa city?
2. What do you think the major reasons for climate change in the city?
3. What were the adverse effects of climate changes in relation to your residents?
4. What measures are being taken to minimize climate change in the city?
5. How local governments interact with the communities to address climate change in the city?
6. What are the mechanisms in the participation of the community's in climate change governance?
7. How do you evaluate the current climate change governance in the city?
8. How would you describe your relationship with other actors to address climate change in the city?
9. In which climate action related issue does the communities cooperate with city administration?
10. What key role did in the prevention of climate change in the city?
11. What are their motivations to promote climate action in city?
12. What institutional change needs to manage climate change in sustainable way in the city?
13. Does your contribution address both climate change mitigation and adaptation related issue?
14. What are the main factors that impede effective climate change governance in the city?

15. What is your suggestion for the overall improvement of the governance of climate change in the city?

Appendix: 18 Interview Guide for Private Sectors Representatives in AA city

Part I: Background information

1. Name of the Campany: _____
2. Current Position of respondent: _____
3. Education Background: _____
4. Educational Status: _____
5. Work experience: _____
6. Sub city: _____
7. Wereda: _____
8. Date: _____

Part II: Guiding questions

1. How do you describe the trend of climate change in the city?
2. What measures are being taken your sector to minimize climate change in the city?
3. What are the governing methods applied by local authorities to address climate change?
4. How local governments cooperate with private sectors to minimize climate change in the city?
5. In which climate action related issue does the city administration cooperate with the private sectors?
6. Did climate change issue connected with your organization (energy, transportation, Housing, Education, waste, planning …)?
7. What key role did in the prevention of climate change?
8. What are their motivations to promote climate action in city?
9. What is the existing situation of climate change governance?
10. What are the main factors that impede to participate in climate change governance in the city?
11. What do you suggest for effective climate change governance in Addis Ababa city Administration?

Thank you for your cooperation!!!

Appendix: 19 Interview Guide for Addis Ababa City administration Sub city & woreda Officials

Dear, interviewee, the following interview questions are designed to purposively selected respondent of Sub City Officials. The main objective of the interview is to collect data associated with climate change governance at Addis Ababa city administration. The collected data will be used merely for scientific research which to be used for the partial fulfilment of PhD degree in Environment and Development studies at college of development studies of Addis Ababa University, Ethiopia.. Your responses are, therefore, vital for the quality and reliability of the study. Thus you are kindly requested to give your factual responses without any restriction. I assured that your responses will be utilized for research purpose only with high confidentiality.

Tigezaw Lamesegin Tel No: 0912147399 e-mail : tigezaw2013@gmail.com

Part I: Background information

1. Name of Respondent: _____
2. Name of Organization:_____
3. Current Position of Interviewee: _____
4. Educational Background: _____
5. Education Status: _____
6. Work experience: _____
7. Phone Number: _____
8. Date: _____

Part II: Guiding questions

1. How do you describe the trend, Cause and impact of climate change in Addis Ababa city?
2. How do evaluate the measures (Mitigation and Adaptation action) taken by your organization to tackle climate change in Addis Ababa city?
3. Which sectors and non-state actors (CSOs, Private Sectors, and community) were involved in climate change response? What was their role? What were the challenges?
4. What are the participation mechanisms of CSOs to involve Environmental Issue (climate Change) in the sub city?
5. Did climate change issue mainstreaming or connected with other priority areas in your sub city of sectors?
6. How do you explain the CCG performance in the Sub city with respect to achieving accountability, participation, role of actors, institutions, climate change law, partnership, and other indicators?
7. In your opinion, what are the major factors that constrain urban climate change governance in the city?
8. What do you suggest for effective urban climate change governance in the city

Thank you for your cooperation!!!

Appendix: 20 Observation Guide (Checklist)

Part .1 Background information of observation area

1. Name of Sub City for Observation: _____

2. Name of Specific Wereda of Observation: _____

3. Number of Population in the Wereda: _____

4. Area Coverage of the Wereda: _____

5. Green area Coverage of the wereda: _____

Part. 2 Guidelines for observation: the following issues will be observed.

1. Infrastructures condition of the city

2. Climate induced impacts of the study area
3. The level of community networking and participation in public works to minimize climate change in the city
4. The level of city residence support system and existence of the plan in place
5. The various resilience building packages put in place
6. The practice of adaptation and Mitigation measure

Appendix: 21 Document review Chalkiest

In addition to books and journal articles the following documents have been reviewed:

- ✓ The constitution
- ✓ Climate Resilience Green Economy Strategy (CRGE)
- ✓ Urban Good governance Strategy
- ✓ The country's environmental policy
- ✓ The 2014 National Urban Climate Change Resilience &Green development strategy
- ✓ The 2014 National Urban Soiled Waste management strategy
- ✓ The 2015 Urban Green Infrastructure Development strategy
- ✓ The 2014 Addis Ababa City CRGE
- ✓ AA Climate action plan
- ✓ AA air quality management plan
- ✓ State of Addis Ababa city, 2017 and 2021
- ✓ AA nonmoterized strategy 2018
- ✓ GTP II
- ✓ The 2017 structural plan of the Addis Ababa City (2017-2027)
- ✓ Addis Ababa City Transportation Strategy
- ✓ Energy policy Of the country
- ✓ Urban Planning and land use management strategies of the city
- ✓ Environmental Impact Assessment Proclamation
- ✓ Pollution Control Proclamation
- ✓ The Public Health Proclamation and National Sanitation Strategy
- ✓ Environmental Audit Regulation
- ✓ Municipal solid waste policy and regulation
- ✓ Industrial Effluent Emission, and ambient air and water quality control regulation
- ✓ Green area management regulation
- ✓ Building permit Regulation
- ✓ Urban development policy of the country
- ✓ Negarit and Addis Gazeta and Magazines
- ✓ Unpublished reports, minutes and others

Appendex: 22 Lists of Respondents for Interview

Key informants	Number
Environment, Forest, & climate change Commission	2
Ministry of urban development and Construction	2
Deputy Mayor of the city	1
Civil Society Organization Agency	1
Civil Society Organization representatives	6

AA Civil Society Organization office	2
Ministry of water, irrigation and energy	2
Addis Ababa electricity utility service provision	2
A,A Environment, Forest, & climate change Commission	15
AA city waste Agency	2
AA city waste to energy Project Plan	2
AA city Resilience Project Office	1
AA Industry and Investment Bearo	2
The Chair Person of Chamber of Commerce in AA city	2
Community Representatives	4
Private sectors representative	5
AA city transport and road Authority	2
AAPlanning commission,	1
A.A Construction commission,	1
A.A Land management	1
A.A Building permit and monitoring	1
AAGulele botanic garden agency	1
AA city River basin and green development Agency	2