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DEDICATION

This work is dedicated to my Parents, Kome Henry Suinyuy and Caroline Yiven

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STATEMENT OF THE AUTHOR

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ABSTRACT

Climate change is increasingly becoming a great hindrance to socio-economic development and wellbeing of Cameroon. This is in particular the case of Yaoundé in the centre region where climate extremes such as torrential rainfall and increasing temperatures causing flooding, landslides, mudslides, heat waves and seasonal variations have become a nightmare. The mitigation and adaptation to this climate change impacts requires effective knowledge transfer in order to optimize action and policies within the region. The first priority objective of Cameroon's National Adaptation Plan sets out to improve knowledge on climate change and the second priority being; informing, educating and mobilizing the Cameroonian communities on Adaptation strategies. This justifies the reason for which this research with focus in the centre region was carried out. The aim of this research was to assess the effectiveness of climate change knowledge transfer for adaptation and mitigation action and policy in Cameroon. The specific objectives of this research included to evaluate the current state of climate change knowledge transfer frameworks, identify involved actors and their power relations, Identify key challenges hindering efficient knowledge transfer, identifying dissemination canals and the extent of knowledge outreach. A mixed-method approach that combined qualitative and quantitative data collection methods was used. A review of existing literature work and policy documents was done, interviews with 9 key informants from some key climate change knowledge management establishments, 182 questionnaires administered to households from sample localities (Mbankolo(42), Nkolbisson(38), Etoug Ebe(38), Awae Village(32) and Ntui(32), surveys and focus group discussion. The SPSS software was used to analyse quantitative data collected from the field while ALAS.ti software was used to analyse qualitative data using the thematic approach. Country policies were examined to assess their alignment with effective climate change knowledge transfer using the policy analysis approach by Carl (2016). Results revealed that there exist already established climate change knowledge transfer frameworks including mainly ONACC and DMN. However only 36.8% of respondent knew of any existing Climate change Knowledge transfer frameworks while 63.2 % did not. Out of respondents who knew a framework, 40(59.7%) identified ONACC, 12(17.9%) identified DMN. The frameworks still function at the national level having their helm at the capital of the country without any or with limited local correspondence. The type of climate change knowledge produced include seasonal calendars, GHG inventories, bulletins, agricultural calendars, and climate change vulnerability and impact studies. The main effective channels of knowledge transfer were through Media TV and Radio 93(51.1%) and social media 54(29.67%). Main challenges to effective climate change knowledge transfer included, lack of resources (37.9%), language (25.8%), low government and community engagement (19.25%), complexity of information (15.4%) and conflict of interest. The outreach was limited to policy makers, education institutions, NGOs and civil societies while local communities were left out. Enhancing effective knowledge transfer in the centre region requires coordinated management of the country's climate action, awareness and sensitization, definition of roles, provision of necessary financial, infrastructural, technical and human resources needed to implement the dissemination process.

Key words: climate change; Knowledge transfer; adaptation; mitigation

RESUMÉ

Le changement climatique constitue de plus en plus un obstacle majeur au développement socio-économique et au bien-être du Cameroun. C'est le cas en particulier à Yaoundé dans la région du centre, où les extrêmes climatiques tels que les pluies torrentielles et la hausse des températures provoquant des inondations, des glissements de terrain, des coulées de boue, des vagues de chaleur et des variations saisonnières sont devenus un cauchemar. L'atténuation et l'adaptation à ces impacts du changement climatique nécessitent un transfert de connaissances efficace afin d'optimiser les actions et les politiques au sein de la région. Le premier objectif prioritaire du Plan National d'Adaptation du Cameroun vise à améliorer les connaissances sur le changement climatique et le deuxième objectif prioritaire est d'informer, d'éduquer et de mobiliser les communautés camerounaises sur les stratégies d'adaptation au changement climatique. C'est pourquoi cette recherche avec un accent sur la région du centre a été réalisée. L'objectif de cette recherche consistait à évaluer l'efficacité du transfert de connaissances sur le changement climatique pour les actions et les politiques d'adaptation et d'atténuation au Cameroun. Les objectifs spécifiques de ce travail de recherche comprenaient l'évaluation de l'état actuel des cadres de transfert de connaissances sur le changement climatique, l'identification des acteurs impliqués et leurs relations de pouvoir, l'identification des principaux défis entravant un transfert efficace des connaissances, l'identification des canaux de diffusion et l'étendue de la diffusion des connaissances. Une approche mixte combinant des méthodes de collecte de données qualitatives et quantitatives a été utilisée. Une revue de la littérature existante et des documents de politique ont été effectués, des entretiens avec 9 informateurs clés de certains établissements clés de gestion des connaissances sur le changement climatique, 182 questionnaires administrés aux ménages des localités de l'échantillon (Mbankolo (42), Nkolbisson (38), Etoug Ebe (38), Awae Village (32) et Ntui (32)), des enquêtes et une discussion de groupe. Le logiciel SPSS a été utilisé pour analyser les données quantitatives collectées sur le terrain tandis que le logiciel ALAS.ti a été utilisé pour analyser les données qualitatives en utilisant l'approche thématique. Les politiques des pays ont été examinées pour évaluer leur alignement avec un transfert efficace des connaissances sur le changement climatique en utilisant l'approche d'analyse des politiques de Carl (2016). Les résultats ont révélé qu'il existe déjà des cadres de transfert de connaissances sur le changement climatique, notamment l'ONACC et le DMN. Cependant, seulement 36,8 % des répondants connaissaient l'existence d'un cadre de transfert de connaissances sur le changement climatique, tandis que 63,2 % n'en connaissaient pas. Parmi les répondants, 40 (59.7%) ont identifié l'ONACC, 12 (17.9 %) ont identifié le DMN. Les types de connaissances produites sur le changement climatique comprennent des calendriers saisonniers, Inventaires des GES, des bulletins, des calendriers agricoles, des études sur la vulnérabilité et l'impact du changement climatique. Les cadres fonctionnent toujours au niveau national, leur direction étant basée dans la capitale du pays sans aucune correspondance locale ou avec une correspondance locale limitée. Les principaux canaux efficaces de transfert de connaissances étaient les médias TV et Radio 93 (51,1 %) et les médias sociaux 54 (29,67 %). Les principaux défis à relever pour un transfert efficace des connaissances sur le changement climatique sont le manque de ressources (37,9 %), la langue (25,8 %), le faible engagement du gouvernement et de la communauté (19,25 %), la complexité de l'information (15,4 %) et les conflits d'intérêt. La sensibilisation s'est limitée aux décideurs politiques, aux établissements d'enseignement, aux ONG et à la société civile, tandis que les communautés locales ont été laissées de côté. L'amélioration du transfert efficace des connaissances dans la région du centre nécessite une gestion coordonnée de l'action climatique du pays, une prise de conscience et une sensibilisation, une définition des rôles, la fourniture des ressources financières, infrastructurelles, techniques et humaines nécessaires à la mise en œuvre du processus de diffusion.

Mots clés : changement climatique ; transfert de connaissances ; adaptation;atténuation

ABBREVIATIONS AND ACRONYMS

AfDB: African Development Bank

BUCREP; Bureau Central des Recensement et des Etudes de Population, Cameroon (Central bureau of census and population studies)

CO2: Carbon Dioxide

COP: Conference of Parties

DNM: Meteorological Department of the Ministry of Transport

FAO; Food and Agricultural Organization

GDP: Gross Domestic Product

GFCS: Global Framework for Climate Services

GHG: Green House Gas

ICT: Information and Communication Technology

IEA: International Energy Agency

IMF: International Monitory Fund

INDC: Intended Nationally Determined Contributions

IPCC: Intergovernmental Panel on Climate Change

IWRM: National Action Plan for Integrated Water Resources Management

KT: Knowledge Transfer

MINADER: Ministry of Agriculture and Rural Development

MINATD: Ministry of Territorial Administration and Decentralization.

MINEDUB: Ministry of basic education

MINEPDED; Ministry of Environment, Nature Protection and Sustainable Development

MINESUP: Ministry of Higher Education

MINRESI: Ministry of Scientific Research and Innovation

MINT: Ministry of Transport

MRV: Monitoring, Reporting and Verification

NAMAs; National Mitigation Action Plan

NAPs: National Adaptation Plans

NCCARF: The National Climate Change Adaptation Research Facility

NCCP: National Communications of on Climate change

NDCs: Nationally Determined Contributions

ONACC: National Observatory on Climate Change

PNACC; Plan National d’Adaptation aux Changements Climatiques

REDD+: Reduce Emissions from Deforestation and Forest Degradation

SND 30: National Development Strategy (Stratégie Nationale de Développement

SPSS: Statistical Package for the Social Sciences

SSA: Sub-Saharan African

UN: United Nations

UNEP: United Nations Environmental Programme

UNFCCC: United Nations Framework Convention on Climate Change

TABLE OF CONTENT

LIST OF TABLES

LISTS OF FIGURES

LISTS OF APPENDIX

I. CHAPTER ONE

1. GENERAL INTRODUCTION

1.1 Background of the study

The climate of the world is changing and Cameroon like other African countries which are most vulnerable to climate change is greatly affected by its impact. In Africa, climate change is one of the major risk multipliers for the population and environmental stability. Average temperatures of Africa is expected to increase faster in the 21st century than global average. These temperature extremes are expected to surpass the current temperature levels by 2 °C by 2050. Rainfall projected changes show that southern Africa will become drier while west and eastern Africa become wetter with more torrential rainfall and frequent floods (Troni *et al.,* 2014).These changes interact with baseline stresses that intend increase vulnerability and exacerbate poverty. Africa's agricultural systems are amongst the most vulnerable in the world while at the same time 6 out of every 10 African relies on agricultural activity as a means of livelihoods(Troni *et al.*, 2014).

Climate change poses significant challenges to Cameroon, impacting its ecosystems, economy and societal well-being. As the 16th most vulnerable country globally, Cameroon faces threats to livelihoods, infrastructure, and environmental stability. Yaoundé in the Centre Region has in recent times suffered human loss and infrastructural damages as a result of recurrent floods and mudslides due to torrential and persistent rainfall (Olivier, *et al.,* 2011). Given this situation, building resilience through mitigation and adaptation to the negative impacts of climate change is indispensable to safeguard the livelihoods, development, and the needs of the population especially the poor and the most vulnerable(Troni *et al.,* 2014). In building resilience of these vulnerable communities , there is need to make sure that they have access to knowledge on appropriate adaptive strategies even though access to this knowledge is very limited in African countries (Harvey, 2018). The realities of climate change started being well admitted in 1979 when the first World gathering took place in Geneva organized by the World Meteorological Organization as a response to adverse climatic effects observed in the previous decade(Fawzy *et al.,* 2020). The Intergovernmental Panel on Climate Change (IPCC) was then created in 1988 by the World meteorological Organization in collaboration with the United Nations Environmental Programme (UNEP) to provide scientific information and knowledge to help them make informed climate-related policy decision(Fawzy *et al.,* 2020). Since the adoption of the UNFCCC in 1992, it has been the main force and leading actor at the global level in terms of climate change action. The principal objective of this convention consist to stabilize GHG emissions in the atmosphere so as to prevent dangerous interference on the climate system while also working on building resilience of vulnerable communities to the impacts of climate change.

Following the 2006 Nairobi work programme of the UNFCCC, assisting developing countries including Cameroon in understanding vulnerability, Adaptation, Mitigation, and Risk Assessment of climate change was set as a priority objective. This would help them make informed adaptation decisions and measures using suitable scientific, technical and socio-economic basis while also considering present and future climate variability. Adding to this, another framework known as The Cancun 2010 Adaptation Framework of the UNFCCC adopted during COP 16 also emphasized technological development and transfer for climate change adaptation and mitigation especially in the developing countries (Kuna & Horstmann, 2017). There is also the Special Climate Change Fund which was created to facilitate technological transfer and adaptation of developing countries. At COP 21, a target was set to limit temperature increase at 2 °C by 2100. Through this global climate change focused entity , there has been the call for commitment from the over 198 members states who have concerned to develop and implement Mitigation and Adaptation action plans such as NDCs, NAPs, NAMAS and other Sectorial strategy Plans. Moreover, financial, technical and capacity building support mechanisms have been established particularly for developing countries mandated by the Paris agreement that binds the commitment of member states. Within priority number 3 of the Sendai Framework of 2015, at global and regional level, the framework insists on cooperation between university and scientific networks, research institutes and the private sector in elaborating Climate products such as watch and alert services (Knowledge). This would permit to reduce catastrophic risks especially in developing countries. In priority number 4, at the national and local level, the framework insists on multi-risk and multi-sectorial investment on early warning and alerts systems centred on the population pushing for communication mechanisms in case of catastrophic risks. This demonstrates the importance of knowledge transfer for climate and natural risks reduction.

The transfer of climate change adaptation and mitigation knowledge generated during research as well as effective indigenous knowledge systems is potentially very important to developing countries in Africa like Cameroon, where vulnerability to climate change impact is highest than most western countries. At the same time with just some exceptions, knowledge transfer or sharing is not yet a priority in the agenda of national research funders and researchers in the western countries as well as in Africa (Kuna & Horstmann, 2017).

Despite commitments to international conventions like the UNFCCC, the Paris Agreement, the Kyoto Protocol and the Sendai Framework, Cameroon struggles with effective climate change policies and actions. The absence of reliable climate forecasts and baseline information on climatic hazards increases the vulnerability of Cameroon to climate change impacts (PNACC, 2015). Knowledge transfer plays a crucial role in informing and mobilizing communities for climate action, yet existing frameworks primarily function at the national level, leaving gaps in decentralized knowledge production and dissemination. By identifying and assessing the effectiveness of existing frameworks for knowledge transfer, this research aimed to address these gaps by exploring avenues for enhancing knowledge transfer for climate change adaptation and mitigation in Cameroon. It focuses on fostering synergies and effectiveness in climate action and policies through improved communication, coordination and collaboration among stakeholders at all levels. The research will analyse data to understand current practices, and opportunities related to knowledge transfer, synergizing actions, and policy implementation. The study will review conceptual and empirical literature on knowledge transfer, climate change adaptation and mitigation, and policies. The key research objective lies in identifying and assessing the effectiveness of existing frameworks for knowledge transfer related to climate change adaptation and mitigation in Cameroon. It proceeds with a case study in selected localities of the Centre Region (Mbankolo, Ntui, Awae Village, Nkolbisson and Etoug Ebe). Using a mixed-methods approach with data collection methods including literature review, interviews, surveys and focus groups discussion, the study is aimed at evaluating the current state of climate change knowledge Transfer, identify involved actors and their power relations, identify key challenges hindering efficient knowledge transfer, identifying dissemination canals and the extent of knowledge outreach. The case study in the Centre Region helps examine climate change adaptation and mitigation initiatives, focusing on effective knowledge transfer mechanisms, collaborative approaches, and supportive policy environments. Policy analysis evaluate existing climate change policies and frameworks in Cameroon to assess their alignment for effectiveness knowledge transfer in addressing climate change adaptation and mitigation and support for climate action and policy synergy. Findings from the study, literature review, stakeholder consultation, data analyses, case study, and policy analysis are then synthesized to develop evidence-based recommendations. This research is highly relevant as it addresses the urgent need to strengthen knowledge transfer mechanisms, synergize actions, and policies towards climate change adaptation and mitigation in Cameroon. Enhancing knowledge transfer initiatives ensures that climate-related knowledge reaches the vulnerable populations. Thus, ultimately empowering communities with the necessary information and resources for effective adaptation efforts, safeguarding their livelihoods amidst climate challenges enhancing Cameroon's resilience to climate impacts and aligning its climate actions efforts with global objectives.

1.2 Problem statement

Climate change today stands as one of the key pressing challenges of our time with significant consequences on the ecosystems, economies, and societal wellbeing worldwide. Cameroon increasingly witnesses the effects and consequences of climate change which poses threats to livelihood, infrastructure and environmental stability (Augustine Njamnshi *et al.*, 2018). According to the International Monetary Fund (IMF, 2024), Cameroon is placed 16th most vulnerable country globally to the impacts of climate change and projections suggests that climate change will result in significant output losses, conflict risks, food insecurity, exacerbated poverty and inequality causing an increase in population displacement (International Monetary Fund, 2024). Cameroon's vision and efforts to develop a strong, diversified, competitive economy, strengthen national unity and reduce poverty, consolidating its democratic process has been undermined by climate change effects. The country is already experiencing abnormal climatic phenomena such as high temperatures, violent winds, drought, floods, landslides and rainfall perturbations, where over 320,000 people are affected yearly by climate related disasters (Tsalefac *et al.*, 2015). The very first strategic priority area of the established National Adaptation plan (PNACC) of the country sets out to improving knowledge on climate change in Cameroon and the second priority being; informing, educating and mobilizing the Cameroonian communities on Adaptation strategies to climate change (Cameroon NAP, 2015). Knowledge transfer is indispensable in trying to inform, educate, improve climate change knowledge and mobilizing the communities for climate change action. Despite the efforts that have been made by national actors towards mitigation and Adaptation, there remains a gap at the level of effective knowledge transfer and synergy for actions and policies at the various levels. Actions in knowledge production, management and transfer have been tight down to a few working bodies at the central level. The National Observatory on Climate Change (ONACC) and the Meteorological Department at the Ministry of Transport (DMN) are the main effectively functioning climate change knowledge management frameworks in the country. They produce knowledge on climatic alerts and predictions, agricultural calendars, monitor and assess socio-economic and environmental impacts of climate change, at the end propose measures to prevent, mitigate and or adapt to the adverse effects and risks of climate change. Dissemination channels such as workshops, conferences, publications, and digital platforms are utilized for this knowledge sharing. These dissemination methods face challenges to effective knowledge transfer including the fact that a significant proportion of local population lack access to digital platforms, limited resources, inadequate infrastructure, socio-political instability, lack of coordination among stakeholders, and insufficient capacity building (World Bank Group, 2022). These frameworks also function at the national level while there exist no such frameworks at the regional, divisional, sub-divisional or local levels. This brings in the problem of decentralization in knowledge production and transfer. Studies have shown that knowledge on climate change has remained dispersed or isolated consequently making the poverty stricken and vulnerable local communities to lack access to accurate information at the right time to act and react against climate change. Yaoundé in the Centre Region, have in recent years been witnessing a lot of catastrophies on yearly bases from floods and mudslides that each time lead to the destruction of property and the loss of lives. These would have been avoided if early warning climatic information or alerts were disseminated to the population of the area by the responsible knowledge frameworks and on time. A lot of efforts are still required to enhance knowledge sharing and capacity building across all levels of the government (Fombad, 2024). Since the existing frameworks function at the national level without local correspondence, communication on climate change knowledge either gets to the communities very late or they do not have access at all to information on early warning systems. Because of this, they thus lack access to knowledge that can help them plan their agricultural and livestock activities amidst climate change ((Maponya and Mpandeli, 2012). Climate watch and alert services have a crucial role in early warning systems. There increase awareness of the population, building their adaptive capacity and preparedness against disasters given changing climatic conditions. Most of the Knowledge produced is lost on the way as dissemination channels such as websites/social media publication, peer-reviewed papers, and scientific publications are rather accessible to actors from the academic sphere leaving out the policy makers, local stake holders and the local communities who are key actors in the implementation of this knowledge on the ground. Apart from United Nation Framework Convention on Climate Change (UNFCCC) Working Group discussions that are led by western scientists at the international level, there exist very limited national structures created to effectively Disseminate scientific knowledge at the level of communities (Kankeu *et al.,* 2019). The competence, the knowledge production process, the partners and the quality of knowledge produced is also to be questioned given the technological requirements it takes to produce this knowledge of which the country is limited. There has also been diversity and differences amongst stakeholders and the lack of coordination and collaboration which forms a significant problem for knowledge transfer because it brings about conflicts and coordination difficulties. This research thus aim at addressing this gap by exploring avenues for enhancing knowledge transfer for climate change mitigation and adaptation with a focus on fostering synergies and enhancing effectiveness in climate action and policies in Cameroon.

1.3 Context and Justification

The negative effects of climate impacts on developing countries are already being felt, putting a strain on critical sectors for national growth and poverty reduction. Its implications are already terrible and will influence the fate of many generations to come, notably impacting the poor, especially in emerging countries if no proper actions are implemented (Bele *et al.*, 2011). With climate change as a big challenge, two types of actions are combined; adaptation and mitigation. This include the adoption and implementation of different types of policies, technologies, innovations and strategies for various given contexts in order to avoid or minimize the effect of climate hazards. It has been emphasized by the UNFCCC that in the phase of increasing climate crises, thinking globally and acting locally is very crucial. In this light, the UNFCCC as the main world body uniting world countries towards the combating climate change has pushed for and led to the development of national policy action plans in this regard. This includes the NAPs (National Adaptation Plans) which are national action plans for adaptation and NAMAs (National Mitigation Plans) which are plans for national mitigation action. Climate change, as one of the most pressing concerns confronting the globe, particularly most vulnerable communities, has received a lot of attention. Access to information and knowledge to help with decision-making is critical for successful climate change adaptation and mitigation. Sharing knowledge for evidence-based climate change adaptation and mitigation is critical to lowering vulnerabilities(Chisita & Fombad, 2020). To Chisita and Fombad (2020), Climate change adaptation necessitates an integrative approach in the form of a plan that enables information sharing. Information and knowledge about climate change needs to be produced and disseminated for adoption and implementation so as to effectively resolve its issues when they occur as well as limit activities and change behaviours that contribute to GHG emissions to the atmosphere. The absence of adequate channels for knowledge exchange is likely to impair successful climate change adaptation. The United Nations Office for Disaster, (UN International Strategy for Disaster Risk Reduction 2015) highlights the need to promote systematic collection, analysis, management and use of critical data and information at all levels and to ensure its dissemination as a major measure against climate change disasters.

Cameroon is one of the countries which has suffered a lot of environmental, economic, social, and political adversities due to climate change that has exacerbated poverty levels in the country especially amongst the most vulnerable communities. With Agriculture being the most vulnerable sector, climate change has had devastating effect across all sectors of the economy. Cameroon has committed itself to combat climate change with already many political commitments. She is a member to the UNFCCC (United Nation Framework convention on climate change) (1994) and a party to the Paris agreement that she rectified in 2016. Following this in accordance to her commitments, Cameroon has developed her NDC (Nationally Determined Contributions) and a NAP which acts as the main climate change policy document of the country as of now. The NAP proposes an integrated plan for all players of both the public and the private sectors. A lot of research, innovations, data and other scientific works are being and have been generated in a bid to combat climate change in the world, Africa and Cameroon in Particular. The management and Dissemination of these knowledge is very pivotal for the county's climate vision. Given this, the NAP has as some of its main priority objectives, improving knowledge on climate change in Cameroon, informing, educating and mobilizing the Cameroonian population to adapt to climate change. There also exist effective indigenous knowledge systems that have been developed, and accumulated over many years in local communities on climate adaptation and mitigation practices. For this reason, presidential Decrees No. 2015/512, No. 2015/513, November 16, 2015, and No. 2016/191 on April 11, 2016 were issued by the president of the republic creating and operationalizing ONACC. There is also the National Department of Meteorology (DNM) and the Ministry of Scientific research and innovation. All these amongst other actors are involved in climate change knowledge production, management and dissemination. Within this documents, mitigation and adaptation plans have been elaborated based on every sector of the economy. According to her updated NDC (2022), Cameroon intend to reduce her greenhouse gas emission by 35%. Climate change has also been recognized as a cross sectorial threat and thus objectives have been set to integrate climate consideration in to all national and sectorial policies. This is already been seen as climate change has been recognized as a major threat to be dealt with in National Development plans like the SND 30. Prior to these, the government had earlier elaborated an environmental Law No 96/12 of 5 August 1996 that guides all activities that affects the environment and the publication of the first and second National Communications on Climate change (NCCP). Amongst all these, exist other regulations and some projects that have been implemented.

Justification of the study area

The Centre region is a region that has mostly steeply sloping mountainous relief especially in the areas of Mbankolo, Nkolbisson, Etoug Ebe, Awae and Ntui. Additionally the area hosts one of the most densely populated city of the country, Yaoundé. This has brought land use planning and management issues leading to populations settling in zones considered at risk of natural and climatic hazards like mudslides, landslide given the accidented relief and flooding. In addition to this, it makes up part of the Bimodal Forest ecological zone with a dense hydrographic network and heavy rainfall patterns. The area has been undergoing an instability issue in its natural environment due to multiple natural and manmade influences (Saint-clair and Emmanuel, 2024). According to the NAP, temperatures in this zone have increased from 23.5C in 1974 to 25.3 in 2005. This has led to a high evapotranspiration and consequently torrential and violent storms. While precipitation has dropped by 11.95% over a period of 60 years, forecasts show a slight increase within the 2010-2035 period. All this has contributed to intensify the potential of extreme climatic hazards such as floods and mass movements in the region. Incidents that have already been recorded include the 1998 landslide in Yaoundé, Awae 1998(Zogning *et al.*, 2007) and the recent mudslides and flooding that occurred in Mbankolo on the 8th October 2023 causing the death of over 30 people. From 1980 to 2008, over 128 flood incidents were recorded, which caused a lot of property damages and the loss of about 70 lives in the Mfoundi division area(Olivier *et al.*, 2011). While urbanization has let to haphazard and anarchic expansion in chosen urban study localities exacerbating climate vulnerability, in Mbankolo, Nkolbisson and Etoug Ebe, extreme climate events have been affecting the chosen rural study areas of Awae and Ntui which has as main source of livelihood agricultural activities. It shows the imperative nature of knowledge production, management and dissemination that is very necessary to avoid and or reduce the impact of such disasters and climate hazards.

All these demonstrates Cameroon's Centre region vulnerability to climate change particularly the localities of Mbankolo, Awae, Etoug Ebe, Ntui and Nkolbisson on one hand and on the other hand also demonstrate the country's commitment to climate change adaptation and mitigation efforts. It was therefore of great interest to explore the current state of existing frameworks, policies and actions for climatic knowledge production, management and transfer for adaptation and mitigation.

1.4 Research objectives

1.4.1 Main Objective

Assess the effectiveness of knowledge transfer for climate change adaptation and mitigation actions and policies in Cameroon

1.4.2 Specific objectives

1. To assess the current status of knowledge transfer Frameworks for climate change adaptation and mitigation in Cameroon.
2. To identify the key actors involved in climate change related knowledge transfer and power relations existing between them.
3. To identify dissemination canals and processes of knowledge transfer.
4. To identify key challenges to effective knowledge transfer for climate action and policy in Cameroon.
5. To assess the extent of knowledge outreach of the existing knowledge transfer frameworks.

1.5 Research Questions

1.5.1 Main research question:

How effective is knowledge transfer for climate change Adaptation and Mitigation actions and polices in Cameroon?

1.5.2 Specific Research Questions:

1. What is the state of knowledge transfer frameworks for climate change adaptation and mitigation?
2. Who are the actors involved and power relations existing between them?
3. What are the dissemination channels and processes?
4. What are the key challenges hindering effective knowledge transfer in the context of climate change action and policies in Cameroon?
5. What is the extent of outreach and implementation of the knowledge transfer?

1.6 Research hypothesis

1.6.1 Main hypothesis

There are effective knowledge transfer mechanisms combined with synergistic actions and policies leading to more robust climate change adaptation and mitigation strategies in Cameroon.

1.6.2 Specific hypothesis

1. The state of knowledge transfer frameworks for climate change adaptation and mitigation in Cameroon exhibits the existence of well-structured frameworks and Knowledge transfer

frameworks which are effective and improve understanding and awareness on climate impacts, and on adaptation and mitigation strategies.

2. There exists a complex network of actors involved in climate change-related knowledge transfer in Cameroon characterised by unequal power relations.

3. Various dissemination canals and processes such as workshops, conferences, publications, and digital platforms are utilized for climate change-related knowledge transfer in Cameroon.

4. Challenges including limited resources, inadequate infrastructure, socio-political instability, lack of coordination among stakeholders, and insufficient capacity building initiatives significantly hinder effective knowledge transfer for climate action and policy in Cameroon.

5. Existing knowledge transfer frameworks have limited outreach, particularly in rural and marginalized communities.

1.7 Relevance of the study

Climate change presents formidable challenges to Cameroon, impacting its ecosystems, economies, and societal well-being. It profoundly affects various sectors crucial for Cameroon's socio-economic development, including agriculture which employs over 70% of the population, water resources, and biodiversity (Cameroon Country Climate and Development Report, 2022) (Kengoum *et al.*, 2013). Effective knowledge transfer plays an important role in facilitating the adoption of climate-resilient practices and technologies across these sectors. To maintain seamless and effective knowledge flows, communicative linkages must be handled at every point. As the country grapples with escalating vulnerability to climate-related hazards such as extreme weather events and changing precipitation patterns, there is an urgent need to strengthen knowledge transfer mechanisms, synergize actions and policies towards adaptation and mitigation. The effectiveness of existing knowledge transfer mechanisms will be assessed which will then help in the development of comprehensive and effective recommendations that will help enhance knowledge transfer for climate change adaptation and mitigation especially through synergizing actions and policies. This will guide the Cameroon government to make informed-decisions and policy interventions related to climate change adaptation and mitigation. The NAP underscores the crucial role of improving knowledge on climate change, informing, educating, and mobilising the Cameroonian population to address climate change challenges at the national scale (Tsalefac *et al.*, 2015). By strengthening knowledge transfer initiatives, Cameroon will drive towards achieving these objectives and enhance its resilience to climate impacts, thus aligning its climate action efforts with broader global objectives.

It is imperative to recognize the disproportionate impact of climate change on local communities in Cameroon such as the case in the Centre Region. Despite bearing the brunt of climate-related hazards, these communities often lack access to timely and relevant climate information and resources. By scrutinizing existing knowledge transfer mechanisms, the study endeavours to strengthen community resilience by ensuring that climate-related knowledge reaches vulnerable populations. Empowering these communities with the necessary information and resources is essential for enabling effective adaptation efforts, thereby safeguarding their livelihoods and well-being amidst the challenges posed by climate change.

1.8 Organization of the thesis

This study is structured in to five chapters. Chapter one makes up the Introduction which consists of the Background of the study, the Problem Statement, Context and Justification. Included in this chapter too is the Research Objectives and Questions, and the Relevance of the study. Chapter two opens up with the Literature Review on existing studies on the Main concepts of the study's focus. This particularly include previous studies on knowledge transfer, climate change adaptation and mitigation and existing policies and actions. Within this, gaps were being identified and the contribution of the study to existing knowledge. Chapter three dwells on the Methodology used in carrying out the study. These include the study area, Research design, Data collection methods, and the Data analysis techniques. This is followed by Chapter Four which presents the research Findings on the Current status of knowledge transfer Frameworks, Key actors involved in knowledge transfer and power relations, Dissemination canals and processes of knowledge transfer, Key challenges for effective knowledge transfer, and Knowledge outreach of the existing knowledge transfer frameworks. It will then dive in to the Discussion that will include the Interpretation of findings, and Recommendations for enhancing knowledge transfer. Finally, the fifth chapter makes up a Summary of the study, Contributions to the field, Conclusion, Recommendations, and Future research directions.

II. CHAPTER TWO

2. LITERATURE REVIEW

2.1. Empirical literature

2.1.1 Climate change impact and vulnerability in Cameroon

Cameroon has diverse geographical landscapes and climates typical of Africa. The southwest has hot and humid coastline and rainforest zones; the mountainous zones in the north have a temperate temperature; and the northern desert regions are scorching and dry. Cameroon is thus susceptible to varied climate change impacts throughout its many regions (Sandrine *et al.*, 2015). According to a World Bank analysis, Cameroon's average annual temperature has risen while its mean annual rainfall has declined in recent decades. The average annual temperature has increased by 0.86°C in 46 years, from 24.28°C in 1974 to 25.14°C in 2020. In contrast, the average annual precipitation in Cameroon has fallen by 2.9 mmm per decade since 1960, with an especially low average rainfall in 2015. This is the case in Yaoundé, Centre Region of Cameroon. (See figure 1.4 and figure 1.5)

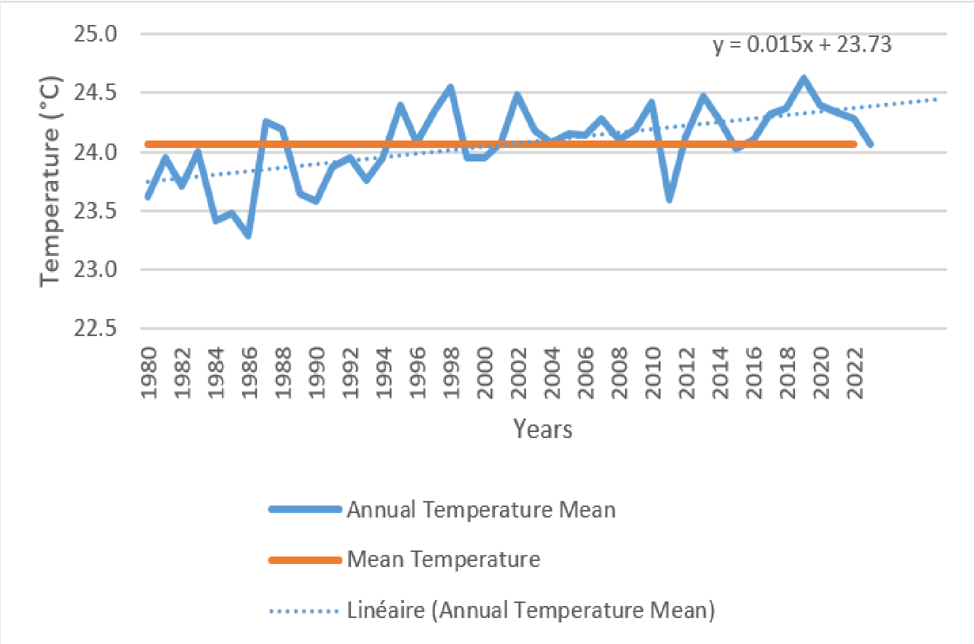


Figure 2.1 Yaoundé Mean temperatures 1980-2022

Source: ONACC 2024

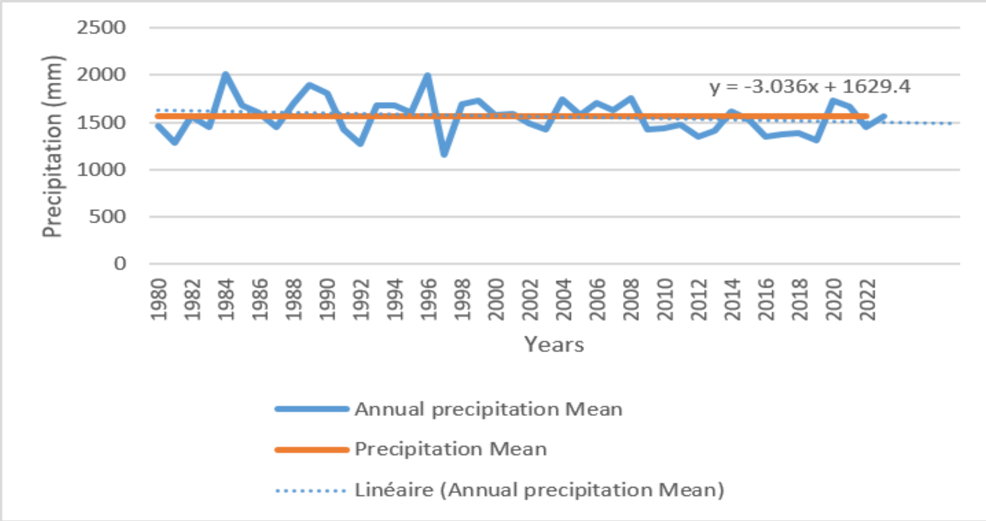


Figure 2.2 Yaoundé Mean precipitation 1980-2022

Source: *ONACC 2024*

Between 1991 and 2020, the coast of Cameroon witnessed the highest precipitation, while the north of the country was the driest. Violent winds, floods, landslides, erosion, and increased drought and desertification have burnt vast areas of northern Cameroon. In the Adamawa region, seismic and volcanic threats, landslides triggered by heavy rainfall are the most recurring risk. It also faces erosion caused by overgrazing. The Western Highlands face gas emissions from Monoun and Nyos lakes due to heavy rainfall and the same climate risks as those in the Adamawa plateau. The South Cameroon plateau has heat waves (a global warming effect) and flooding, landslides, and erosion. In the Southwest rainforest and coastal regions intense and copious rainfall causes frequent floods, mass movement, and erosion (Sandrine *et al.*, 2015). According to the World Bank's (2022) study, today over two million people (9% of the population) live in drought-prone zones, and around 8% of the country's GDP is susceptible to climate change impact. It is estimated to produce a GDP loss of 4–10 percent by 2050, with greater output losses in the most pessimistic scenario and if no adaptive action is implemented (IMF, 2024). The tropical forests vegetation covers more than 40% of the country and provide primary necessities including food, medicine, fuel, and building materials to an estimated 8 million rural people. Increasing changes in precipitation amounts, temperatures, and droughts conditions put these people at higher risk of rising poverty. Population resident in certain regions like the far north region are more vulnerable to climate extremes especially droughts that are causing disturbing food security crisis and loss of livelihoods. Mean temperatures have increased while not equally distributed over the region. Projected change in climate in the future will like lead to an increase in the number of people affected by impacts. This study indicates that climate change is expected to have immediate effects on many socioeconomic systems.

2.1.2 Adaptation and mitigation as the solution to Climate Change

Climate change poses a significant threat to infrastructure and human development in the Global South and this highlights the importance of developing mitigation and adaptation techniques to improve the situation. The two approaches that oriented climate change action are adaptation and mitigation (Mutambisi *et al.*, 2021). The vulnerability of any person or community is determined not only by the location of their settlement but also the state of the settlement, the effectiveness and capability of the local government and how well communities are able to adapt to climate extremes. The poorest communities, such as those in Sub-Saharan Africa, are usually regarded to be the most susceptible because they lack access to adaptation and mitigation services and facilities (Laukkonen *et al.*, 2009). To address these vulnerabilities, it is important to integrate climate change adaptation and mitigation measures with sustainable community development to improve adaptive capability.

Climate change is expected to have adverse effects on agricultural activity reducing production. This is particularly in the sub-Saharan African region. Reducing or avoiding this effects require adaptation which entails either important or little changes in the way we do certain things in the farming system (Abegunde, *et al*, 2019). Farmers in areas where rainfall is relatively low have substituted the cultivation of water demanding crops with the cultivation of less water demanding ones. Crop growers in flood-prone zones have change to crops with short-cycles and have changed the planting schedule in order to avoid periods of intensive rainfall. Farmers can adapt to climate change by diversifying their crops, adjusting planting days in response to shifting precipitation patterns, growing tree crops, practicing mixed cropping, and generating revenue from alternative sources(Abegunde *et al.*, 2019). Agriculture is reported to contribute to global warming, accounting for 19-29% of world emissions. Climate change mitigation here focuses on reducing or avoiding GHG emissions, such as reducing nitrous oxide and methane emissions per unit of production. Intensifying production in a sustainable manner is a key strategy towards achieving mitigation by reducing land cover change(Abegunde *et al.*, 2019).

In Africa, the adaptation capacity and resilience of urban authorities, their institutional frameworks, and particularly the poor population of the urban areas have been challenged not only by limited efforts to increase climate change awareness, increase outreach of early adaptation measures, and scale up of good practices, but also by inherently low adaptive capacity(Lwasa., 2010). Urban areas play an important role in this issue because they emit the most greenhouse gas emissions (more than 60% of the world's population currently lives in cities) and are more exposed and vulnerable to the effects of climate change. Climate change in cities has increasingly unpredictable and negative repercussions. Urban planning and territorial governance are critical in adaptation and mitigation attempts to avert these effects in urban settings. In doing so, it is vital to begin providing answers to problems such as: how to adjust urban dynamics to make the city less vulnerable to climatic (Rinawati *et al.,* 2013). Building on early and scalable adaptation measures is crucial to help communities, institutions, urban authorities, and other players become climate ready while addressing the inherent challenges (Lwasa., 2010). To improve urban resilience, measures for mitigation and adaptation must be developed. Some sustainable policies adopted in cities focus on four areas: climate strategies, eco-building, sustainable mobility, and urban planning. Settlement sites, particularly metropolitan areas, require designed and operational instruments aimed at providing a sufficient level of homeland security and managing risk prevention using a multidisciplinary approach. Building effective knowledge synergy which is capable of adjusting reactions based on the unique evidence and the requirements of the region, resulting in a flexible adaptation strategy.(Rinawati *et al.*, 2013).

Local institutions are in the forefront of adaptation, attempting to account for local effects and alleviate the adverse effects of climate change. There have been endeavours to include climate change into development plans for managing increasingly catastrophic disasters and their related hazards. Climate change adaptation requires inputs from different stakeholders given its complexity. The current challenges that threatens Africa's progress, such as poverty, war, poor governance, and technological limitations, are making it challenging to establish the best approaches to achieve climate change adaptation (Mutambisi *et al.*, 2021).

2.1.3 The Current Status of Climate Change Adaptation and Mitigation (Knowledge Transfer Frameworks, Actions and Policies)

The state of Current Actions and policies

Since the creation of UNFCCC of 1992, the adoption of the 1997 Kyoto protocol which obliged industrialized countries to jointly reduce their GHG emissions by at least 5% below 1990 levels in the commitment period 2008 to 2012, climate change preoccupations ranging from negotiations, policies and actions have taken the centre stage at global discussions (Raymond Clemençon, 2023). Negotiations and policies at the international level have played a pivotal role in sparking the most significant scientific cooperation in the history of humanity. It has currently emphasized on some key dimensions including equity and climate justice in building institutional frameworks at the national and subnational levels. This should be considered when developing climate action plans for adaptation and mitigation to climate change(Raymond Clemençon, 2023). These negotiations and policies have in many ways encouraged and contributed towards financing climate action at country and local levels especially in the most vulnerable and poverty stricken developing countries. They have also supported the adoption and development of renewable energy technologies. The Paris agreement of 2015 insisted on the magnitude of climate change issue yielding to the scientific consensus of defining a global warming target, keeping temperature rise bellow 1.5°C against the pre-industrial values. This was done to avoid dangerous interference in the climate system. The Agreement calls for all member nation to establish submit and periodically update their intended NDCs and NAPs. This has created a consistent cycle where countries plan and communicate their NDCs, implement them, and evaluate individual and collective progress which permits to plan informed policy decisions for the future and to update NDCs. The 5 year NDC review was postponed due to the COVID pandemic until 2021 that the 26th COP took place in Glasgow. If unconditional NDCs submitted in 2022 were to be implemented, it would lead to a 2.6°C temperature increase by 2100 if there are fully implemented together with current policies. This shows the gap that exist between national commitments and the efforts to enact those commitments. About 88 member countries of the UNFCCC had adopted the net-zero policy before COP27 which took place in 2022. This covers about 78% of global GHG emissions.

According to the IPCC (2007), integrating climate policies in to already existing country policies in various levels of government to deal with climate change issues is very important (Hirpha *et al.*, 2021)**.** According to UNDP and UNEP (2011), most developing nations are still in the process of integrating climate change considerations in to national strategies of development. This has been so due to some challenges including financial, resource, adaptive capacity and technological constraints(Hirpha *et al.*, 2021). Raymond Clemençon (2023) gives a 30 years review on climate change negotiations indicating that the focus has changed from international policies and negotiations to national and subnational stakeholders and particularly from the government to the private and societal stakeholders.

Cameroon have signed key international conventions on climate change such as, the 1992 UNFCCC, the Kyoto protocol ratified in 2002 and the Paris Agreement ratified in 2016 as well as has developed strategies in some major sectors including agriculture, energy, Forestry and waste sectors. The REDD+ Steering Committee was established in 2012, and its work focuses on authorizing and piloting actions aimed at decreasing emissions from deforestation and forest degradation. Adding to the First and Second National climate change Communications, Cameroon has made efforts to establish climate policies, however, she still lacks a regulatory framework to complement its goals. Country strategies such as the vision 2035 and the 2020-2030 National Development Strategy (Stratégie Nationale de Développement, SND 30), acknowledges the importance of considering climate change impacts and the need for a stainable approach to development. As part of the SND30 strategy, the authorities want to: (i) improve initiatives related to sustainable natural resource management; and (ii) take necessary measures to adapt to and mitigate the consequences of climate change. The PNACC 2015-19, which is complemented by an implementation plan, and the NDC were updated in 2021. Cameroon has established a target of decreasing its GHG emissions by 35% by 2035, with 12% unconditional and 23% conditional on the availability of funds in relation to 2010 GHG levels (MINEPDED, 2021). Many regional and council administrations have implemented local Climate Change Action Plans. In 2018, a National Strategy for the Reduction of Emissions due to Deforestation and Degradation of Forests, Sustainable Forest Management and Conservation, and Increase of Carbon Stocks (REDD+) was established to tackle the gaps and challenges in decreasing deforestation and forest degradation. A 10-year climate-smart investment strategy was created to give more attention to the agricultural, forestry, and livestock industries sectors climate adaptation concerns. In response to climate threats, the National Action Plan for Integrated Water Resources Management (IWRM Action Plan) pushed for a systematic approach to the sustainable development, allocation, and monitoring of water resources across sectors. The MINEPDED and its agency, ONACC, play a central significant role in Cameroon's climate change institutional mechanisms. However, climate change intervention is more efficient when it follows a bottom-up strategy, with local governments playing a leading role at the local level. This is because governments at the local level are responsible for managing council waste, urban transportation and infrastructure, industrial zone development, and granting construction licenses. These are activities that have a strong potential for emissions reduction and adaptation. The Global Covenant of Mayors for Climate and Energy which is the biggest climate alliance worldwide has over 50 Cameroonian councils as its members. It has about 10 thousands local governments and city members. Out of the members from Cameroon, 26 have agreed to develop a local climate strategy, and seven have already done so (World Bank, 2022). A coordination structure known as the inter-ministerial committee under the Prime Minister was created in 2017, for the oversight of the Paris Agreement (Decree 2017), and another one established to support the implementation of the NDC, however it is not yet functional.

Cameroon is yet to adopt a law that requires public structures to consider climate change in their policy designing, and to develop climate sensitive budgets. More so, most sectors lack laws that support the country's adaptation and decarbonisation goals. In addition, a considerable proportion of the country's NDC (23%) rely on resources to be mobilized from the private sector and partners (World Bank, 2022). During the implementation of the first NDC, it was observed that few policies received necessary funding, and at the same time limited capacity has prevented the private sector from incorporating climate change considerations in their business plans. There is also a dearth of competence among government frameworks to analyse climate change actions and performance, as well as any institutional framework for engagement. The administration has not been successful in mobilizing internal and external resources to meet the NDCs.

2.1.4 The state of knowledge transfer frameworks for climate change adaptation and mitigation

It is critical to acknowledge the value of knowledge that aids in decision-making, particularly in the context of climate change adaptation and mitigation. Knowledge about adaptation exists in communities and research institutes, but it is not generally shared with policymakers for response and action, resulting in excellent adaptation practices remaining at the micro-level(Lwasa., 2010). The majority of African farmers lack access to climate information in order to make decisions about natural resource management (Chimi *et al.*, 2022). Another study conducted by the African ability Building Foundation shows that some of the biggest problems in coordinating climate change initiatives are fragmentation and lack of coherence, limited information sharing, knowledge and capacity limitations(The African Capacity Building Foundation, 2023). Many research works globally ((Fombad, 2024), (Horstmann *et al*, 2017), (Clare, and Saleemul. 2014)) have demonstrated how Information, knowledge and experience are important in determining the effectiveness of adaptation and mitigation. The IPCC Assessment (2014) revealed that, the amount of accessible climate data from Africa continues to be low. This has been aggravated by limited internet connection and the fact that climate information that is produced does not target both online and offline access (Fombad, 2024). Within the Paris Agreement (2015), article 7.7 recognizes the role and need for knowledge transfer and thus prioritizes the principles of knowledge management insisting on the need for sharing information, experiences, best practices and lessons learned, as well as strengthening scientific knowledge.

A study by Ziervogel *et al.*, (2014), showed that, most African countries lack a robust nationally decentralized framework that provides spatially extensive and reliable climate data. Cameroon is no exception to this assertion and this is in fact a pivotal problem that undermines the country's efforts to build a strong and climate resilient nation. There is no defined institutional set up to oversee and coordinate the production, codification, dissemination and use of climate knowledge across the various sectors and spheres. This has resulted in overlaps, conflicts of interest and disjointed efforts instead of synergy. André *et al.*, (2013) in their work, discovered that at the national level, undertaking action, planning and policy against climate change impacts in an effective necessitates robust and comprehensive information and a strong knowledge base. Policy makers within some administrative units of the government does not consider climate change as an important aspect in policy planning and some, even considering it as working against national development priorities. A study by Stott and Huq, (2014) showed that, the weakest climate knowledge communication link is with the vulnerable communities at the local level, in terms of both gaining knowledge on local climate, and on adaptation and mitigation measures. A research work by Horstmann *et al,* (2017), demonstrated that knowledge transfer, still plays yet a very minor role in adaptation programmes in Europe as it increases effectiveness of adaptation research for both developing and European countries, and narrows the gap between development collaboration agencies and the adaptation community. Another study carried out by Ozor N. *et al,* (2021), revealed that the climate information systems in their target study countries (Cameroon, Kenya, Malawi, ……), have weak climate watch and alert service systems for weather events coupled with limited capacity of actors in climate forecasting, generation of climate watch and alert products and services, and information. These are used to support long-term informed policy development on adaptation and resilience. To them, limited access and unreliable data use, inappropriate and late climate information which has constantly been provided to inform decision making in African countries constitute a major challenge for sustainable development. Damages recorded during the recent floods and mudslides in Yaoundé (Mbankolo 2023) are partly due to the lack of early warning information and flood management knowledge systems. These vulnerable communities are the central actors in the adoption and implementation of climate related knowledge. Thus it is imperative that knowledge on current climate change stakes reach them for adaptation and mitigation to succeed.

Adaptation to climate change depends on wide understanding of adaptation aims and issues at multiple scales (Horstmann *et al*, 2017). This requires strong communicative connection amongst all climate change adaptation actors starting from the central level, through the regional level right down to the local communities in Cameroon. These actors include include climate scientists, national and international policy-makers, government bodies, research institutions, development workers, community groups, and, critically, the vulnerable to the impacts of climate change and, as such, need to adapt (Horstmann *et al*, 2017). Knowledge sharing between stakeholders can create and maintain connections, inform effective policy and ensure that emerging policies benefit those communities who are under pressure to adapt. However, integration between multiple scales is a complex ambition characterized by friction (Stott and Huq, 2014). Knowledge management must be based on inclusive access to trustworthy, effective and widespread communications. However, problems remain due to complex contrasts between the specific contexts within which knowledge is generated and shared.

2.1.5 The Key Actors Involved In Climate Change Related Knowledge Transfer and Power Relations Existing Between Them

The effectiveness of Climate change adaptation and mitigation relies greatly on understanding at a larger scale by the targeted audience, of the intended knowledge or innovation developed to help adapt to climate change impacts. Achieving this requires strong and effective communication between stakeholders or better still actors. These actors include those who are involved in the knowledge production, management and Dissemination process, as well as the targeted audience. According to Stott and Huq, (2014), actors include climate scientists, international and national policy makers, research institutions, academic institutions, government agencies, community groups, development workers, and especially those who are most susceptible to the impacts of climate change and need to adapt (Stott and Huq, 2014). It is very important that the frameworks for knowledge management identify and characterise all the stakeholders that are supposed to be part of the centre because this is key to the coordination of climate change knowledge transfer activities (Fombad, 2024). Identifying the key actors also permit to identify actor specific challenges in the process of knowledge transfer (Harvey, 2018). This has been proven effective and beneficial in Kenya's 2012 National Climate Change Action Plan. These stakeholders can help identify the personification and codification requirements of different local communities in dealing with the knowledge transfer process and can also facilitate the knowledge generation process by giving more insights on local knowledge systems. Stakeholders here include local government agencies, concerned citizens, scientists, researchers, Local and international research agencies, NGOs, farmers, the media, international organisations and communities vulnerable to climate change impact. Chisita & Fombad, (2020) highlights that a higher literacy level results in better climate adaptation and mitigation because of what is learned, taught and the research done. They emphasized the role of the government in creating a conducive environment and argue that, local, national, and international cooperations are very crucial for success in knowledge sharing.

At the international level, we have the UNFCCC which constitutes the major international body in charge of all climate change concerns and because of this, it can be considered the first international actor concerning climate change knowledge transfer. It is through this body that frameworks such as the IPCC, the Technology mechanism, and the Climate Technology Centre and Network which deal directly with climate change technology and knowledge transfer are created. We also have the UNEP (implementation of climate education programs and green technology transfer), International Renewable Energy Agency (promote the shearing of knowledge on renewable energy solutions), and the world Meteorological Organization (promote early warning systems and climate knowledge dissemination) amongst others. Adding to this we have multilateral finance institutions, NGOs and civil societies.

In Africa, while identifying key actors, we first of all cite the African Union and the African Ministerial Conference on the Environment which coordinates the climate change strategies and policies in Africa. Adding to this, we have the African Climate Policy Centre (Major centre for climate research and policy guidance), the Pan-African Climate Justice Alliance (Advocacy group pushing for climate policies and knowledge sharing initiatives), the African Centre of Meteorological Applications for development (Pushing for climate monitoring and early warning systems). There is also an initiative known as the AfricaAdapt which is a network hosted by four institutions involved in the dissemination of African adaptation strategies using online and offline approaches in both French and English to reach adaptation stakeholders.

At the national level, the main body that is in charge of climate change issues is the MINEPDED under which there exist also one of the main knowledge management frameworks known as ONACC. Adding to this is the Meteorological Department at the Ministry of Transport (MINT), Ministry of Scientific Research and Innovation (MINRESI), Ministry of Higher Education (MINESUP) and the Ministry of Territorial Administration and Decentralization (MINATD. Other multi scale and multi sector actors include the national focal point of the UNFCCC, the national coordinator of REDD+, civil society organisation, international environmental NGOs, Technical, Financial and Development partners (GIZ, FAO, UNDP, AfDB, World Bank)

Power Relations Existing Between Actors

The differences and diversity among actors poses significant problems for KT due to coordination and conflicts of interest difficulties. According to a study on governing Knowledge transfer for deforestation Monitoring, Reporting and Verification (MRV) in the Congo basin region between Cameroon, DRC and Rwanda, there was no established framework in charge of MRV knowledge transfer. This indicates the absence of responsible state administrative structures. With this situation, power relations, the responsibilities of various actors and processes have no organize way of functioning. This makes knowledge transfer difficult and complex(Kankeu *et al.*, 2019). They added that at the local level, the responsible stakeholders did not have any tangible power to influence the REDD+ MRV knowledge transfer system and that there exist bottlenecks in management and coordination. Another study in Bangladesh revealed that collaboration and cooperation between organisations within the country for climate change knowledge transfer had a lot of difficulties. This was due to differences in organisational objectives and agendas (Stott and Huq, 2014). In KT projects in most Sub-Saharan countries, external financial and technical support are very determinant. Without this external interference, national actors will not be able to produce and use Knowledge. A Decentralisation system of government that is not effective, has been identified to be an obstacle to KT given that, within such a system, local communities are very far from administrative unit centres. This coupled with the absence of regulatory structures and frameworks (Kankeu *et al.*, 2019).

2.1.6. Climate Change Knowledge Dissemination Channels and Processes

2.1.6.1 Dissemination Channels

Climate change knowledge Dissemination is key for wide spread, sustainable and intergenerational adaptation and mitigation. This is because, until knowledge becomes organisationally established and disseminated across all concerned stakeholders, it is very vulnerable as it resides in given individuals. Knowledge can either be in a tacit form that is socially ingrained or in an explicit form that can be codified and disseminated through language means. This means that, this has to be taken in to consideration when choosing the dissemination channel for any knowledge transfer process (Kuna and Horstmann, 2017). The use of virtual channels like conferences, emails, webinars, internet resources and other remote communication tools are suitable for the transfer of codified knowledge but cannot in the same way be effective in disseminating sensory information, non-verbal and intuition communication which are very important in the development and dissemination of knowledge. While some knowledge dissemination channels such as that of global scientists and policy makers are somehow well established, many vital dissemination channels at national and sub-national levels especially those of the vulnerable people at the local level lack this quality (Stott and Huq, 2014). Research knowledge dissemination is usually mostly done through the use of documents, electronic meetings and conferences and web-based information canals. Socialisation and Collaboration are very pivotal in the sharing of tacit skills, behaviours, ways of work and routines. The conversion of explicit knowledge to tacit knowledge or tacit knowledge to explicit knowledge helps to better understand and enhances the knowledge transfer process (Kuna and Horstmann, 2017).

At the local level, face-to-face communication has proven to be the most effective knowledge transfer approach over written and online resources. This includes interactions at the local level between government extension workers, partner NGO personnel, parents, children, community volunteers, and community groups. Adding to this, exist media, audio, visual employment (charts, posters, maps) and written channels (documents, school books) (Stott and Huq, 2014). According to Kuna and Horstmann, (2017), there exist three mean channels of climate change knowledge dissemination which are, electronic, face-to-face interactions and literature. Technological advancement have greatly widened the outreach of information sharing, increase the frequency and also the potential amount of information disseminated through electronic channels. Electronic channel involves the use of social media, email, skype, web-conferences, webinars, telephone, websites, blogs, and electronic surveys to disseminate knowledge. Never the less, the use of electronic channels in developing countries like Cameroon is at times challenging due to the lack of access to online resources like internet connection, phones and computers. The face-to-face channel on its part encompasses the use of physical interaction platforms like workshops, seminars, meetings, conferences, course lectures, training programmes, and summer schools. This method is very crucial for sharing tacit knowledge and for the building of trust between stakeholders. Kuna and Horstmann (2017) identified the use of documents, reports, journals, and books as the literature channel. Current Knowledge transfer efforts have concentrated on sophisticated scientific knowledge, policy and very technical knowledge leaving behind the experiences lived and the perceptions of the most vulnerable to climate change. A similar conceptualisation of the dimensions of knowledge transfer by Fombad (2024) in his publication identifies personification and codification as the two main methods to knowledge Dissemination. The personication same as face-to-face channels deals with tacit-to-tacit knowledge transfer, where people-to-people methods are used to disseminate knowledge. Codification methods on their part seek to connect the targeted audience to written documents and other knowledge resources (electronic and literature) enhancing explicit-to-explicit knowledge transfers. He recommends that both personification and codification method should be used in order to maximize knowledge dissemination effectiveness. According to Fombad, (2024), Knowledge transfer for Adaptation and mitigation might be more effective, if it is complemented by knowledge produced by the population affected itself. This is because local knowledge does not only provide information on local climatic impact but also on the socio-economic and political structure at the micro level within which adaptation and or mitigation can take place. We also have co-productive approaches, which involve interactive programmes using brainstorming, feedback sessions mind mapping and gaming are used. Through this process, participants using their own personal experiences jointly develop and create new knowledge and solutions to climate change.

In Cameroon, before 2015, they had been the first (2005) and second (2014) National Climate Change Communications which acted as a major means of disseminating climate related information. Both Personification and codification strategies are employed for knowledge transfer including channels such as digital platforms, workshops, conferences, press release, Communiqué, publications, and training programs. Climate knowledge and information are available on online repositories, such as the ONACC, DMN and the Ministry of Agriculture and Rural Development (MINADER) websites. Nonetheless, access can be a challenge because of the lack of internet connection resources, non-functioning websites, outdated information, or restrictions (World Bank Group, 2022).

2.1.6.2 Process of knowledge transfer

Successful knowledge transfer needs thorough planning, effective communication, and a disciplined strategy. Following are some critical steps to consider when transferring knowledge according to Gallemard (2023).

i. **Identification of the knowledge to be transferred:** The fundamental step in successful transfer of knowledge is defining the knowledge which needs to be transferred. This might entail mapping out the information, skills, expertise, and experience that are crucial to the success of climate change adaptation and mitigation, a project, or function. For example, if an organisation is working on transmitting knowledge on a new Adaptation or mitigation measure to farmers, the knowledge to be transferred may include understanding the technics, tools, precaution, the benefits, and procedure for implementing the technic.

ii. **Identification of the target audience:** After the knowledge has been identified, the following stage is to determine who ought to receive it. Every knowledge produced is targeted at a particular audience which could be policy makers, scientists, local stakeholders and the population in general which have different educational levels and backgrounds. Different people learn and process information in various ways. To successfully communicate knowledge, the strategy should be tailored to the audience's interests and learning style. This could include altering the pace, intensity, speed or duration of the training, providing practical knowledge, or using real-world examples.

iii. **Choosing the suitable Method:** Depending on the targeted audience, their accessibility and interest, the Personification (Tacit-to-Tacit) or Codification (Explicit-to-Explicit) aproach can be used. Training sessions, social media, mentoring, documentation, are some of the methods within these two approaches that can be used to transfer knowledge. Some people learn best through practical application, while others prefer to read, watch or listen to information. Therefore, selecting the appropriate method of knowledge transfer is crucial. By choosing the suitable method of knowledge transfer, you can guarantee that the information is delivered in an interesting, accessible, and effective manner for the intended audience. This can result in increased retention of shared knowledge and enhanced application of taught competencies.

iv. **Development of a structured approach:** Establishing and adopting a systematic approach to knowledge transfer is vital as it helps ensure that the process is organized, consistent, and effective. The Absence of a structured approach will make information transfer to be haphazard and inconsistent, resulting in misunderstandings, errors, and inefficiencies. To guarantee that knowledge transfer is successful and efficient, creating an organized checklist with specific objectives, timelines, and milestones is key. This can assist to keep the process on track and to make sure that critical knowledge is shared in a timely way, particularly climate change information, which is very time-sensitive.

v. **Creation of a supportive environment:** Effective knowledge transmission necessitates creating a favourable environment for learning and adoption, as well as boosting morale and making it easier for the intended audience to learn new ways to overcome obstacles and improve their livelihoods. Fostering a positive environment can also help to support the share of information. This could include encouraging stakeholders to ask questions, providing feedback and assistance, and generating chances for practice and application of new information.

vi. **Monitoring, evaluation and learning success:** The last stage of a successful knowledge transfer process includes, monitoring, evaluation and learning. It helps to identify areas of strength and where there are weaknesses, allowing for continuous improvement, and provides proof of the impact that knowledge transfer activities have had. This can include obtaining feedback from stakeholders, tracking performance indicators, and monitoring progress towards objectives (see Figure 2.3).

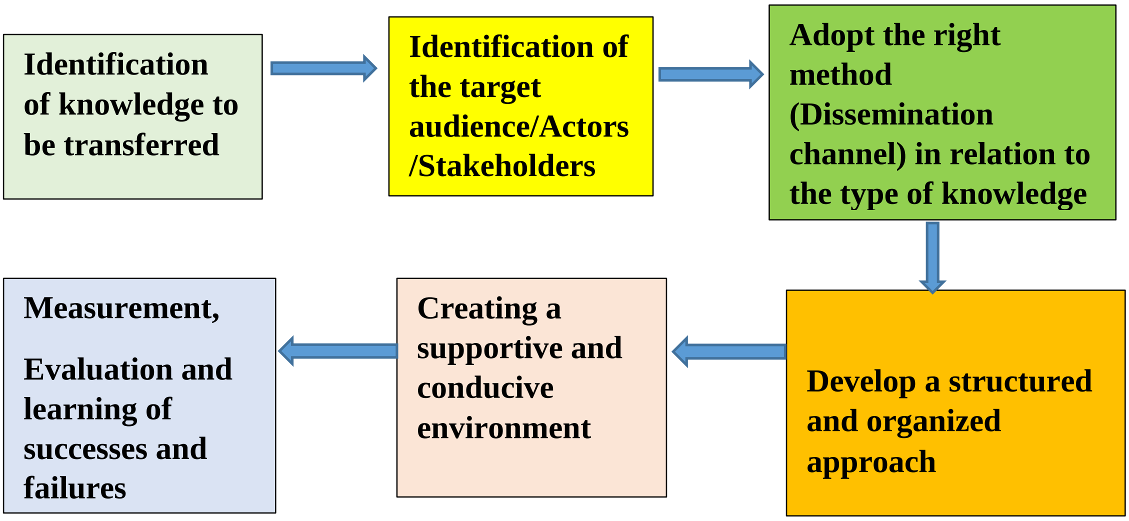


Figure 2.3 Process of effective Knowledge Transfer

Source; *Adopted from Jeremy Gallemard 2023*

A systematic adoption of these steps will help improve the effectiveness of knowledge transfer and Assure coordination and continuous improvement through the evaluation and lessons learned.

2.1.7 Importance of knowledge transfer For Climate change Adaptation and Mitigation

Climate change adaptation is a wide-ranging and complicated topic encompassing multiple technical and scientific obstacles. It requires good communication and knowledge transfer between researchers and decision makers (Vescovi *et al.*, 2009). Knowledge transfer is a critical process which involves the sharing of expertise, skills, and experience across teams, projects, and departments by organisations (Gallemard., 2023). Thus, it is an important process for tackling climate change adaptation and mitigation as it will promote the effective sharing of important information, expertise, and skills across stakeholders such as governments, communities, researchers, and industries.

Informed policy decision making: The transfer of knowledge on representations of likely future climatic events contributes in the development of informed climate adaption policies by allowing for the estimation of potential anthropogenic climate change effects. These policies will improve the capacity for adaptation for both human and natural surroundings(Vescovi *et al.*, 2009).

On boarding of new stakeholders: Gallemard (2023) states in his work that Knowledge transfer can help break down silos between stakeholders and encourage collaboration amongst them. KT contribute towards reducing the comprehension gaps that exists between the local stakeholders, the policy makers and the scientist themselves (Vescovi *et al.*, 2009). When new teams, government officials, or local communities take part in climate action, KT ensures that they quickly understand critical policies, scientific information, and best practices. Communities new to climate adaptation programs can learn from those who have successfully implemented disaster risk reduction techniques or sustainable farming practices, speeding their ability to implement effective solutions. By facilitating multidirectional and active communication between specialists, decision makers and the concerned population, KT promotes efficient information management (Vescovi *et al.*, 2009)

Succession planning in climate action: Climate-related programs and initiatives are long-term, and key personnel such as scientists, policymakers, or project managers may retire or change jobs. Knowledge transfer guarantees that others benefit from their experience and insights on climate data, successful policies, and field implementation approaches. This lessens the possibility of knowledge gaps or setbacks in climate adaptation and mitigation initiatives.

Knowledge sharing across sectors: Addressing climate change necessitates a multifaceted strategy. KT can help to bridge the gap between industries such as agriculture, energy, and urban planning. For example, sharing knowledge about sustainable energy solutions across departments can aid in the formulation of laws that include renewable energy into farming or urban development, resulting in a better coordinated response to climate change.

Climate resilience process improvement: To Gallemard, (2023) knowledge transfer can be used to improve processes within an organisation by identifying areas for improvement and sharing best practices across teams. Today's farming systems are adapted to current climate conditions, yet we know little about how well they will stand up to progressive climate change, particularly as they come under increasing pressure from other global drivers and entirely novel climates are encountered in many places. The transfer of best practices from one community to another will be very necessary, together with an effective learning processes, local institutions, and farmers' perceptions of the value of participation. Many promising practices remain enclosed in Research reports, policy document, local knowledge and other knowledge banks(Vermeulen *et al.*, 2012). Complex procedures, such as managing water resources or adjusting agricultural techniques, are frequently used in climate adaptation and mitigation plans. KT enables the identification of inefficiencies as well as the dissemination of these best practices. Communities experiencing a drought, for example, can learn from others who have effectively implemented water conservation practices, resulting in more effective resource management.

KT facilitates the mainstreaming of adaptation solutions both during and after projects. With the knowledge provided, projects are developed to integrate the formulation of climate projections of the given region, evaluation of the environmental and human impacts related to climate change, and adaptation methods relevant to the project's stakeholders and interest groups(Vescovi *et al.*, 2009).

Climate solution innovation; It is boosted by sharing new ideas, technology, and processes across teams. Researchers and practitioners can develop creative techniques by facilitating KT, such as employing artificial intelligence for climate modelling, developing nature-based solutions, or bringing indigenous knowledge to modern conservation practices. By connecting various researchers, decision-makers, and local populations, it will create a chance for innovative interdisciplinary, multi-organisational discussions and enable the mainstreaming of adaptation (Vescovi *et al.*, 2009).

Knowledge retention for climate governance: As climate policies and strategies evolve, it is crucial to preserve critical knowledge. KT guarantees that critical insights, such as climate modelling approaches, adaption solutions, and policy consequences, are not lost when specialists leave. This is especially significant for poor countries like Cameroon, where knowledge may be limited.

Implementation of new climate technology: Climate change mitigation frequently necessitates the introduction of novel technologies, such as solar energy systems or carbon capture techniques. KT ensures that those technologies are understood and effectively implemented by all essential parties. For example, imparting information about renewable energy technologies can assist rural populations in Cameroon in better utilizing solar electricity, resulting in sustainable energy consumption.

Best practices in climate adaptation, such as coastal defence strategies and urban greening programs, can be shared across regions and sectors. KT ensures that successful adaptation programs be repeated elsewhere. For example, if one region successfully mitigates the impact of flooding through reforestation, sharing that information can motivate similar projects in flood-prone areas.

Continuous learning, adoption and improvement of climate action: KT promotes continuing learning and refinement of climate strategies. As climate change presents shifting difficulties, KT fosters an atmosphere in which stakeholders share fresh data, discoveries, and methods to improve decision-making. This results in a more adaptable, imaginative, and resilient response to climate impacts, which benefits both local and global efforts to mitigate climate change. In a study conducted by Alif *et al (2024)* on participatory knowledge transfer approaches, results showed that training and knowledge dissemination can greatly influence farmers' adoption of new best practices, technologies and policy measures, resulting in improved yields, household income and environmental sustainability.

2.1.7 Challenges in Knowledge Transfer for Climate Change Adaptation

Lack of cooperation: Substantial climate data Knowledge and information are generated, but institutional bureaucracy, conflicts of interest and limited cooperation hinder their quality and effective utilization. ONACC and The National Directorate of Meteorology and to a lesser extent other entities (the National Statistics Institute, National Mapping Institute, Hydraulic Research Centre, and The Institute of Geological and Mining Research) are the organizations which have as main objective climate data management, production of climate and hydrological knowledge and information, climate impact assessments, or cartography of all these, however, cooperation is insufficient.

High cost of finance: while the transfer and adoption of climate technology and knowledge is capital intensive, Many developing countries face the problem of the inability to access or provide financing for knowledge and technological transfer and adoption(UNEP, 2022). Public resources which are limited are hardly distributed amongst responsible institutions adversely affecting data quality. Sources of data and knowledge systems are rather scattered with poor management of data (maintenance of weather stations to ensure consistent data collection, coordination, and sharing) (Kuna and Horstmann, 2017). Access can at times be challenging due to non-functioning websites, outdated information. Due to inadequate resources, data coverage is frequently restricted to specific areas, and information on risks and vulnerabilities is not generated. For example, it is a problem in getting information on particular regions or cities when you succeed to get access to the websites as No forecast are available for the selected region or city. Some climate data is available online through sources such as the ONACC, however, access can be difficult due to non-functional websites, outdated information, or restrictions. (World Bank, 2022).

In current times, Information and Communication Technology (ICT) play a key role in the knowledge transfers projects. Generally, developing countries find difficulties in maintaining ICT infrastructures and at the same time, access and connectivity is hindered by frequent power outages and a high cost of internet connection from official mobile internet service providers (Chisita and Fombad, 2020).

Institutional and regulatory weaknesses: Adaptation and mitigation in general, relies heavily on the presence of a favourable well-structured environmental regulations and suitable infrastructural setting (UNEP, 2022). The absence of such a favourable atmosphere makes knowledge transfer and adoption of many climate technologies more costly and therefore less viable. For example, in Cameroon policy frameworks are hardly fully conducive to a green energy transition and this is because, they were largely created for, and during a period when fossil fuels was the dominant energy source. This therefore constitute important barriers for mitigation and adaptation technologies adoption and transfer.

Climate action especially knowledge transfer is also hampered by a lack of accountability, state, and citizen engagement. Resourceful stakeholders rarely impact decision-making and execution with their findings, recommendations, and knowledge, and difficulties remain for private sector participation. Furthermore, oversight agencies have extremely little capacity to monitor climate change actions and performance. (World Bank, 2022).

Political economy concerns also jeopardize the possibility of an effective and equitable climate response. Major points of contention have arisen about leadership, responsibilities, and the transfer of skills and information, placing major actors such as the MINEPDED against sector ministries, or central agencies against decentralized groups. Growing sources of climate funding are also shifting incentive structures, leading to rent-seeking (World Bank, 2022).

Capacity and knowledge: This corresponds to a country's wider knowledge base and technological literacy, which includes the human capital skills and knowledge of the workers, the governing structures, the legal and organizational framework, and the duties and functions of technology-related institutions and networks(UNEP, 2022)**.** Key innovative climate knowledge and technologies are new and continually evolving. The time interval between their development, introduction, and market deployment by technological leaders and their transfer to developing nations is cut short, and as a result, developing countries like Cameroon have very limited time to gain expertise and establish capacity for these technologies(UNEP, 2022).

Lack of innovation: Technological innovation, knowledge development, and transfer play a critical role in climate change adaptation and mitigation, as well as in economic growth and development. Developing countries like Cameroon are characterised by low levels of investment in innovation despite holding the highest potential returns, resulting in what can be termed the innovation paradox. The majority of low-income countries rely on difficult-to-access technologies created in high-income countries, which are obtained through technology knowledge transfer to the south. Thus, Climate technical growth in countries like Cameroon is significantly influenced by their ability to acquire, utilize, and distribute technological information developed overseas. As a result, international technology knowledge transfer is an important factor in eliminating technological, knowledge, and ability gaps in climate change adaptation and mitigation (UNEP, 2022). For example, according to UNEP, between 1990 and 2015, 80% of all low-carbon technical inventions were concentrated in high-income nations, whereas low-income countries account for just 0.01% of exports and 0.3% of total imports of low-carbon technology. The same applies to patented adaption technologies, which are concentrated in high-income countries.

Suitability in the local context: One of the primary obstacles encountered by developing countries such as Cameroon is identifying the most suitable knowledge or technology based on different local realities and changing climates affecting localities differently, from among many different technologies and multiple knowledge sources(UNEP, 2022). Matching the various knowledge and technological developments with the different people that need them has been a challenge and very costly for developing countries given the limited capacity they have. Cameroon is a country highly rich in diversity when it comes to climate, geography, biodiversity and social setting. Within this diversity, knowledge and technological transfer is supposed to be suited to each local climatic, geographic and biodiversity conditions and needs. If this relevant social and environmental contexts are ignored, the implementation of the knowledge or technology transferred might prove ineffective and may even lead to maladaptation. Thus prior to the adoption of any public policy transfer any knowledge or technology, careful considerations are required for the environmental and social contexts.

Language problems: The scientific understanding of climate change by some practitioners and especially local vulnerable communities is not as is really desired. Climate change is characterised by very complex technical terminologies and adding to this, most local communities that are the most affected by climate impact understand mostly local languages. Thus bringing in information in languages like English and French will hinder comprehension. A restricted understanding of some forces at the source of climate change, the scientificity and complexity of some adaptation and mitigation knowledge hinder greatly the comprehension of these stakeholders. This weakens the ability to explain related concepts to this audience and consequently hinder the Dissemination process (Stott and Huq, 2014).

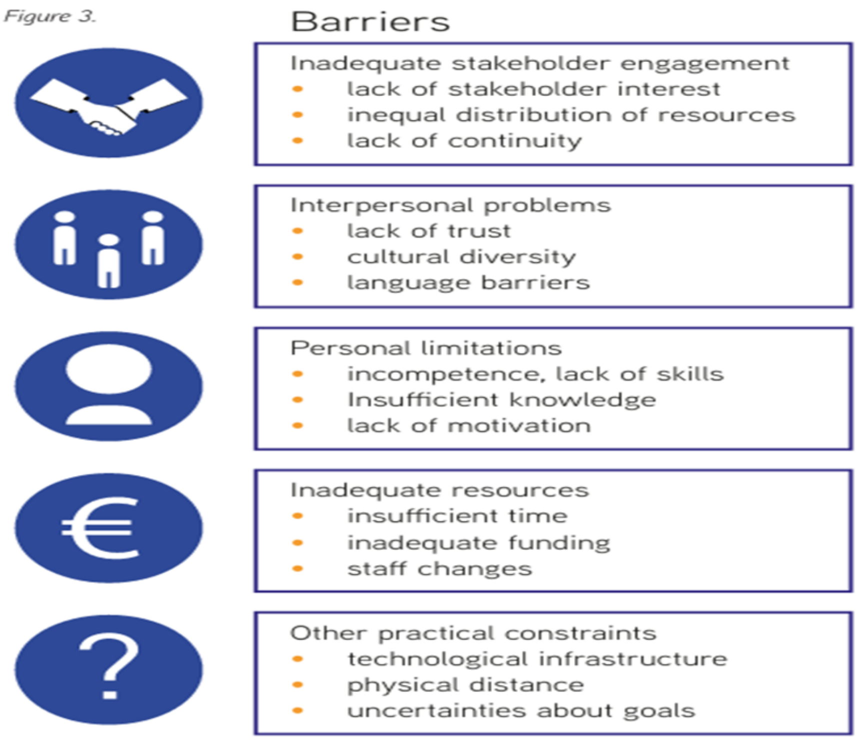


Figure 2.4 Barriers to KT

Source: Adopted from (Kuna and Horstmann, 2017)

2.1.8 The Extent of Outreach and Implementation of the Knowledge Transfer

Stott and Huq, (2014) argue that, Individuals are more likely to adapt if they have access to some certain reliable and tangible information about possible climate change impacts on their livelihood. This implies that Knowledge transfer is very vital for adaptation and can be considered successful when it reaches the targeted audience. This audience could be the policy makers, vulnerable communities, farmers, scientist, NGOs amongst other stakeholders of interest. Consequently, the extent of the outreach is very important in determining how successful a knowledge transfer initiative is**.** They acknowledged that there is the existence of institutional disconnections in many knowledge management frameworks between scientific bodies and local level stakeholders which hinders knowledge transfer and outreach. The medium of dissemination should be taken very seriously in relation to the given context and the targeted public. If we take the case of climate change knowledge transfer, targeting farmers in rural areas, it should be noted that, rural population usually have little access to explicit-to explicit channels of disseminating knowledge such as documents and online resources. Thus tacit-to-tacit methods would be the best approach in order to maximise the outreach to the targeted public (farmers). Language is also one of the main factors that possibly affect the outreach. Stott and Huq, (2014) identifies language challenge in terms of technical terminologies and in terms of language difference itself. A study by Fombad, (2024) revealed that, climate change knowledge remains scattered and isolated limiting the outreach of the information to particularly local vulnerable people. As a result, they do not have timely access to the necessary information to adapt to climate change. He added that some farmers in South Africa already accused the government for not providing them with knowledge on how to manage their livestock amidst climate change.

2.2 Diffusion of Innovation (DOI) Theory

This theory, proposed by Everett Rogers in 1962 is centred on how innovation knowledge is transferred or sheared. It explores how new ideas, practices, or technologies spread within a social system over time (Liu *et al.*, 2017). The notion emerged from communication to describe the way, gradually, a product or concept gathers momentum and spreads (diffuses) through an audience or community. Rogers (2010) introduced the diffusion model in multiple editions of his book Diffusion of Innovations, defining it as "the process in which an innovation is communicated through certain channels over time among the members of a social system." (Liu *et al*, 2017). As a result of this dispersion, individuals inside a social system embrace a new concept, conduct or product. Adoption means that a person performs something different from what they did previously, such as employing a different agricultural or building approach, purchasing or using a new product, or acquiring and performing a new behaviour. The key to adoption is that the individual perceives information regarding the idea, behaviour, or product as new or innovative. It is through this that Knowledge transfer is possible.

According to Rogers, adoption of knowledge about a new idea, behaviour, or product does not happen simultaneously in a social system (Behavioral Change Models, 2024). The stages by which a person adopts innovation knowledge particularly climate change Adaptation and mitigation strategies in our context, and whereby the innovations knowledge transfer is performed, include recognition of the necessity for an innovation, willingness to adopt (or reject) the innovation, preliminary use of the innovation to test it, and continuous usage of the innovation.

In the context of climate change, this theory helps to understand how knowledge about effective mitigation and adaptation strategies is disseminated and adopted among different stakeholders in Cameroon. Examining the rate and pattern of knowledge transfer will provide insights into the effectiveness of policies and actions aimed at addressing climate change.

2.3 Main Concepts

2.3.1 Knowledge Transfer

It means to the transfer of concrete and intellectually valuable expertise, learning, and abilities that are located in an individual or a group, or ingrained in a routine or process (Taewook and Hyung-Ju, 2018) .This involves the widespread comprehension of information, expertise, and best practices related to climate change adaptation and mitigation (Clare and Saleemul. 2014). It encompasses how knowledge is generated, shared, and utilized by various stakeholders, including policymakers, researchers, practitioners, and communities (Clare and Saleemul. 2014). Knowledge transfer can be seen as a process of knowledge sharing or exchange. The primary goal is to bring about understanding and promote change in the individual or organisation receiving the information/knowledge (Kuna and Horstmann, 2017). According to Kuna and Horstmann (2017), the three main ways to transfer and pass on knowledge are electronic (email, telephone, skype, web-conferencing, websites, blogs, electronic surveys, social media), in-person conversations (project meetings, seminars, courses, workshops, summer schools, conferences, interviews), and written documents (journal papers, books, reports). Fombad, (2024) on his part identified, Personification and codification as the two main knowledge transfer strategies.

Personification is concerned with tacit-to-tacit information transfer, in which interpersonal means are utilized to transmit knowledge. On the contrary hand, the codification technique tries to connect individuals to documents in organizations and improves explicit-to-explicit knowledge transfers. It strongly encouraged that organizations use both codification and personification in parallel to maximize knowledge resources, with one taking precedence over the other. Explicit knowledge is usually emphasized through paperwork, web-based material, electronic meetings, and phone conferences. Nevertheless, the sharing of tacit information may be equally important for knowledge transfer to be effective. Collaboration and socialization are critical for learning others' tacit abilities, habits, and methods of working. The effectiveness of knowledge sharing and development depends on the means that are used.

Climate change Knowledge could mainly be divided in to universalistic science knowledge and indigenous knowledge systems. Universalistic scientific knowledge refers to knowledge that involves techniques and methods that often relate to advanced technologies from the western world. Universalistic knowledge is also referred to as Exogenous knowledge and is that knowledge that has been experimented using scientific research methods, tested proven and documented to be replicated and improved (Chirisa *et al.*, 2018). On the other hand, indigenous knowledge systems refers to those that originate from tested, proven and used knowledge by local communities from over an accumulation of years of experiences in observing environmental and climatic phenomena and behaviour. Also known as Endogenous knowledge, this type of knowledge is unique to a given culture and society being passed down from one generation to another and works in relation to given community decisions on their various activities of livelihood including the domain of Agriculture, environmental management, arts and health amongst others. (Chirisa *et al.*, 2018). The conceptualisation of KT is illustrated in Table 2.1.

Table 2.1 Conceptualisation of KT

<table>
<tr><th>Concept</th><th>Dimensions components</th><th colspan="3">Components</th><th>Indicators</th></tr>
<tr><td rowspan="4">Knowledge Transfer</td><td rowspan="3">Universalistic science Knowledge</td><td>Personification
Tacit-to-Tacit</td><td colspan="2">Seminars,
Workshops,
Conferences,
Interviews and courses</td><td>➢ Extent of outreach
➢ Level of adoption
➢ Number of Seminars,
➢ Number of Workshops,
➢ Number of Conferences,
➢ Number of Interviews and courses Carried out</td></tr>
<tr><td rowspan="3">Codification
Explicit-to-Explicit</td><td>Electronic</td><td>Web-conferencing
Websites
Blogs,
Electronic surveys
Social media
Email, telephone, Skype,</td><td>➢ Extent of outreach
➢ Number of Web-conferencing Websites, Blogs, Electronic surveys, Social media, Email, telephone, Skype carried out</td></tr>
<tr><td>Literature</td><td>Journal papers
Books,
Reports
Policy brief</td><td>➢ Extent of outreach
➢ Level of awareness
➢ Number of Journal, papers, Books,
Reports and Policy brief published</td></tr>
<tr><td>Indigenous knowledge systems</td><td colspan="2"></td><td></td></tr>
</table>

Our focus here is more on Universalistic science Knowledge. Through the examination of measurable indicators of KT such as Extent of outreach, Level of adoption, Number of Seminars, Number of Workshops, Number of Conferences, Level of awareness, frequency of alerts, papers, Books, Reports and Policy brief published, we are able to say if existing frameworks are effective or not.

2.3.2 Climate Change Adaptation

According to the United Nations Environmental programme (UNEP), Adaptation to climate change refers to adjustment in human or natural systems with regard to present or expected climatic stressors or their impacts, which minimizes damage or utilizes potential benefits.

The Intergovernmental Panel on Climate Change (IPCC) defines adaptation as the process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities (IPCC, 2014). According to the Cameroon PNACC, Adaptation refers to the ecological, social and economic system adjustments to an observed or anticipated climate risk, its effects and impacts. It refers to a change in practices, procedures and structures aimed at limiting or eliminating damage caused by climate change.

People and communities have adjusted to and survived with climate change, variation, and extremes with varied degrees of effectiveness throughout time. The majority of African national governments are implementing adaptive governance frameworks. Disaster risk management, adaptations in technologies and infrastructure, ecosystem-based approaches, fundamental public health interventions, and livelihood diversification are examples of adaption techniques that reduce susceptibility. The IPCC 2015 report recognized national governments as major players in overseeing the adaptation endeavours of local and subnational governments, for instance, by protecting vulnerable groups, promoting diversification of the economy, and providing information, policy and legal frameworks, and funding. It stated that Organizations bridging science and decision making, including climate services, play an important role in the communication, transfer, and development of climate-related knowledge, including translation, engagement, and knowledge exchange which will help in managing future risks and build resilience. Local government and the private sectors are increasingly recognized as critical to progress in adaptation, given their roles in scaling up adaptation of communities, households, and civil society and in managing risk information and financing (IPCC Fifth Assessment Report, 2014). This calls for the decentralization of climate change knowledge management and transfer of responsibilities.

Adaptation to climate change could either be planned where we anticipate climate change and its effects, and address them or unplanned spurred by events that precipitate unplanned changes (Stephen and Andreas, 2024). According to The National Climate Change Adaptation Research Facility (NCCARF), adaptation could be Incremental where series of relatively small actions and adjustments are taken in the face of the impacts of climate change or Transformational Adaptation which involves significant change to community goals and expectations. Transformational adaptation is generally undertaken when incremental adaptation is no longer sufficient to address the risks. To NCCARF, adaptation is termed Anticipatory or proactive when it takes place before the impacts of climate change are observed opposing to Reactive Adaptation that is undertaken in response to an effect of climate change that has already been experienced. Adaptation can be termed Private when taken by a person or business that benefits only that particular individual or business or both to that person or business but also to the public more broadly. It can also be Public adaptation undertaken by a public entity to benefit the broader community.

Adaptation could also be ecosystem-based. Ecosystem-based adaptation refers to the management of ecosystems to improve ecological structures and functions that enable ecosystems and humans to adapt to a variety of changes, including climate change(Mutambisi *et al.*, 2021)(see Table 2.2).

Table 2.2 Conceptualisation of Climate Change Adaptation

Concept	Dimensions	Components	Indicators
Climate Change Adaptation	Planned Anticipatory Proactive	Public or institutional entities Transformational	Institutional and policy framework: adaptation plans, integration in to development plans, Governance structure and legal framework
			Number of Capacity building and knowledge transfer initiatives and its impact
			Resilience infrastructure and physical measures(quality &quantity)
			Financial allocations
			Number of people benefiting from improved access to services for adaptation
			Public awareness
		Private individual Incremental	Personal infrastructure and property resilience: Number of house hoods with climate proof homes, resource efficiency and conservation measures, and insurance coverage
			Behavioural and lifestyle changes
			Participation in community and collective adaptation
			Knowledge and awareness
	Unplanned Reactive	Public or institutional entities Transformational	Response and relief: Response time, Number and coverage of people that receive emergency relief and compensation funds
			Post-disaster infrastructure repair and restoration: repair time, % repaired, & number of essential services
			Job creation in recovery efforts
			Level of Public engagement and awareness campaigns in recovery efforts
		Private individual Incremental	Restoration of livelihood
			Diversification of income source
			Change in behaviour and lifestyle. Climate risk insurance

The combination of Planned and unplanned adaptation approaches has the potential to bring various advantages by reducing vulnerability to climate change and contributing to socioeconomic growth and conservation.

2.3.3 Climate Change Mitigation

According to UNEP, Mitigation is seen to mean using new technologies and renewable energies, making older equipment more energy efficient, or changing consumer behaviour to reduce Greenhouse gas emissions. It is seen as the interventions to reduce greenhouse gas emissions at source or to increase the storage of these gases (Cameroon NAP, 2015). The IPCC defines it as actions or activities that limit GHG emissions from entering the atmosphere and or reducing their levels in the atmosphere from energy production and use (IPCC, 2023). Taking climate change to be a boat that has gotten a sprung leak, while adaptation here is working on removing the water that has already gotten in to the boat to stay dry, Mitigation here would work on plugging the holes. Following this way, in the face of climate change, Mitigation efforts includes measures to solve the underlying problem by reducing or stopping the emissions from fossils fuels that will consequently cause an irreversible rise in global temperatures(Behsudi, 2021). Climatic behaviour is controlled by natural factors, yet anthropogenic activities such as, combustion of fossil fuels, Agriculture, deforestation, industrial processes and waste are increasingly changing the narrative(Lackner & Chen, 2020). The ultimate goal of mitigation is usually to preserve biodiversity that can withstand human evolution and the complexity of ecosystem services that bound and support it. Thus, Mitigation efforts are aimed at limiting emissions of anthropogenic GHG such as carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and fluorinated gases (hydrofluorocarbons, perfluorocarbons, sulphur hexafluoride) towards attaining Net zero in compliance with the Paris Agreement.

The international Energy agency (IEA) revealed that if no mitigation efforts are made , global average temperature rise might reach 6°C (Lackner & Chen., 2020). According to the stern committee report, it is estimated that the cost of mitigating climate change now is about 1% of Global GDP while the cost of doing nothing will be 5-20 times higher (IPCC 2010b; Stern 2007). Many mitigation strategies have so far been developed in the face of climate change. These include; the development of renewable energy sources such as solar energy, energy conservation and energy efficient technologies, Carbon capture, Afforestation and reforestation, soil carbon sequestration, ocean fertilization, wetland restoration and construction, economic instruments and regulatory frameworks amongst others.

Mitigation can be divided in to mitigation with conventional technologies and mitigation with Negative emissions technologies. Also known as mitigation that reduces CO2 emissions, as the name indicates, mitigation with conventional technologies is that type of mitigation that uses decarbonisation technologies and techniques to reduce GHG emissions from existing human induced sources(Fawzy *et al.*, 2020). This includes the use of renewable technologies such as solar, hydropower, nuclear power, Fuel switching, energy efficiency gains and carbon capture, storage and utilization techniques to reduce emission from anthropogenic activities. This mitigation option is very pivotal, given that energy-induced emissions makes up the greater proportion of GHG concentrations in the atmosphere and thus efforts should be focused on both the supply and demand sides of energy. This implies targeting the sectors that are energy intensive like, industry, transportation, Construction, and Agriculture. Adopting this approach involves the introduction of energy efficient technics and processes that reduce energy consumption. It is also worth understanding that all these work in line with well-designed and implemented pro- emissions reduction policy frameworks. This favourable policies could be classified in to technology-push, demand-pull and systemic policy instruments(Fawzy *et al.*, 2020).

Mitigation with Negative emissions technologies on its part, also referred to as carbon dioxide removal methods (Capture and Sequester approach) are those mitigation methods that are introduced to capture and sequester GHG from the atmosphere. Example of technics used here include, Afforestation and Reforestation, Soil carbon sequestration, Wetland restoration and construction, Ocean fertilization, Direct/Bioenergy carbon capture and storage(Fawzy *et al.*, 2020). Negative emissions technology is an inevitable need even at the highest rate of conventional decarbonisation efforts. However, Negative emissions technologies cannot be relied upon independently for meeting Net zero or 2 °C target, and should not be considered as a complementary suit to conventional mitigation technologies and not a substitute(Fawzy *et al.*, 2020). (See table 2.3)

Table 2.3 Conceptualisation of Climate Change Mitigation

Concept	Dimensions	Components	Indicators
Climate change Mitigation	Conventional mitigation technologies (reduce CO2 emissions)	Renewable energy	Share of Energy supply
			Share of Power production
			Share in global power capacity
			Number of renewable energies adopted
			Number of Pro- renewable energy policies
		Carbon capture, storage and utilization	Capturing capacity
			Number of installed plants for capture
			Number of Pro- Carbon capture, storage and utilization policies
		Fuel switch and efficiency gains	Energy Loss reductions
			Amount of energy recovered, reused and recycled
			Energy efficiency of buildings, thermal engines, hybrid and electric vehicles
			Number of Pro-Fuel switch and efficiency gains policies
	Negative emissions technologies (Capture and Sequester CO2)	Afforestation/ Reforestation and Soil carbon sequestration	Number and size of forested(Trees)/ soil conserved areas
			Sequestration rates and storage capacity
			Number of Pro- Afforestation/ Reforestation and Soil carbon sequestration policies
		Wetland restoration and construction and Ocean fertilization	Number of existing initiatives
			Wetlands and oceanic carbon sequestration rates and storage capacities
			Number of Pro- Wetland restoration and construction and Ocean fertilization
		Direct/Bioenergy carbon capture and storage	Number of Direct/Bioenergy carbon capture and storage initiatives
			Amount of Carbon captured
			Number of Pro- Direct/Bioenergy carbon capture and storage

Negative emissions technologies (Capture and Sequester CO2) with the exception of its sophisticated approaches such as Direct/Bioenergy carbon capture and storage, seem to be the main preferred mitigation strategy so far especially in Africa since it is relatively cheaper as compared to Conventional mitigation technologies (reduce CO2 emissions). However GHG emission reduction will be very significant of there is synergy between these two approaches.

2.3.4 Synergizing Climate change Adaptation and mitigation strategies and policy

In the face of current anthropogenic climate change crisis, there is the need to employ all options available to build resilience against impact and to resolve the underlying causes(Orgbalt *et al.*, 2020). No climate change solution option is a one size fits all and thus cannot be taken as such. While climate change mitigation and adaptation are the two ways to go about resolving climate change, it is also very important to take note that one cannot be adopted in isolation from another and in most cases, synergy of the two strategies is the perfect match**.** Making reference of climate change to a sinking boat, resolving the problem does not only require plugging the holes or removing the water that is already entering the boat only but it requires that we address both issues simultaneously. Assuming we become successful in mitigation efforts in reducing emissions and stop the increasing warming effects of the atmosphere, it wouldn't be enough as the earth has already experience significant warming that is already having negative impact on livelihoods and societies now and in the near future(Orgbalt *et al.*, 2020). This is where the imperative necessity of adaptation comes in and explains why the two approaches need to work hand in hand. How much adaptation efforts we need depends on how much mitigation efforts we have put in, and how effective and fast they are(Orgbalt *et al.*, 2020). The best way of dealing with climate change requires a balance approach between Adaptation and mitigation strategies (Lackner & Chen., 2020). Therefore while building resilience and minimizing the impact of climate change through adaptation is imperative, at the same time, solving the underlying problem by limiting or stopping emissions of CO2 is equally important (see Figure 2.5)

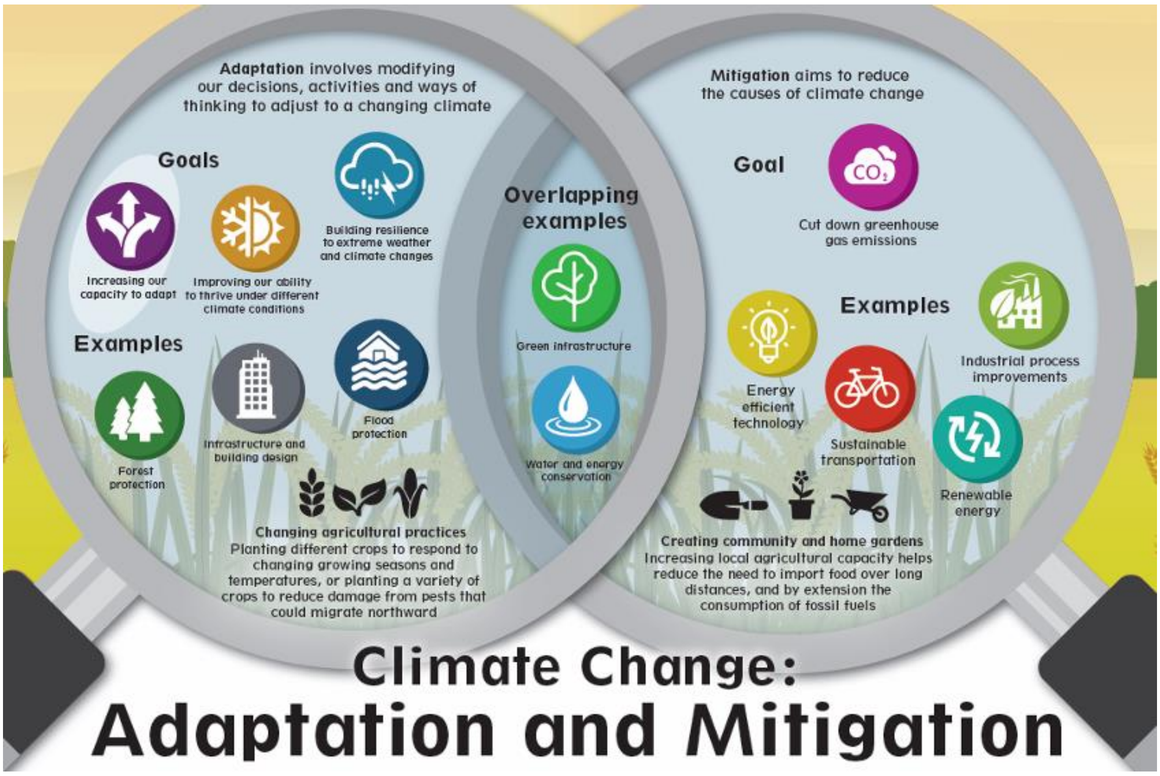


Figure 2.5 Adaptation and Mitigation Synergy

Source:https://ghe.uwo.ca/blog/posts/climate_change_adaptation_mitigation_vulnerability_health.html

This synergy between mitigation and adaptation strategies would not be ideal if not complemented by favourable policy frameworks. There is the need for the integration of climate mitigation and adaptation considerations in to various sectorial policies. Through Strategic Policy Plans, support is birthed for the implementation of cost-effective and long-term climate change mitigation and adaptation measures in various sectors(Orgbalt *et al.*, 2020)

III. CHAPTER THREE

3. RESEARCH METHODOLOGY

3.1 Research Design

A mix of qualitative and quantitative research methods were used, where literature review, questionnaires and interviews conducted with research participants were carried out to get in-depth qualitative and quantitative information.

3.1.1 Area of study

The study area is the Centre region of Cameroon with a surface area of about 68,953km2. Within the five relief regions of Cameroon, the centre region is located in the southern Cameroon plateau. Its altitude varies between 500 to 1000 meters above sea level with the exception of the Sanaga valley and its tributaries**.** The region is characterised almost entirely by accidented relief with the land rising steadily in an escarpment from the south western coastal low land to join the Adamawa plateau towards the north. The highest altitude of the region is the Mbam Minkon point with an altitude of about 1,295 metres. It has a type A or the Guinea-equatorial type of climate which is characterised by high level of humidity and precipitation. The region experiences a bimodal type of climate with two rainy seasons and two dry seasons making up part of the bimodal rainfall forest zone of the five Agro-ecological zones of Cameroon. The south western part of the region receives the highest precipitation while it drops increasingly towards the north. The average temperatures stands at about 24°C for almost the whole region except north western parts that at times fall to 23°C. Forest cover is the dominant type of vegetation which makes up part of the equatorial rainforest with the exceptions of the Djerem, Mbam, and Noun and the northern border region that have the woodland and Sudano-Guinea savannah vegetation. High rates of deforestation of especially the Ebony and Iroko species has reduced the forest and woodland cover. The centre region holds the position as the political capital of the country. The study area is particularly within selected neighbourhoods of the councils of Yaoundé 2 (Mbankolo), Yaoundé 6 (Etoug-Ebe), Yaoundé 7 (Nkolbisson), the Mefou et Afamba (Awae village) and Ntui (Mbam et Kim)(See Figure 3.1).

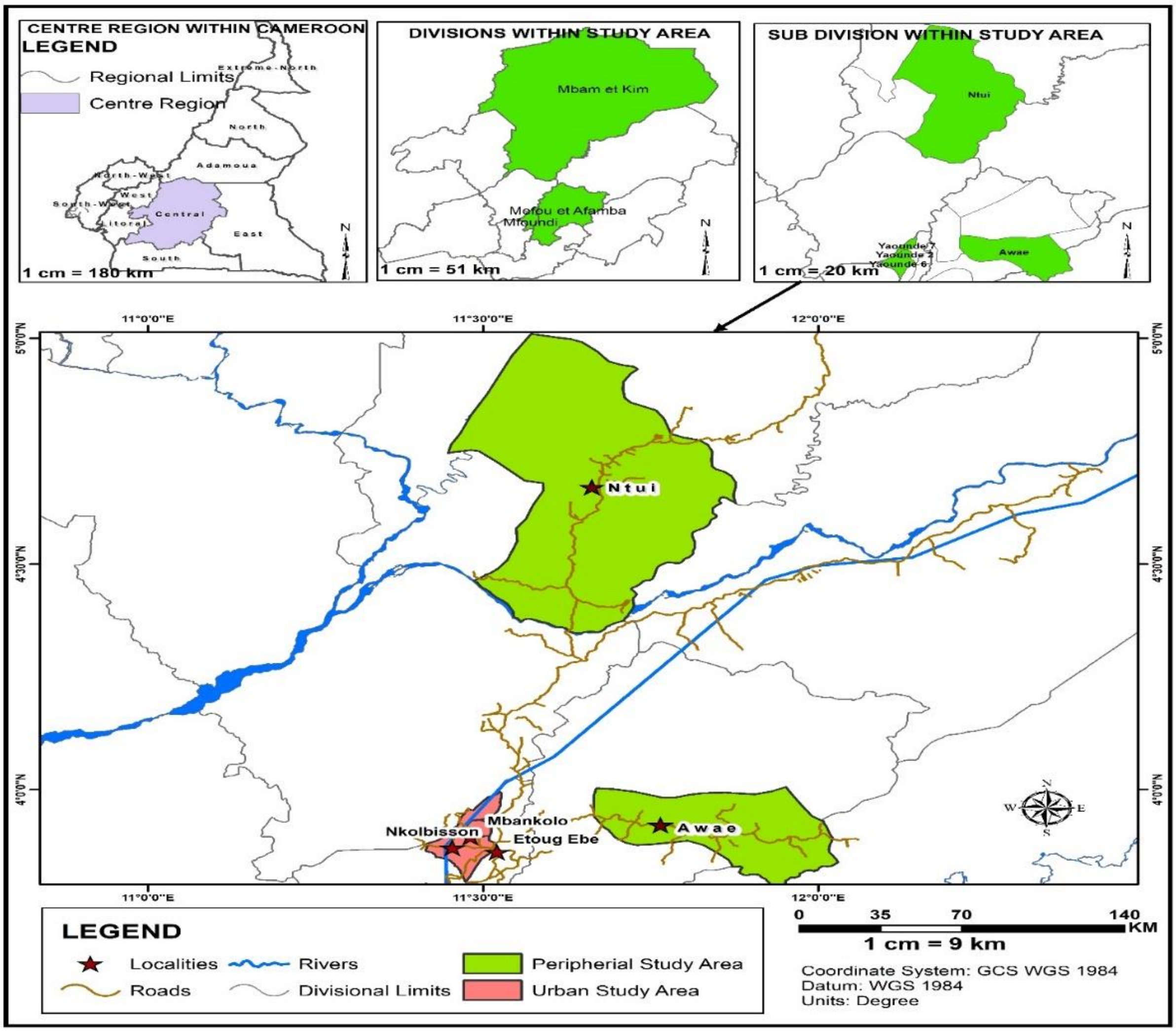


Figure 3.1: Map of the study area

Source: *Developed after field visit and extraction from Administrative map of Cameroon, NIC (2018)*

Mbankolo (Yaoundé 2)

Mbankolo is located in the central region of Cameroon, in the Mfoundi division at the southern edge of Yaoundé city centre. More precisely, it is found in the council of Yaoundé 2 with geographic coordinates 3°53'20 "N and 3°55'30 "N for north latitude, and between 11°29'50 "E and 11°31'55 "E for east longitude. The relief of the area is characterised by steep, hilly and accidented slopes at an elevation of about 700-800 m above sea level neighbouring mount Fébé. It makes up part of the south Cameroon plateaux relief region with gently sloping slopes and valleys also shaped by small rivers and streams that contribute to its local drainage system. Mbankolo like most parts of the centre region has a bimodal tropical rainforest climate, with high temperatures averaging about 24°c to 30°c throughout the year. It experience significant precipitation throughout the year with an annual average of about 1500mm-2000mm. The vegetation is mainly the tropical rainforest type featuring a variety of species of trees, plants, and shrubs. Tree species include mahogany, oak, and teak species but how ever high rate of urbanization, urban sprawl and agriculture have led to heavy deforestation. Soils here are typically topical and feralitic soils which have a reddish colour due to high iron oxide content. They are suitable for the cultivation of crops like cassava, plantains, and maize. Concerning population, Mbankolo makes up part of the Yaoundé 2 subdivision which has a population of about 45512 inhabitants (BUCREP). Thus the population of Mbankolo is likely in the ranges of tens of thousands. The economy of Mbankolo is characterised by mainly urban activities including secondary, tertiary activities and to a lesser extent primary activities such as agriculture.

Etoug-Ebe (Yaoundé 6)

Administratively, Etoug-Ebe is found in the Mfoundi Division within the Yaoundé 6 council which is one of the urban district of the city of Yaoundé**.** It lies approximately between 3°51' N Latitude and 11°31' E Longitude in the southern part of Yaoundé. It is relatively close to the heart of the city (5-10km) which makes it part of the metropolitan area. The relief same as that of other surrounding part of Yaoundé is made up of hilly terrain within the south Cameroon plateaux. Its average altitude stands between 600m-1000m above sea level. The neighbourhood has undulating hills, valleys and small water courses. It has a tropical rainforest climate with a bimodal seasonal pattern characterised by high levels of humidity and temperatures. The average annual precipitation stands at about 1500mm-2000mm of rainfall with seasonal variations. Temperatures average annually between 24°c and 30°c. Given the tropical rainforest type of climate, the area has a rainforest type of vegetation typical of central Cameroon. While the area has been greatly urbanized, it holds some patches of secondary forest and vegetated areas. Urbanisation has led to the replacement of vegetation cover by residents, businesses, and other infrastructures. The neighbourhood has the feralitic type of soils which are typical of the rainforest region of central Cameroon rich in iron oxides suitable for the cultivation of some crops though the primary function is residential, commercial and infrastructure. Concerning the population of the area, Etoug-Ebe makes up part of the Yaoundé 6 council which hold a population of about 64886 inhabitants (BUCREP). The population is a mixture of various ethnic groups as it makes up part of the political capital of the country where Cameroonians from all over the country are residence. The economic function include, commercial, residential, transport, public services and insignificant agro activity.

Nkolbisson (Yaoundé 7)

Nkolbisson is located within the Mfoundi division of the centre region specifically in the Yaoundé 7 council area. It makes up part of the greater Yaoundé municipality and is consequently one of the suburban areas of Yaoundé. It is located approximately in between geographic coordinates 3°50'N Latitude and 11° E in the southern part of Yaoundé. It is about 10-15km from the city centre though it retains some rural characteristics. Nkolbisson experiences the tropical rainforest climate type with a bimodal seasonal pattern characterised by high humidity and precipitation throughout the year. Annual average rainfall stands at 1500mm-2000mm typical of most areas in central Cameroon. Temperatures on their part are at an annual average of about 20°c to 30°c. Found within the south Cameroon plateaux, the relief of Nkolbisson is accidented, undulating between hills, valleys and some low lying areas. The Altitude of the neighbourhood is between 700m-800m above sea level and it is gentler compared to surrounding areas which have steeper slopes, giving it, its natural landscape and scenic view. It belongs to the rainforest vegetation zone with tree species such a mahogany, oak, teak, various types of palms and bamboos. While urbanisation has led to the transformation of forest land in to commercial and residential spaces, pockets of secondary forest still exist together with some agricultural land. Soils are feralitic, reddish or yellowish in colour generally fertile favouring the cultivation of crops such as cassava, maize, plantain and yams. Nkolbisson makes up part of the Yaoundé 7 council which has a population of about 17942 inhabitants (BUCREP). The population includes a mixture of urban dwellers, small business owners and farmers. Commercial, residential, public services and transport functions make up the main activities of the neighbourhood while agriculture still occupies a relatively important part of the economy. Thus it still has a mixture of rural and urban characteristics.

Awae Village (Mefou et Afamba)

Awae is a council located in the Mefou et Afamba Division which is one of the 10 divisions of the centre region of Cameroon. It is found outside the central urban zone of Yaoundé and is administratively managed by local councils and has a mayor who oversees all local governance, infrastructure and development programs. It is located between 3°25' N Latitude and 11°35' E Longitude in the south central part of Cameroon. This is approximately 30 to 40 km southeast of the Yaoundé metropolitan area. It has a tropical rainforest climate that is characterised by high temperatures, high rainfall and high humidity. It has a bimodal seasonal pattern with two rainy seasons and two dry seasons. Precipitation ranges from 1500mm to 2000mm on yearly bases. Temperatures average 24°c to 30°c relatively warmth all year round. Awae is characterised by a hilly and undulating landscape that is typical of the southern plateaux consisting of rolling hills, plateaux and small valleys. Its altitude ranges between 600m to

1000m above sea level. The regions moderate climate has contributed to its favourable agricultural conditions. Awae has the tropical rainforest type of climate with dense vegetation cover made of trees, shrubs and plants. In addition to this natural forest, there is agricultural land where forest has been cleared for small scale and large scale farming of crops such as pineapples, plantains, cassava, cocoa and maize. The area is also reach in biodiversity with a variety of plants, and animals. Soils here are feralitic rich in iron and aluminium and are well drained, generally fertile supporting the growth of a wide range of crops. The population of Awae is about 3490 inhabitants (BUCREP). The population consists largely of farmers and agriculture is the backbone of Awae's economy as the fertile soils combined with favourable climatic conditions of the regions are well suitable for subsistence and cash crop farming. There also exist cattle rearing alongside crop farming and Adding to this, there are small scale trade, local crafts, and public sector activities.

Ntui (Mbam et Kim)

Ntui is a locality located within the Mbam et Kim division of the centre region. It is found in the larger region of the Yaoundé metropolitan area but is rural compared to the central parts of Yaoundé. It is situated between 4°26' N Latitude and 11°37' E Longitude. It lies north of Yaoundé approximately 100km away from the capital city and thus make up an important link between the centre region, the eastern region and the northern parts. It experiences a tropical climate characterised by high temperatures, with a bimodal climate pattern. Ntui typically receives between 1500mm to 2000mm of rainfall annually, making it one of the wettest regions of the country. Temperatures range between 23c to 30c with slightly cooler temperatures during dry seasons. It is situated in the southern plateaux characterised by varied and undulating landscape. The altitudes stands at about 500m to 1000m above sea level. The drainage has several small river tributaries that empty in to the Mbam River. The vegetation is tropical rainforest with lush canopy of trees, and a diverse range of plant species. Significant areas of Ntui are cleared for agriculture supporting the cultivation of crops such as cocoa, cassava, palm oil, plantains, and yams. Despite this, parts of Ntui still maintain forest cover and soils are feralitic which are common in humid tropical zones of Cameroon. Ntui has a population of about 5130 inhabitants (BUCREP). The population is diverse and primarily made up of rural residents involved in mostly agricultural activity with many living in villages and smaller settlements. There is also minor fishing activity on the Mbam River and forestry.

3.1.2 Sampling Technique

Purposive sampling was used because it was considered an easy and informal method to reach the target population. Random and snowball sampling were also used.

3.1.2.1 The sample population and Sample size

The sample population include some randomly selected households in chosen localities of the study area (Mbankolo, Nkolbisson, Ntui, Etoug Ebe, and Awae Village), local administrative authorities and the different stakeholders involved in the process of Climate knowledge production, management and Dissemination selected through expert sampling. The sample size of the study was 202.

3.1.3 Stakeholder mapping:

We identified and mapped key stakeholders involved in climate change adaptation and mitigation efforts in Cameroon especially those involved in knowledge production, management and dissemination including government agencies (ONACC, Meteorological Department of the Ministry of Transport), NGOs, community organizations, researchers, and international development partners. Snow ball sampling was also used here, where already identified stakeholders helped to direct us to other resourceful persons. Google map, GPS and online searches on their websites were then used to get the localisation of these organisations. Interview requests were then sent to them either through online resources (Phone call, message, emails) or physically.

3.2 Data Collection

3.2.1 Secondary data

A comprehensive review of existing literature on climate change adaptation, mitigation, and knowledge transfer, was conducted with a focus on studies relevant to Cameroon and similar contexts such as other African countries. The internet was a main source for existing literature using google search engines such as ResearchGate, google scholar, BASE, and organisational websites were used to access this secondary data. This include articles and textbooks publications, policy documents and academic research works. Data was acquired from existing databases, of the identified knowledge production, management and dissemination Frameworks including ONACC, Meteorological Department of the Ministry of Transport, and NGOs amongst others.

3.2.2 Primary data

A mixed-methods approach was employed to gather primary data from stakeholders. This included:

i. **Participatory and Direct Observation:** It was done on the field during research internship at ONACC. This was precisely in the department of the production and dissemination of climate watch and alert services. During this time, the researcher was actively involved in the processes of knowledge production, management and transfer. The researcher collected data here through observation and listening of personnel and what is being done. From all these, he then wrote down what he judged important towards his study. This was done throughout the internship period which had a duration of two months as from January 3th 2025 to February 28th 2025.

ii. **Interviews:** semi-structured interviews were conducted with key informants representing various stakeholder groups to gather insights into current practices, challenges, and opportunities related to knowledge transfer, action and policy synergy for effective implementation. At least one participant was interviewed from each of the selected organisations involved in climate change knowledge production and dissemination. The research used expert sampling by selecting professionals involved in the management of climate change information where climate knowledge managers were used as research subjects. These participants were chosen because they are custodians of climate change adaptation and mitigation knowledge and they were drawn from public and third-sector organisations (NGOs). A total of 9 interviews were administered to purposefully selected stakeholders within climate change knowledge production, management and dissemination frameworks within the study area (see Table 3.1 for the list of sampled informants).

Table 3.1 List of sampled informants for interviews

Organisation	Sample size	Key Informant(s)
ONACC(National Observatory on Climate Change), Yaoundé	**3**	**Mr. Njela Mbeih Gaston Evariste (**Research Assistant-Department for the production and Dissemination of Climate watch and Alert Services, Yaoundé
		Dr. Kimin Ignatius Ngala (Technical staff, Department for the production of climate watch and alert services)
		Dr. Meyong (Chef des missions, Department for the production of climate watch and alert services.
DNM (National Department of Meteorology, Ministry of Transport), Yaoundé	**1**	**Mr Bongkiyoung Emmanuel** (Meteorology and climate expert at the National Meteorological Department , Yaoundé
MINRESI (Ministry of Scientific Research and Innovation) Yaoundé	**1**	**Prof. Ako Ako Andrew** (Sub-Director: Centre for Water and Climate Change Research Within the Institute of Geological and Mining Research (IRGM)) Yaoundé
CIFOR-ICRAF (Centre for International Forestry Research and world Agroforestry), Yaoundé	**1**	**Dr. Bertin Takoutsing** (Associate Scientist for land health and digital soil mapping, ICRAF
Education institutions	**1**	**Prof. Ndi Rochester Edwards** (Senior Lecturer of Climatology, University of Yaoundé I)
IRAD (Institute of Agricultural Research for Development), Yaoundé	**1**	**Dr. Madou Chantal** (IRAD Researcher)
INC (National Institute of Cartography) Yaoundé	**1**	**Dr. Fotso Ngeumo Thierie** (Chief of Climate Change Research Laboratory, Directorate of Geographic research

Some of the target key informants such as the municipal councils of Yaoundé 2 and 7 were not finally interviewed due to bureaucratic setbacks. This institute required a request for an interview to be deposited before the researcher can be called for interview. The request were deposited but the researcher got no response.

iii. **Surveys and questionnaires**: Surveys and questionnaires were administered to a broader sample of local community population and stakeholders in the neighbourhoods of, Mbankolo, Etoug Ebe, Nkolbisson, Awae and Ntui. This was done to collect qualitative and quantitative data on knowledge levels, perceptions, and preferences regarding knowledge transfer for climate change adaptation and mitigation strategies. This included 182 questionnaires that were administered randomly to representative of selected households. Some of the questionnaires were given to be filled by the respondents while some were being filled by the researcher and his data collection assistant while verbally asking the questions. This sample was limited at 182 respondents because, at some point during the questionnaire administration, responses became saturated as the answers became recurrent without any new responses. At this point the researcher decided to limit his sample size to 182.

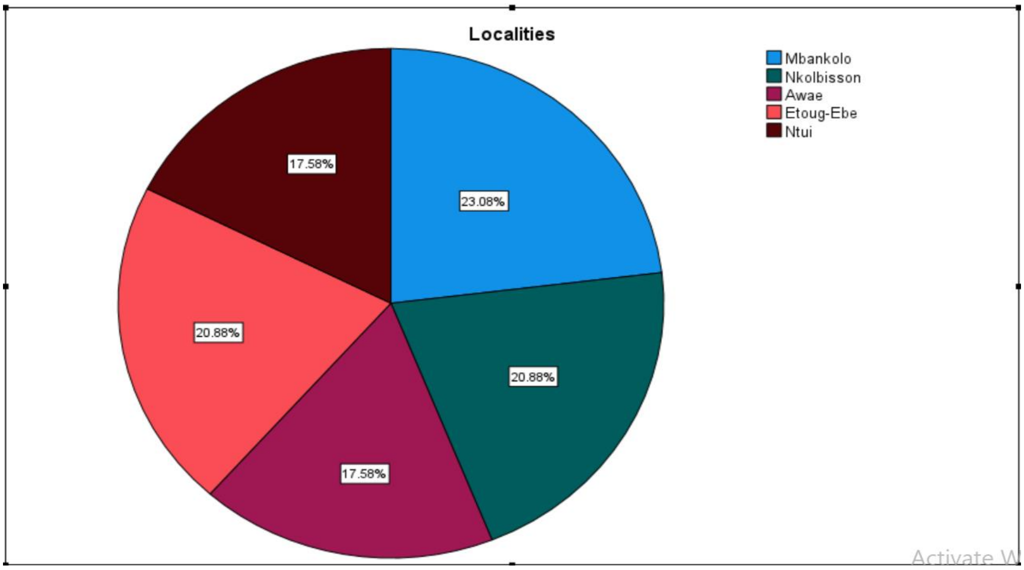


Figure 3.2 Distribution of respondents by study area localities (%)

Source; *Researcher's Field survey (2024)*

A sample of the questionnaire can be seen in appendix 1. Some pictures from questionnaire administration in the study area can also be seen in appendix 2.

iv. Focus group discussion: A focus group discussions was facilitated with diverse stakeholders in ONACC consisting of 11 experts from various departments. This included the department for the production and dissemination of climate watch and alert services, department of integrated observations and impact assessment of climate change, and the department of information and partnership, communication and public relations unit. This was an interactive discussion that explored shared concerns, priorities, future prospects, and potential collaborative initiatives during the internship period. The focus group discussion took place for about 3 hours during which the researcher recorded the conversion in an audio and also wrote down some key notes.

3.3 Data analysis and Tools of Treatment

Qualitative data from questionnaires, interviews and focus groups discussions were analysed using thematic analysis to identify recurring patterns, themes, and narratives related to knowledge transfer, synergies among actions, and policy implications. Quantitative data were analysed using statistical techniques such as EXCEL, SPSS, to identify correlations and trends, while ALAS.ti 24 was used to analyse some of the qualitative data. Map of the study area was treated using satellite imagery, Google Earth, ArcGIS and Arc Map software applications.

Existing climate change policies and frameworks in Cameroon were examined to assess their alignment with effective knowledge transfer in addressing adaptation and mitigation challenges, and opportunities for enhancing synergies among actions(Carl, 2016). This analysis used the policy analysis approach by Carl, (2016) involving the Identification of the problem, establishment of evaluation criteria, identifying alternatives, evaluate alternatives and present in recommendation (see Figure 3.2).

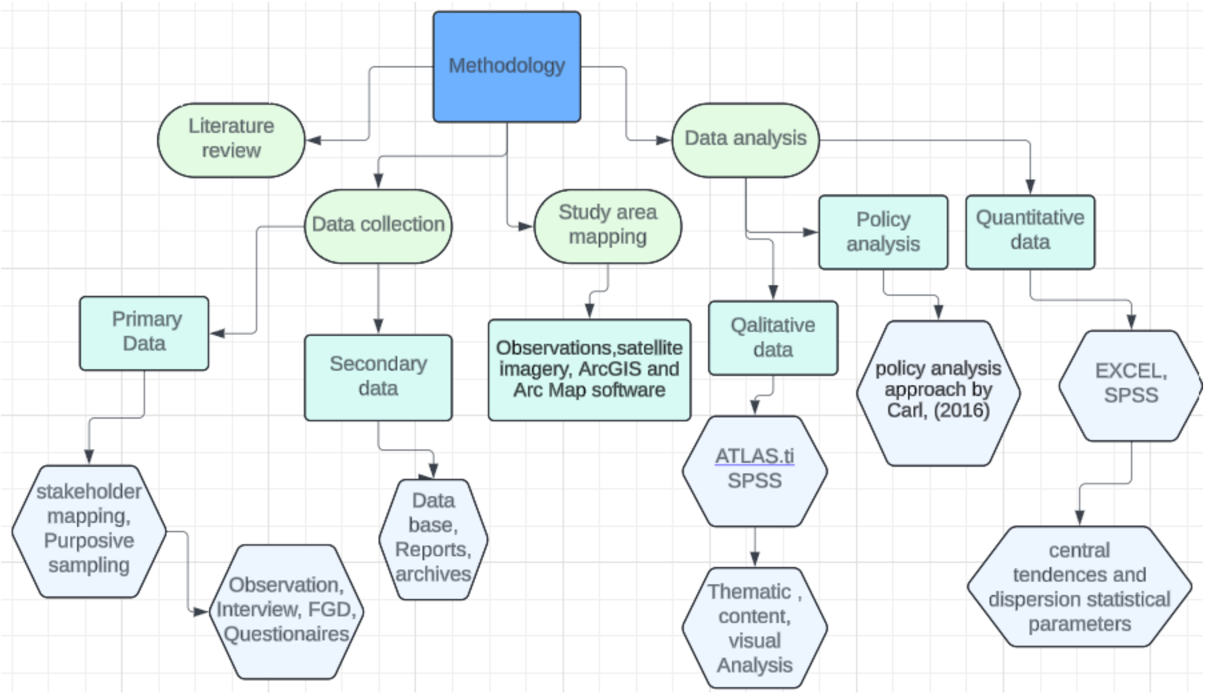


Figure 3.2 Research flow chart

This flow chart presents the various approaches that have been adopted by the researcher from data collection to analysis.

3.4 Synthesis

The findings from the literature review, stakeholder consultations, data analysis, case study, and policy analysis were then Synthesized to develop evidence-based recommendations for improving knowledge transfer, synergizing actions, and enhancing policy coherence in climate change adaptation and mitigation efforts in Cameroon. Recommendations target towards policymakers, practitioners, Knowledge management frameworks and other stakeholders involved in climate change governance and action.

3.5 Validation and Dissemination:

Validate through feedback sessions with the stake holders and experts on the field. Share research findings and recommendations through academic publication article, policy brief, workshops, and conferences to facilitate knowledge exchange and uptake among relevant stakeholders. Engage with policymakers, practitioners, and civil society organizations to ensure the practical relevance and impact of the research outcomes.

3.6 Obstacles during Fieldwork

- Language barriers hindered effective communication and data collection particularly as some important documents or information were not available in both English and French. This problem was also faced when administering the questionnaires and interviews as some of the respondents were not bilingual. Communicating with them was thus a bit difficult.
- Another key Difficulty was at the level of booking appointment especially with key informants at various targeted institution as many of them had very tight schedules.
- Political and institutional factors also presented obstacles to the study. Bureaucratic processes hindered the administration of some data collection processes. At the level of some institutes like the councils, administratively, it required to submit a demand for interview of which the response to the demands were not forth coming.
- Respondents whose homes were located at the risks zones where for example a disaster had already occurred like Mbankolo were repulsive to answer to the questionnaire. This is because they considered the researcher as some sort of spy from the government who is working on displacing them from their homes.

IV. CHAPTER FOUR

4. RESULTS AND DISCUSSION

4.1 Introduction

The results of the study are presented in this chapter. The respondent's demographic profile will be presented first followed by their position, perception and perceived consequences of climate change. The results will be presented and interpreted according to each research objective. This way, the research Findings on the Current status of knowledge transfer Frameworks will be presented first. This will be followed by the findings on Key actors involved in knowledge transfer and power relations. Thirdly, results on Dissemination canals and processes of knowledge transfer will be presented followed by the findings on Key challenges for effective knowledge transfer. Lastly, findings on Knowledge outreach of the existing knowledge transfer frameworks will be presented. This chapter ends with discussion of the results.

4.2 Research Results

4.2.1 Respondent's demographic profile

A total of 200 questionnaires were distributed and administered within the localities of Mbankolo, Awae Village, Nkolbisson, Ntui, and Etoug Ebe. Out of these, 182 were completely filled and collected**.** While 9 interviews and one focus group discussion were conducted with key informants (see Table 4.1).

Table 4.1 Respondent's demographic profile

Variable	Classification of variable	Frequency	Percentage (%)
Sex	Male	96	52.7
	Female	86	47.3
Age	20-30	74	47
	30-40	49	26.9
	40-50	35	19.4
	50-60	19	10.4
	60+	5	2.7
Education	Not Literate	7	3.8
	Primary	28	15.4
	Secondary	45	24.7
	High school	45	24.7
	University	57	31.3
Occupation	Primary activities	83	45.6
	Secondary activities	32	18.7
	Tertiary	65	25.7
Marital status	Single	77	42.3
	Married	105	57.7
Family size	1-3	44	24.2
	3-4	54	29.7
	4-5	29	21.4
	5+	45	24.7

Source: Researcher's Field survey (2024)

From the results presented in table 4.1, after randomly administering 182 questionnaires, 96 (52.7%) of the respondents were male while 86 (47.3) were female. This results were subject to the availability and willingness of the inhabitants to answer the questionnaires. Mostly male inhabitants were available for administering the questionnaires, thus at some point Female respondents were sorted to strike a gender balance. Amongst all the respondents, 7(3.8%) were not Literates, 28(15.4%) got just primary education, 45(24.7%) obtained secondary education, 45(24.7%) High school, and 57(31.3%) attended University level.

Concerning respondents age, 74(40.7%) were aged between 20-30 years, 49(26.9%) aged 30-40, 35(19.2%) aged 40-50, 19(10.4%) aged 50-60 and 5(2.7%) were aged 60+. Of these respondents, 83(45.6%) were involved in primary activities especially agriculture as their main source of livelihood, 32(17.6%) were involved in secondary activities and 65(35.7%) were involved in tertiary activities.

In regards to marital status, 105(57.7%) of respondents were married while 77(42.3%) were single. Talking about household size, the results on the table show that, 44(24.2%) of respondent had a household size of 1-3 persons, 54(29.7%) had a size of 3-4 persons, 39(21.4%) had a household size of 4-5 persons and finally 45(24.7%) had a household size of 5+.

4.2.2 Position, Perception and Impacts of climate change

Results from the field survey on the position of respondents as to wether they agree that climate has change over the years in their locality shows that, 165 (90.7%) agreed while 17 (9.3%) desagreed. Results on the perception of climate change is illustratd in Figure 4.2.

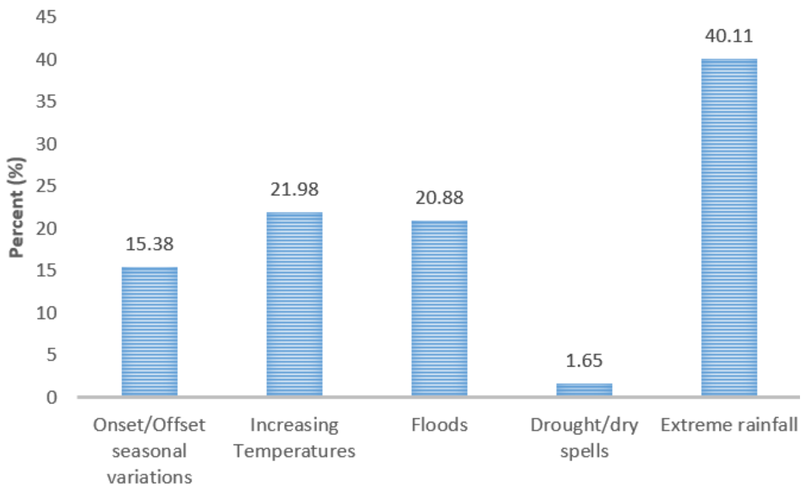


Figure 4.2 Perception of climate change by respondents in their localities(%)

Source: Researcher's Field survey (2024)

According to the findings on figure 4.2, 73(40.11%) of respondents were said to percieve climate change in their locality mostly in the form of extreme rainfall, 40(21.98%) percieve in terms of increasing temperatures, 38(20.88%) percieve in terms of recurrent floods, 28 (15.38%) percieve onsets and offset seasonal differences and 3(1.65%) respondents reported to percieve drought and dry spell incedents. Findings on the impacts of climate change is illustratd in Figure 4.3.

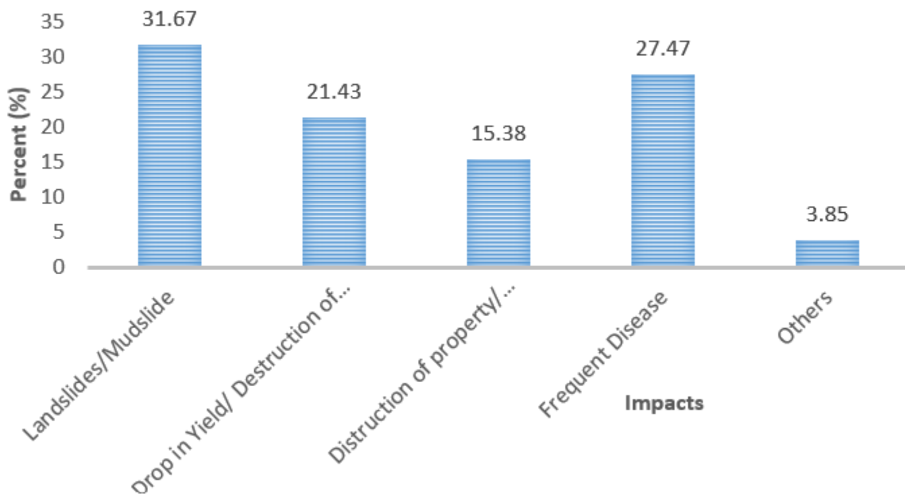


Figure 4.3 Impacts of climate change in study area(%)

Source: Researcher's Field survey (2024)

As shown in figure 4.3 the impacts of climate change in study area, 55 (31.87%) respondents reported landslide and mudslides as the impacts they experience due to climate change, 50 (27.47%) reported frequent diseases, 39 (21.43%) drop in agricultural yield and distruction of crops, 28 (15.38%) reported distruction of property and disruption of economic activities. While these respondents reported the already cited impacts, 7 respondents reported rather other impacts aside the already listed.

4.2.3 Types of Knowledge being produced

Seasonal calendars; existing frameworks work on establishing the seasonal calendars for all the agro-ecological zones of Cameroon. In this calendars is provided the start and end dates for the dry and rainy seasons. This also includes modelisation and prevision of possible quantities of the various climatic parameters such as temperature, precipitation and relative humidity amongst others.

Agricultural calendars; Agricultural calendars are also produced for the five ecological zones of the country. This agricultural calendars presents the seasonal calendars and specification of the time when farmers can carry out their agricultural activities from the preparation of farms, sowing, and phytosanitary treatment to the harvesting periods. Adding to this, knowledge on the possible climatic extremes with defined periods is outlined providing response strategies that can be adopted by farmers in case.

The Bulletin and weather previsions; this includes daily to 10 day weather previsions that are done to help the population make informed decisions on their daily activities. ONACC for example produces every 10 days, a bulletin of expected weather conditions together with probable extremes and the resulting risk. This is done with respect to the various agro-ecological zones and the impacted sectors. Adaptation strategies are then provided.

Climate vulnerability; this vulnerability studies are done in various sectors and agro-ecological zones. For example, ONACC undertook a study on climate vulnerability of agricultural produce such as that of rice and onions production in the sudano-sahelian zone (North and Far North regions). From this studies, results are published, and workshops organized with farmers in the region to present to them the situation and possible recommendations to adapt. This also include the assessment of the effects of climate change on food crop production in the agricultural sector and its socio-economic impacts.

Climate outlooks; this is done at the end of each year. It involves the comparism of the historic values of all climatic parameters with that of the current ended year. This is done to give out to the public, the current climatic trend. It provides insights on whether the current values were above, equal or bellow historic values. This permits the audience to have an understanding of the climatic trends of all the agro ecological zones of the country and to possibly take them in to consideration when designing policies or planning any economic activity.

GHG inventories; this is done across the various sectors including agriculture, forestry, and other land use sectors in both the monomodal and bimodal agro ecological zones.

Apart from the above types of knowledge provided by the main frameworks of ONACC and DMN, other sources of climate knowledge also exist. NGOs, civil societies, development banks/cooperation, University and research institutions carry out research on some climate issues such as floods, drought, seasonal variations, amongst others from which reports, articles and documents are published. For example after deathly landslide that occurred in the Santchou escarpment in 2024, the University of Dschang in collaboration with other research institutes carried out a study on the field. From this study a document was developed and provided to the state for informed policy decisions.

4.2.4 Current status of knowledge transfer Frameworks in Cameroon

The objective here involved to identify existing frameworks for climate change Knowledge transfer, their accessibility, usage by the population, Dissemination frequency, and Knowledge transfer tools preferences and effectiveness to the population of the study area (see Table 4.2.3.1)**.**

Table 4.2.3.1 Current status of knowledge transfer Frameworks in Cameroon

Variable	Classification	Frequency	Percentage (%)
Do you know any KT framework?	Yes No	67 115	36.8 63.2
Which Framework do you Know?	ONACC DMN Others	40 12 15	59.7 17.9 22.3
Rate their Effectiveness	Very effective Effective Moderately effective Ineffective	6 17 28 16	8.9 25.3 41.7 23.8
Which KT tools do you use	Media resources Workshops/ demonstrations Written docs/reports Local associations/groups/means	90 73 16 3	49.5 40.1 8.8 1.6
Have you received any climate alert?	Yes No	122 No	67 33
Frequency of the alert	Regularly Occasionally Rarely	14 56 52	11.4 45.9 42.6

From table 4.2.3.1, we observe that out of the 182 respondents under study, only 67 (36.8%) knew of any existing frameworks for climate change knowledge while greater 115 respondents (63.2%) did not have an idea of any existing framework. Out of the 67 respondents who knew at least one existing framework, 40(59.7%) identified ONACC, 12(17.9%) identified DMN, while 15(22.3%) identified other frameworks such as the MINADER, MINRESI, and Research institutes amongst others.

The table also shows that, 90(49.5%) of the respondents admitted to using media resources as their main tool for obtaining knowledge. This is seconded by workshops, training and demonstration, where 73(40.1%) respondents admitted to using it as their main source of knowledge and information. 16(8.8%) use written documents and reports while 3(1.6%) use local means such as local groups and associations. Concerning the effectiveness of existing frameworks, out of those who presented to know a framework, 28(41.7%) rated their effectiveness to be moderate, 17(25.3%) effective, 16(23.8%) ineffective and 6(8.9%) very ineffective. Key informants generally had the view that the effectiveness is still very limited due to a lot of existing barriers. Dr Kimin Ignatius stated that:

''The effectiveness is limited due to late information delivery to the end-users and at times ONACC and DMN produce varying information which might confuse the users'' (Interview, 2025).

Out of the 182 respondents, 122(67%) admitted to have received at least once climate alerts while 60(33%) responded to have never received any climate alerts. From the 122 respondent who have received climate alerts, 56(45.9%) said they received the alerts occasionally, 52(42.6%) receive rarely, and 14(11.4%) responded to receive regularly these alerts. Key informants such as those from ONACC admitted to face difficulties in getting accurate and real time data for analysis due to the conflicts of interest, limited ground station coverage and the deterioration of existing ones. This might possibly affect the reliability of the final information being produced.

4.2.5 Key actors involved in knowledge transfer and power relations

The objective here was to assess the key actors involved in the climate knowledge transfer process and the power relations that exist between them which probably influences the effectiveness of climate change knowledge transfer. Most of the findings on this objective were gotten through interviews with key informants and focus group discussion. Due to their competences, experiences and active involvement in the climate change Knowledge transfer process in Cameroon, they were deemed suited to identify key actors.

4.2.5.1 Key actors

Information collected from field study including policy reviews, interviews and focus group discussions suggest that the key actors includes primarily MINEPDED and its organ ONACC and the DMN. This two bodies appear to hold the main role as far as the production and dissemination of climate watch and alert services are concern throughout the national territory.

4.2.5.1.1 ONACC and partners

On December 10, 2009, Presidential Decree No.2009/410 established the National Climate Change Observatory (ONACC) under the supervision of MINEPDED. To make it operational, the President of the Republic issued Decrees No. 2015/512, No. 2015/513, November 16, 2015, and No. 2016/191 on April 11, 2016, naming the Chairman of the Board of Directors, Director, and Members of the ONACC's Orientation Council. It was founded as the national legal authority responsible for executing climate change policies. Its vision is to contribute to Cameroon's socio-economic development while also being low in carbon and resilient to climate change, with the tagline "Together let's fight global warming." Its wide missions are described in two axes: climate monitoring and impact assessment which more specifically include:

- Develop climatic indicators for tracking environmental policy
- Conducting projected assessments to forecast climate change over short, medium, and long periods.
- Monitor climate change, offer meteorological and climatological data to all sectors, and create annual climate reports for Cameroon.
- Carry out and encourage studies on climate change indicators, impacts, and hazards..
- Collect, analyse, and disseminate climate change information in Cameroon to those making decisions, national and international organizations
- To initiate any awareness-raising and preventive information action on climate change.
- To monitor the implementation of the NDC and complement other greenhouse gas reduction efforts.
- To initiate yearly greenhouse gas inventories and the annual carbon footprint by socio-economic activity sector in the agro-ecological zones of Cameroon.
- To monitor, at the operational level, greenhouse gas emission reduction activities in development projects.
- Propose to the government preventive actions to minimize greenhouse gas emissions, as well as mitigation and adaptation strategies to address climate change's detrimental consequences and dangers.
- To serve as an instrument of cooperation with other regional or international observatories operating in the climate sector.
- Enable compensation for the climatic services given by forests through ecosystem management, conservation, and restoration efforts.
- Enhancing the capacity of climate change data collection organizations to establish a dependable national network for data collection and transmission.

The ONACC decree from 2009 was revised in 2019, granting it the status of a public scientific and technical entity with legal personality and financial autonomy. It was thus operationally charged with the mission of "monitoring and analysing the socio-economic and environmental repercussions of climate change and suggesting preventive measures, mitigation, and/or adaptation to the negative impacts and risks associated with these changes.

The Board of Advisers formulates general policies of the ONACC and it consists of: the President of the Republic; the Prime Minister; a representative from the relevant ministries (MINEPDED, Ministries of Forests, Finance, Technical Cooperation, Scientific Research, Agriculture, Water and Energy, and Meteorology); and elected members. The Board members are appointed by Presidential Decrees. Members and the chairman of the Board are appointed for the term of three years, renewable once. Her partners include FAO, World Bank, GIZ, Climate Risk institute, MINADER, UNDP, CUSO, ACF, and UNICEF amongst others.

4.2.5.1.2 Meteorological Department of the Ministry of Transport (DNM)

The meteorological services in Cameroon are managed by the Ministry of Transport .The DNM was established during the colonial era, when Cameroon was still under French rule. It was handed to Cameroonian experts by presidential decree following her independence. This structure's major focus activity was meteorological guidance to air navigation (providing meteorological data for aviation operators, air traffic service organizations, emergency response organizations, airport management, and other organizations involved with the management and development of air navigation).

Their goal is to provide data on climate, precipitation, soil and air humidity, the direction and velocity of the wind, temperatures, and radiation. In summary, the DNM works with everything that contributes to an understanding of the current and future weather. To accomplish its objectives, weather observation stations have been established throughout the country and equipped with sophisticated measurement devices. In addition to air transport, for which meteorological data is essential agriculture is one of the key users of these weather forecasts in that it allows the precise establishment of the agricultural calendar.

Its mission include:

The establishment and implementation of government meteorological policy; the compilation of climatological data; and the creation of weather forecasts.

Collecting, processing, and transmission of meteorological information; the utilization of data sent via meteorological networks at the national and international levels; the broadcasting of meteorological information.

Monitoring relations with international and regional meteorological and/or hydro-meteorological bodies ; monitoring meteorological and climatological services ; monitoring the implementation of conventions and protocols relating to meteorology and the atmospheric environment ; monitoring the meteorological watch centres at aerodromes, in relationship with the Aeronautical Authority.

4.2.5.3 Other Actors

Aside the above mentioned actors, other actors were identified to makeup key actors in climate change knowledge transfer. This include: MINADER, MINRESI, MINESUP and MINEDUB with their academic institutions such as primary, secondary and university establishments, development partners and NGOs, Communication agencies and Communities. It is also important to cite the Communication agencies like radios and television which play a great role in the dissemination process.

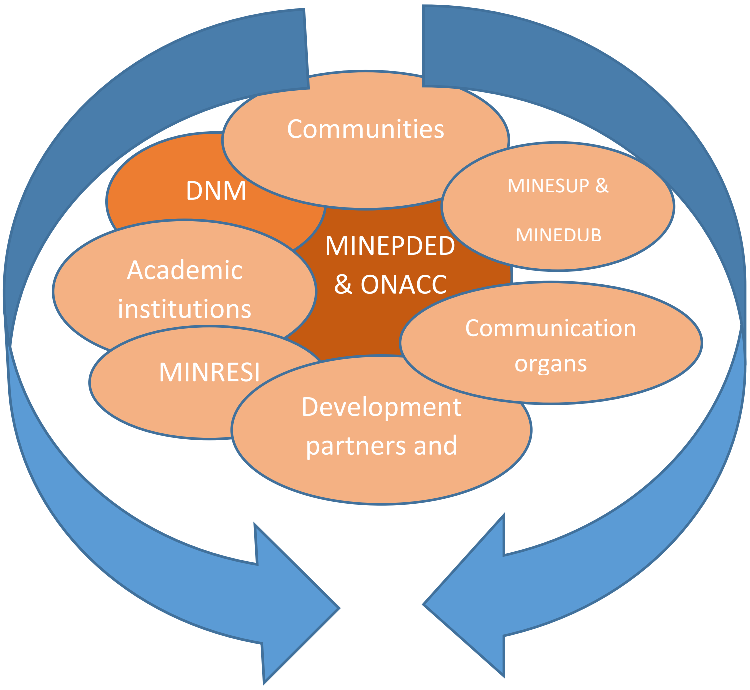


Figure 4.2.5.1 Key Actors of Climate change Knowledge transfer in Cameroon

Dr Madou Chantal pointed out that:

‘‘*The frameworks produce the knowledge but then pass through the communication organs who then relay it to the local population’’ (Interview, 2025).*

4.2.5.2 Power relations

Information obtained from the study suggest that power relations between key stakeholders such as ONACC and DMN have no clear define boundaries. Responsibilities are conflicting making collaboration and cooperation between them very difficult and constituting a great challenge. Effective climate action has been hindered by overlapping mandates, and conflicting roles across sector ministries and agencies**.** The presidential decree creating the MINEPDED, ONACC, and the Inter-Ministerial Committee for Monitoring and Cooperation of the Paris Agreement, does not specify the role and competences held by other concerned Ministries and institutions such as that of MINT and its agency DMN. Dr. Fotso Ngeumo Thierie gave a supporting view on this saying that:

‘‘*Institutionally, the current arrangements of coordination of climate actions are complex, because of the multiplicity of authorities and the absence of a clear definition of responsibilities’’ (Interview, 2025).*

This has resulted in fragmented responsibilities across multiple government levels and institutions, making coordination very cumbersome. For example at times ONACC and the DMN produce conflicting information in terms of climate alerts, agricultural calendars, bulletins and seasonal calendars. They published information with differences in start and end dates of either the dry or rainy season different for various agricultural activities such as planting, phytosanitary treatment and harvesting dates. This consequently confuses the audience who at the end loss interest and trust in these frameworks' climate alert services.

4.2.6 Dissemination canals and processes of knowledge transfer

The research involved a study of the dissemination canals and the involved processes. This included investigations to identify the various dissemination channels that exist, and are being used by the population of the study area. The canals were then classified based on the most used canals (see Figure 4.2).

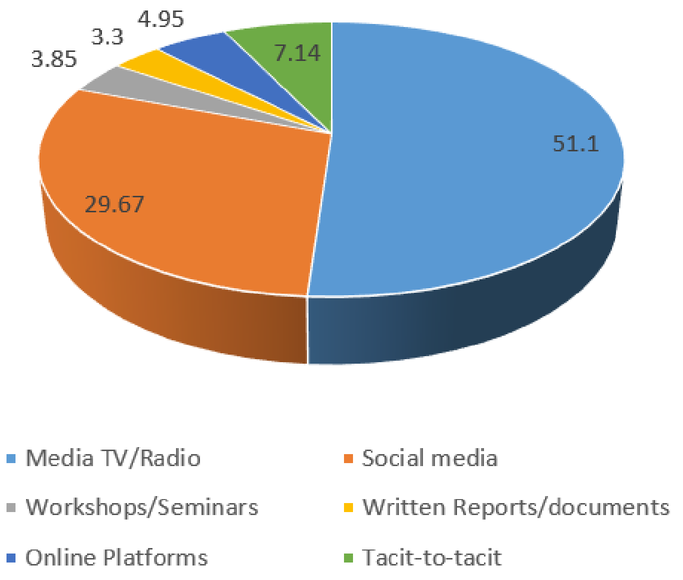


Figure 4.2 Channels for knowledge dissemination (%)

From Figure 4.2, we observe that, 93(51.1%) respondents receive climate alerts through Media TV and Radio, 54(29.67%) through social media, 20(10.9%) through tactic-to-tacit means, workshops and seminars, 9(4.9%) through online platforms and 6(3.3% through reports. Interviews with key informant revealed a similar stand. Many of them cited some channels though not a whole as classified in Figure 4.2. For example, Mr Djela Mbeih Gaston named out some of this channels saying that when information is produced in ONACC such as the 10 day Bulletin or the Agricultural calendar, it is then disseminated through the agency's website, LinkedIn, Facebook, Twitter, radio stations, workshops and at time newspapers. This channels snidely differ by locality (see Table 4.2.4.1)

Table 4.2.4.1 Channels for knowledge dissemination by locality (%)

Localities			Frequency	Percent	Valid Percent	Cumulative Percent
Mbankolo	Valid	Media TV/Radio	19	45.2	45.2	45.2
		Social media	18	42.9	42.9	88.1
		Workshops/Seminars	3	7.1	7.1	95.2
		Online platforms	2	4.8	4.8	100.0
		Total	42	100.0	100.0	
Nkolbisson	Valid	Media TV/Radio	17	44.7	44.7	44.7
		Social media	14	36.8	36.8	81.6
		Workshops/Seminars	1	2.6	2.6	84.2
		Reports	3	7.9	7.9	92.1
		Online platforms	3	7.9	7.9	100.0
		Total	38	100.0	100.0	
Awae	Valid	Media TV/Radio	22	68.8	68.8	68.8
		Social media	5	15.6	15.6	84.4
		Workshops/Seminars	1	3.1	3.1	87.5
		Tacit-to-tacit	4	12.5	12.5	100.0
		Total	32	100.0	100.0	
Etoug-Ebe	Valid	Media TV/Radio	18	47.4	47.4	47.4
		Social media	13	34.2	34.2	81.6
		Workshops/Seminars	1	2.6	2.6	84.2
		Reports	2	5.3	5.3	89.5
		Online platforms	4	10.5	10.5	100.0
		Total	38	100.0	100.0	
Ntui	Valid	Media TV/Radio	17	53.1	53.1	53.1
		Social media	4	12.5	12.5	65.6
		Workshops/Seminars	1	3.1	3.1	68.8
		Reports	1	3.1	3.1	71.9
		Tacit-to-tacit	9	28.1	28.1	100.0
		Total	32	100.0	100.0	

From table 4.2.4.1, we observe that all localities have the media as their main channel for knowledge dissemination. However what is interesting is that, the two rural areas of Ntui (28.1%) and Awae village (12.5%) are the only localities where tacit-to-tacit channels are still used as a means of knowledge dissemination though being one of the least used**.**

4.2.7 Key challenges for effective knowledge transfer

This objective investigated to identify the key challenges that prevent effective climate change KT and also the factors that are barriers to adoption of this knowledge**.** Barriers to knowledge transfer are shown in Figure 4.3.

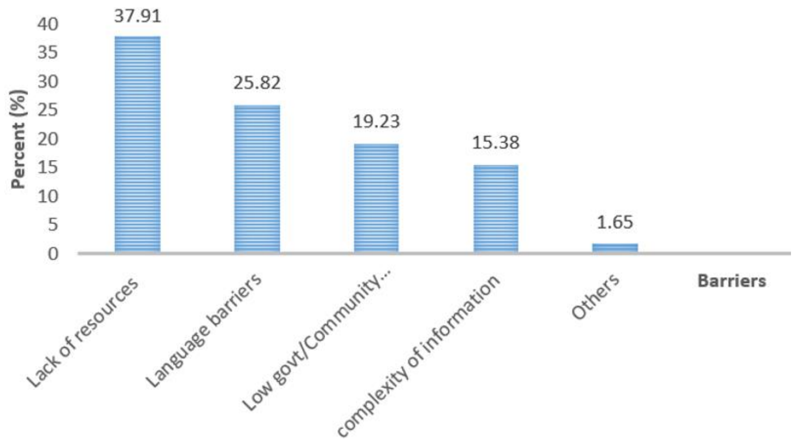


Figure 4.3 Barriers to knowledge transfer (%)

In figure 4.3, we observe the results on the major barriers to accessing climate Knowledge by the public in the study area. Lack of resources (electronic gadgets, internet, experts, libraries) was chosen by 69(37.9%) of the respondents as the major barrier, 47(25.8%) identified language barriers, 35(19.25%) identified low government and community engagement, 28(15.4%) identified the complexity of information and 3(1.6) identified others barriers than the already listed. Most of the key informants sided with these challenges and a good number of them mentioning that, conflict of interest, limited ground data sources, limited sensitisation and the lack of a clear definition of responsibilities has hindered effective climate knowledge transfer. Aside from barriers to access, there exist also challenges to adoption (See figure 4.4)

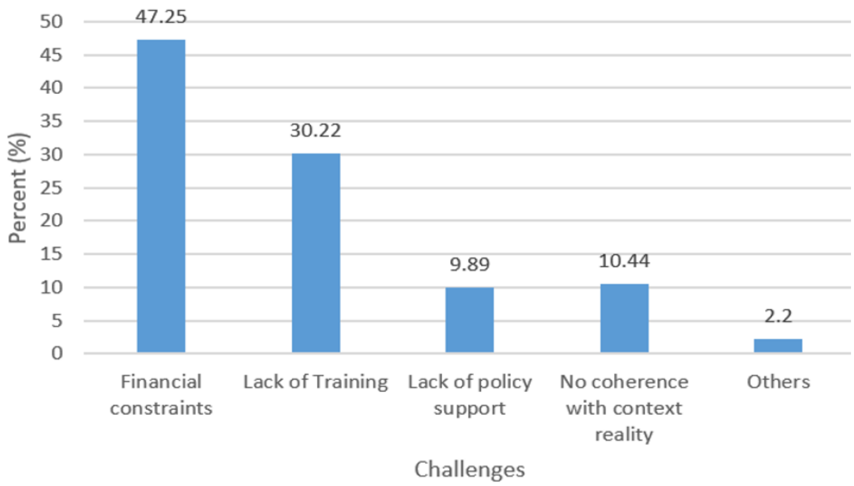


Figure 4.4 Challenges to Adoption of Adaptation and Mitigation Recommendations (%)

It is demonstrated by results in figure 4.4, the challenges to the adoption of recommendations and measures from climate knowledge frameworks by the targeted audience. According to the results, 86(47.2%) of the challenge is financial constraints, 55(30.2%) lack of training, 19(10.4%) due to no coherence with context realities, 18(9.8%) lack of policy support, and

4(2.2%) other challenges. Ignorance, resistance to accept information, and gender issues were added by key informants.

4.2.8. Knowledge outreach of the existing knowledge transfer frameworks

The study assessed the extent of outreach of climate knowledge dissemination in to the various categories of targeted audience including local communities, policy makers, education institutions, and NGOs and civil societies.

Table.4.2.7.1 Knowledge outreach by various audience and by locality (%)

Variable	Classification	Frequency	Percentage (%)
Outreach to local communities	Yes	44	24.2
	No	138	75.8
Outreach to Policymakers	Yes	137	75.3
	No	45	24.7
Outreach to education institutions	Yes	144	79.1
	No	38	20.9
Outreach to NGOs/ civil societies	Yes	150	82.4
	No	32	17.6

Results on climate change knowledge outreach above show that, for local communities, 138 (75.8%) respondents acknowledged that climate change knowledge transfer does not reach local communities while the remaining 44(24.2%) respondents admitted that it reaches local communities. This was complemented by most of the informant interviewed where most of them stated that one of the main challenges in climate change knowledge transfer is the limited outreach to local communities. To them most of the knowledge is accessible to only those from the academia. From this analysis, we can see that rural areas like Ntui and Awae village have limited access to this knowledge that is being disseminated while urban areas like Mbankolo, Nkolbisson, and Etoug Ebe have relatively more access. This shows the need for more efforts to be made at the rural areas to increase outreach especially given they are most vulnerable. On outreach to policy makers, 137(75.3%) respondents believed that climate change knowledge dissemination reaches policy makers while 45(24.7) rejected the idea. Most key informants supported these findings. 144(79.1 %) respondents agreed as to whether climate change knowledge transfer reaches education institution while 38(20.9%) did not. lastly for outreach to NGOs and civil societies, 150 (82.4%) of respondents accepted that it reaches them while 32(17.6%) said it did not.

4.3 Discussion

The first objective of this research was to assess the current status of knowledge transfer and frameworks in Cameroon. Findings show that, there exist formal frameworks responsible for climate change knowledge transfer. This contradicts findings from a study on governing Knowledge transfer for deforestation Monitoring, Reporting and Verification (MRV) in the Congo basin region between Cameroon, DRC and Rwanda, which reported that, there was no formal structure for MRV knowledge transfer. Results from the study show that only 36.8% of respondent knew of existing Climate change Knowledge transfer framework, while 63.2 % did not know of any existing frameworks. The types of knowledge produced include seasonal and agricultural calendars, bulletins, GHG inventories, vulnerability and climate change risks studies, climate change impacts, and weather forecasts with adaptation and mitigation recommendations. Out of respondents who knew any existing framework, 40(59.7%) identified ONACC, 12(17.9%) identified DMN, while 15(22.3%) together with key informants identified other frameworks such as the MINADER, MINRESI, Research institutes, NGOs, universities, amongst others. This is similar to key actors identified by Stott and Huq, (2014). It is worth to note that a majority of respondents who knew of existing frameworks were educated people which probably got the information through their academic studies and also because they are exposed to the media which is the main dissemination channel. This demonstrate that currently, climate change knowledge transfer is still at a preliminary stage in Cameroon. Existing frameworks are still in the process of acquiring full functioning and working towards the development of nationwide dissemination approaches that take in to consideration local context and available resources. The frameworks (ONACC, DMN) still function primarily at the national level having their helm at the capital of the country without any or with limited local correspondence. This supports a study by Ziervogel *et al.*, (2014), which showed that, most African countries lack a robust Nationally Decentralized System that provides spatially extensive and reliable climate data. Even a framework like DMN which has existed for a longer time still lack decentralised correspondence and even where there exist they are lacking in human and material resources. Many key informants indicated that knowledge transfer is still complex, limited and still lacking. For example, Prof Ako Ako said ''*Climate change Knowledge transfer is still at the level of awareness creation and most local communities which are most affected do not yet know of its existence or are ignorant''(Interview, 2025).* Out of those who presented to know a framework, 28(41.7%) rated their effectiveness to be moderate, 17(25.3%) effective, 16(23.8%) ineffective and 6(8.9%) very ineffective. From this result, we can see that for those who know of existing frameworks for climate change knowledge transfer, a general view on their assessment shows that the frameworks are somehow effective. From the 122 respondent who admitted to have received climate alerts, 57(31.3%) said they received the alerts occasionally, 53(29.1%) receive rarely, and 15(8.2%) responded to receive regularly. The explanation to this differences appears to be insufficient dissemination due to limited resources, frequent power shortage and expensive connection cost which hinders access because the framework reported to disseminate this climate information regularly through their various channels. Judging from this analysis, one can see that climate change Knowledge transfer would be relatively effective if the population knew of and had access to existing knowledge transfer frameworks such as ONACC and the DMN.

The second objective of this research was to identify key actors and the power relations that exists between them. From results presented in Figure 4.2.4.1, the key actors identified by key informant and policy reviews includes primarily MINEPDED and its organ ONACC, and DMN amongst others including, MINADER, MINRESI, MINESUP and MINEDUB with their academic institutions such as primary, secondary and university establishments, development partners and NGOs, Communication agencies and Communities. This objective also sorted to understand power relations between these actors. Results show that there are a lot of complexities in power relations with serious conflicts of interest. These together with the lack of clear institutional definition of responsibilities has hindered cooperation consequently affecting effective knowledge transfer. This goes in line with the study by Stott and Huq, (2014) in Bangladesh which revealed that collaboration and cooperation between organisations within the country for climate change knowledge transfer had a lot of difficulties.

The third objective was to identify dissemination channels and process. Results in figure 4.2 show that, 93(51.1%) respondents receive climate alerts through Media TV and Radio, 54(29.67%) through social media, 20(10.9%) through tactic-to-tacit means, workshops and seminars, 9(4.9%) through online platforms and 6(3.3% through written documents and reports. The usage of the media in Cameroon has increased greatly which is very evident especially in the more urban study localities of Mbankolo, Etoug Ebe and Nkolbisson which have more access to electronic accessories and internet connection. In more rural areas like Ntui and Awae village, the media dissemination channels are increasingly being adopted by household with increasing urbanization and access to media resources. Meanwhile tacit-to-tacit means including training, demonstration and workshops, are used as the main method for Knowledge transfer in primary economic activities like agriculture. Generally few people used written document as a source of knowledge mostly because in most cases only those who are educated can be able to obtain knowledge using written document and reports.

The fourth objective involved to identify challenges that hinder effective Climate change knowledge transfer. Results in figure 4.3 on barriers to climate change knowledge transfer show that barriers include lack of resources (37.9%), language (25.8%), low government and community engagement (19.25%), complexity of information (15.4%) and others (1.6%). In addition to the barriers identified by respondents, some of the barriers identified by informants include, conflict of interest between stakeholders, political differences, data accuracy, defining target population, and administrative bottle neck. We observe that lack of resources is the main challenge as far as climate change knowledge transfer is concern both on the side of the frameworks and the targeted audience. Frameworks involved in climate change knowledge transfer have constraints in terms of technical, financial and infrastructural resources which prevents them from carrying out effective knowledge production and dissemination. This has also reduced the territorial coverage. The targeted audience within the localities especially Ntui and Awae village on their part lack resources such as electricity, electronic gadgets, internet, experts, libraries that would permit them get access to the disseminated climate watch alert and services. Adding to this, there also exist indigenous knowledge systems that very much can contribute to a more reliable climate previsions and, effective adaptation and mitigation methods which have been built over the years. However these knowledge is trapped within these communities. This knowledge could be sheared with other communities to improve climate resilience. Low government and community engagement identified by respondents as a barrier here signifies that awareness creation that would convince and engage these stake holders is still lacking. Language has been identified as a problem first because of the complex context of the country when it comes to language. With French and English as the two official languages, Cameroon has over 250 spoken languages. This language complexity coupled with complex scientific climate change terminologies makes dissemination of information difficult. Aside this, challenges also exist at the level of adopting best practices recommended as adaptation and mitigation strategies during dissemination as demonstrated in figure 4.4. From results obtained, challenges to adoption include financial constraints (47.2%), lack of training (30.2%), No coherence with context realities (10.4%), lack of policy support (9.8%), and other challenges (2.2%). Many adaptation and mitigation strategies recommended by frameworks often require a lot of finances to be adopted. Most of the population in the centre region especially the vulnerable communities which are poor and dependent on rain fed agriculture for their livelihoods do not have the necessary financial resources to adopt the recommendations that come with Climate change knowledge . Some of the knowledge require practical training to be adopted but the technical personnel available to do so is not available or if at all available, limited. Even when people are committed to adopt best practices they might be limited by the lack of training. The theory of the diffusion of innovation by Rogers (1962) insist that, the diffusion of any innovation or knowledge is only successful when end result of this diffusion is that, people as part of a social system, adopt the new idea, behaviour, or product. By Adoption, the theory clarifies that, it means a person does something differently from what they did previously. Integrating climate analysis to suit different local contexts especially in a zone like the centre region with complex climatic differences is very difficult. Calibrating climate models with ground station data has constituted a great challenge in developing reliable climate prevision. This has made some climate watch and alert services to lack local context substance with no coherence as previsions are more generic or at times confusing. The theory of the diffusion of innovation says that, the key to adoption is that the person must perceive knowledge about the idea, behaviour, or product as new, innovative and useful within his context. This explains why people would be reluctant to adopt some knowledge transferred, it is not new, innovative or useful in solving their climate induced challenges.

The last objective was to assess the outreach of climate change knowledge transfer by existing frameworks. Concerning outreach to local communities, 138 (75.8%) respondents acknowledged that climate change knowledge transfer does not reach local communities while 44(24.2%) respondents admitted that it reaches local communities. This results are in conformity with a study by Stott and Huq, (2014) which revealed that many vital dissemination channels at national and sub-national levels in Africa are not accessible especially to the vulnerable people at the local level. This is due to the lack of financial, dissemination infrastructure and technical personnel on the side of the dissemination frameworks and the absence of awareness, lack of interest and communication resources to be able to access this knowledge on the side of the population. This complements the IPCC Assessment (2014), which revealed that, the amount of accessible climate data from Africa continues to be low, and this has been worsened by inadequate Internet connectivity and climate information that is either not captured or packaged for online and offline access. Results on outreach to policy makers reveal that a greater 137(75.3%) respondents believed that climate change knowledge dissemination reaches policy makers while 45(24.7) rejected the idea. Key informants supported that there was great outreach to policy makers and some added that this is but normal as most of the knowledge transfer frameworks like ONACC and DMN are state owned. This result is contrary to the study by Lwasa., (2010) which revealed that climate change knowledge exists but is not often shared with policy makers at the local level for better decision making. 144(79.1 %) respondents agreed that climate change knowledge transfer reaches education institution while 38(20.9%) did not agree. Climate change has greatly gained ground in the academic sphere globally and Cameroon in particular given that it is increasingly becoming a global threat affecting all sectors of every economy. More attention has been given to climate change in school curriculums. This explains why results show a positive view as to whether climate change knowledge dissemination reaches the education institutes. On outreach to NGOs and civil societies, a majority 150 (82.4%) of respondents accepted that there was outreach while 32(17.6%) rejected the idea. This is but understandable as some of this establishments exist for the very reason of working towards climate change adaptation and mitigation.

V. CHAPTER FIVE

5. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

5.1 Summary of the study

Africa being the most vulnerable continent to climate change impact, mitigation and especially adaptation through the synergy of actions and policies are very important in efforts to solve the problem. Cameroon and the centre region in particular have been greatly affected by numerous climatic hazards like floods, landslides, mudslides and seasonal variations. This has resulted in great human, infrastructural, material and agricultural losses given that the population is heavily dependent on nature for their livelihood activities. Famers in Ntui and Awae village for example attest to witnessing a lot of difficulties in their agricultural activities and the resulting drop in productivity due to seasonal variations. A major challenge to effective adaptation to these is the lack of adequate and timely information on how to deal with the climatic extremes. The provision of knowledge on climate change adaptation and mitigation, meteorological and climatic predictions are therefore very inevitable in a bit to match these climatic challenge with responsive actions and policies. Within this current situation, given that reliable timely climate watch and alert services would help in cutting down the impacts, one would be curious in understanding the climate change knowledge transfer situation in Cameroon.

This study was therefore conducted to assess climate knowledge transfer for effective adaptation and mitigation, policy and action synergy in Cameroon. Specific objectives were to evaluate the current state of climate change knowledge Transfer frameworks, identify involved actors and their power relations, Identify key challenges hindering efficient knowledge transfer, identifying dissemination canals and the extent of knowledge outreach. A mixed-method approach that combined qualitative and quantitative data collection methods was used. 182 households were sampled in the selected study area localities in the centre region of Cameroon including; Mbankolo (42), Nkolbisson (38), Etoug Ebe (38), Awae Village (32) and Ntui (32). A total of 9 interviews were conducted with key informants in climate change knowledge transfer while one focus group discussion was conducted and at the same time a review of existing literature including articles, reports and policy document was done. The SPSS and EXCEL software were used to carry out data analysis of quantitative data while ALAS.ti was used to analyse qualitative data.

Findings from the study revealed that there were formal structures responsible for climate knowledge transfer. Only 36.8% of respondent knew of any existing Climate change

Knowledge transfer framework in Cameroon. Interestingly, 63.2 % of respondents did not know of any existing frameworks despite the existence and the functioning of knowledge transfer frameworks like ONACC operational since 2015 and the DMN that has even existed for decades. Out of the respondents, 40(59.7%) identified ONACC, 12(17.9%) identified DMN, and 15(22.3%) and some addition from key informants identified other frameworks such as the MINADER, MINRESI, Research institutes, NGOs, universities, amongst others. Main frameworks (ONACC, DMN) still function at the national level at the capital in Yaoundé with non-existent or limited correspondence at the regional, divisional, sub-divisional and local level. Even a framework like DMN which has existed since the colonial era still lack decentralised correspondence. In cases where there exist, they are lacking in human, material resources and existing infrastructure deteriorating. Many key informants indicated that knowledge transfer is still complex, limited and still lacking. Out of those who presented to know a Knowledge transfer framework, 28(41.7%) rated their effectiveness to be moderate, 17(25.3%) effective, 16(23.8%) ineffective and 6(8.9%) very ineffective. From the 122 respondent who admitted to have received climate alerts, 57(31.3%) said they received the alerts occasionally, 53(29.1%) receive rarely, and 15(8.2%) responded to receive regularly. The explanation to this appears to be insufficient dissemination due to limited resources, frequent power shortage and expensive connection cost which hinders access.

From data gotten from the field, key actors identified by key informants and also according to policy review are the MINEPDED with its organ ONACC and the DMN which hold the institutional responsibilities to provide and disseminate climate knowledge throughout the country. Other key actors that were identified include MINADER, MINRESI, MINESUP and MINEDUB with their academic institutions such as primary, secondary and university establishments, development partners and NGOs, Communication agencies and Communities. Most (80.77%) of the respondents receive climate alerts through Media (TV and Radio) and social media. Other channels cited by these respondents are tactic-to-tacit means, workshops and seminars (10.9%), and through written documents and reports (3.3%). The lack of resources (37.9%) was identified to be the major barrier limiting access to climate change knowledge being disseminated. Other barriers include language (25.8%), low government and community engagement (19.25%), complexity of information (15.4%) and others (1.6%). some of the barriers identified by informants were conflict of interest between stakeholders, political differences, data accuracy, defining target population, and administrative bottle neck. Existing Frameworks face challenges in terms of technical, financial and infrastructural resources which prevents them from carrying out effective knowledge production and dissemination reducing the territorial coverage. The targeted audience especially Ntui and Awae village lack resources such as electricity electronic gadgets, internet, experts, libraries that can permit them get access to the disseminated climate watch alert and services.

Challenges to adoption of climate change knowledge disseminated cited by respondents include financial constraints (47.2%), lack of training (30.2%), Lack of coherence with context realities (10.4%), lack of policy support (9.8%), and other challenges (2.2%). 138 (75.8%) respondents acknowledged that climate change knowledge transfer does not reach local communities while 44(24.2%) respondents admitted that it reaches local communities. A greater number of respondents 137(75.3%) respondents believed that climate change knowledge dissemination reaches policy makers while 45(24.7%) rejected the idea. This view was supported by findings from interviews with Key informants. 144(79.1 %) respondents acknowledged that climate change knowledge transfer reaches education institution while 38(20.9%) did not agree, 150 (82.4%) of respondents admitted outreach to NGOs and civil societies while a lesser 32(17.6%) did not accept the idea.

5.2. Conclusion

The absence of an effective system for climate change knowledge transfer has greatly aggravated the impact of climate change extremes and hazards on the population of the centre region of Cameroon. This has increased their vulnerability, reduced their adaptive capacity and consequently their resilience. Climate change knowledge transfer constitute a great opportunity to strengthen population resilience and reduce vulnerability to climate change impact through the improvement of adaptation capacities and mitigation efforts. This study was aimed at assessing the effectiveness of climate change knowledge transfer in Cameroon with a case study in the Centre region. This study revealed that, while key climate change knowledge transfer frameworks such as ONACC and DMN exist, their effectiveness remain limited due to little public awareness, limited resources, limited government and local engagement, the complexity of the knowledge, and conflict of interest between actors amongst others. Additionally, the outreach of knowledge transfer appears to be concentrated to policy makers, educational institutions, NGOS and civil societies while local vulnerable communities have limited access. This is primarily due to the lack of financial and communication facilities in both remote areas and the frameworks themselves. Solving this problem requires designing and putting in place of institutional dispositions and arrangements for a coordinated management, decentralisation of the climate change knowledge transfer frameworks' responsibilities and the transfer of competences, the creation of awareness and sensitization. Strengthening cooperation and collaboration of actors, provision of necessary financial resources by the state, acquisition of data management and improvement of communication infrastructure are also pivotal. All these should be done while synergizing actions and policies. It can therefore be concluded that climate change knowledge transfer has a positive impact on effective climate change adaptation and mitigation actions and policies in Cameroon. However, a lot still needs to be done to render it more effective and obtain its full potential contribution to climate change adaptation and mitigation within the centre region in particular and Cameroon as a whole.

5.3 Policy Recommendations

- Designing and putting in place of institutional dispositions and arrangements for a coordinated management of the country's climate action. This should include a legal and technical framework that clarifies the roles, regulations, competencies and the responsibilities of various actors involved in the country's climate action and policies especially in knowledge production, management and dissemination.
- Creation of awareness and sensitization of the population and stakeholders through the organisation of awareness and sensitization campaigns. Results from the study shows that awareness and sensitization of key actors and the population is still very much lacking and forms a great contributor to the limited knowledge outreach. The population does not have profound knowledge on the issue of climate change, and the existent of knowledge production and transfer frameworks. Thus creating awareness and the sensitization of the population is very crucial for effective climate change knowledge transfer.
- Provision of necessary financial resources by the state to the responsible frameworks of knowledge transfer such as ONACC and DMN. During field studies, key informants in key structures (ONACC, DMN) admitted that one of the major problems limiting the quality, and effectiveness of knowledge transfer was the lack of the necessary financial resources to recruit enough competent personnel and acquire the necessary infrastructural and communication resources. The provision of this financial resources will permit them to do away with the above cited challenges improving the overrule outcomes.
- Acquisition of data management and improvement of communication infrastructure needed to implement the dissemination process. Many meteorological stations have dilapidated over the years without any renovation and also the communication system in Cameroon is very complex and difficult to access either due to unstable network, expensive cost of accessories and internet connection. The renovation of ground meteorological stations and their extension to new areas will permit to improve obtaining of real time ground data and

increase the reliability of the resulting outcomes from their analysis. The structuration and subsidization of communication necessities such as internet connection, the improvement and extension of communication infrastructure such as network antennas in remote areas. This will help improve access to information being disseminated on the various media channels especially to local communities where outreach appears to be very limited (24.2%). This dissemination channel has been proven by field work to be the preferred and most effective knowledge transfer canal. Alternative low cost communication method such as SMS alerts and community information boards can be adopted for areas with limited connectivity.

- Decentralisation of the climate change knowledge transfer frameworks' responsibilities and the transfer of competences to local administrative set ups at the regional, divisional and sub-divisional levels. In the current state of frameworks, all competences are concentrated in the capital of the country without any local correspondences. Even a long existing framework like the DMN, that had some local correspondence have been lacking in terms of infrastructure renovation , transfer of competences and the elaboration of an effective nation coverage approach for climate watch and alert services dissemination.
- There is the need to strengthen collaboration between stakeholders. Collaboration between state actors, Public-private partnership and the collaboration between state and other non-state actors like NGOs and Civil societies is very important. Local administrative and community leaders for example are seen to be the closest people to the population. Because of this, the population confide in them and easily listens to them. Thus getting to the population necessitates the engagement of this local leaders whom local communities take to be their socio-cultural and political representatives. This way a bottom-up approach should be adopted to ensure effective climate change knowledge transfer.
- Development of a national climate change knowledge transfer strategy. This will be a strategy that defines clearly the goal, objectives, responsibilities, actors and their role and the process of knowledge transfer. This will permit for effective, collaborative and coordinated action and also allow to measure progress against the set objectives and indicators.
- Promote research and capacity building. This can be done first by supporting universities and research institutions to carry out more research in climate change focus issues and also to increase training of young researchers and students in the field. Furthermore capacity building programs should be developed for some non-climate expert actors with limited comprehension on the topic climate change and its concepts such as policymakers,

journalists, local leaders. This will boost their understanding and permit easy dissemination, assimilation, adoption and the utilization of climate change knowledge.

- Integration of indigenous knowledge systems in the production and dissemination of climate change knowledge. One of the problems faced by knowledge production and dissemination frameworks is the lack of coherence with local context. There exist rich knowledge systems on climate behaviour, adaptation and mitigation strategies in various local indigenous communities which has been built over overtime and transferred from one generation to another. Calibrating universalistic scientific knowledge with local knowledge would help bring reliable climate predictions and also help identify effective adaptation and mitigation strategies.

5.4 Future research directions

This study greatly contributes to understanding and exploiting the potential of climate change knowledge transfer for effective adaptation and mitigation. However, some aspects concerning climate change knowledge transfer remains unexplored and require a deeper understanding. This should constitutes future directions of research as far as climate change knowledge transfer is concerned. They include:

- ✓ Digital innovation and ICT in climate change knowledge transfer
- ✓ Equity and inclusivity in climate change knowledge transfer
- ✓ Private sector and Public-Private partnership in climate change knowledge transfer
- ✓ Enhancing community based approaches and indigenous knowledge integration for climate change knowledge transfer
- ✓ The role of Artificial intelligence in climate knowledge transfer

6. BIBLIOGRAPHY

Abegunde, V. O., Sibanda, M., & Obi, A. (2019). The dynamics of climate change adaptation in sub-Saharan Africa: A review of climate-smart agriculture among small-scale farmers. *Climate, 7(11)*. https://doi.org/10.3390/cli7110132

Alif, Ž., Novak, A., Mihelič, R., Juvančič, L., & Šumrada, T. (2024). Can knowledge transfer speed up climate change mitigation in agriculture? A randomized experimental evaluation of participatory workshops. *Environmental Science and Policy,* 152(September 2023). https://doi.org/10.1016/j.envsci.2023.103662

André Lindner, Fitria Rinawati and Katharina Stein. (2013). Climate Change Impacts on Biodiversity—The Setting of a Lingering Global Crisis. *Diversity*. http://dx.doi.org/10.3390/d5010114

Augustine Njamnshi, Christoph Schwarte, Eugene Nforngwa and Mithika Mwenda, Afanyu Yembe Njamnshi and Berenice Ekoli. (2018). "Bottom-up Climate Legislation in Cameroon."https://legalresponse.org/wp-content/uploads/2018/05/Cameroon_Booklet.pdf

Behsudi, A. (2021). What Is Mitigation vs Adaptation ? of climate change. September, 46–47. *IMF*. https://www.imf.org/-/media/Files/Publications/Fandd/Article/2021/September/climate-change-what-is-mitigation-and-adaptation-behsudi-basics.ashx

Bele, Mekou Youssoufa, Olufunso Somorin, Denis Jean Sonwa, Johnson Ndi Nkem, and Bruno Locatelli. (2011). "Forests and Climate Change Adaptation Policies in Cameroon." Mitigation and Adaptation Strategies for Global Change 16 (3): 369–85. https://doi.org/10.1007/s11027-010-9264-8

Carl, V. (2012). Basic Methods of Policy Third Edition. *Routeledge* https://www.book2look.com/embed/9781317349990

Chimi, P. M., Mala, W. A., Fobane, J. L., Essouma, F. M., II, J. A. M., Funwi, F. P., & Bell, J. M. (2022). Climate change perception and local adaptation of natural resource management in a farming community of Cameroon: A case study. *Environmental Challenges,* 8(April), 100539. https://doi.org/10.1016/j.envc.2022.100539

Chisita, C. T., & Fombad, M. C. (2020). Knowledge sharing to support climate change adaptation in Zimbabwe. *Emerald Insight*. https://doi.org/10.1108/VJIKMS-10-2019-0161Cl, Raymond Clemencon. (2023). 30 Years of International Climate Negotiations : Are They Still our Best Hope ? . The Journal of Environment and development. https://doi.org/10.1177/10704965231163908

Everett M.Rogers., (2010). Diffusion of Innovations, 4th Edition. *The Free Press*. https://books.google.dz/books?id=v1ii4QsB7jIC&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false

Fawzy, S., Osman, A. I., Doran, J., & Rooney, D. W. (2020). Strategies for mitigation of climate change : a review Strategies for mitigation of climate change : a review. *Environmental Chemistry Letters,* August. https://doi.org/10.1007/s10311-020-01059-w

Fombad, Madeleine C. (2024). "Knowledge Management for Climate Change in South Africa : A Proposed Strategy." *IFLA Journal*. https://doi.org/10.1177/03400352231217277

Gallemard, J. (2023). The Basics of Knowledge Transfer: *A Beginner's Guide* (2023). 1–20. https://blog.smart-tribune.com/en/knowledge-transfer%0A/Volumes/Samsung SSD 970 EVO - Daten/Dateien/Zotero-Sicherungsordner-Alles-2024-06-04/storage/8T3QBC9Q/knowledge-transfer.html

Harvey, B. (2018). Knowledge sharing for climate change adaptation in Africa : opportunities and challenges. *ResearchGate.* https://www.researchgate.net/publication/244478249_Knowledge_sharing_for_climate_change_adaptation_in_Africa_opportunities_and_challenges

Hirpha, H. H., Mpandeli, S., Bantider Dagnew, A., Chibsa, T., & Abebe, C. (2021). Assessing the integration of climate change adaptation and mitigation into national development planning of Ethiopia. *International Journal of Climate Change Strategies and Management*, 13(3), 339–351. https://doi.org/10.1108/IJCCSM-07-2020-0082

International Monetary Fund. African Dept.(2024). "Climate change in Cameroon : key challenges and reform priorities 1," 30–46. https://www.elibrary.imf.org/view/journals/002/2024/052/article-A003-en.xml

IPCC, (2014): Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir (2014). *"Intergovernmental panel on climate change Drafting Authors :"* https://www.ipcc.ch/site/assets/uploads/2018/02/WGIIAR5-FrontMatterA_FINAL.pdf

IPCC. (2023). Frequently Asked Questions - Introduction and Framing. 100. https://www.ipcc.ch/report/ar6/wg3/downloads/faqs/IPCC_AR6_WGIII_FAQ_Chapter_01.pdf

Kankeu, R. S., Demaze, M. T., Krott, M., Jean, D., & Symphorien, S. (2019). Governing knowledge transfer for deforestation monitoring : Insights from REDD + projects in the Congo Basin region. 0–21. *Research Papers in Economics.* https://ideas.repec.org/a/eee/forpol/v111y2020ics138993411830128x.html#download

Kankeu, Richard Sufo, Moise Tsayem Demaze, Max Krott, Denis Jean, and Sonwa Symphorien. (2019). "Governing Knowledge Transfer for Deforestation Monitoring : Insights from REDD + Projects in the Congo Basin Region," 0–21. *Forest Policy and Economics.* https://www.sciencedirect.com/science/article/pii/S1389934120300575

Kengoum, F. and Tiani, A.M. (2013). Adaptation and mitigation policies in Cameroon: Pathways to synergy. *Occasional Paper*. 102. Bogor, Indonesia: CIFOR. https://www.cabidigitallibrary.org/doi/pdf/10.5555/20153426455

Kuna, Birgit, and Britta Horstmann. (2017). "Learning through Collaboration,". *Researchgate*.https://www.researchgate.net/publication/283417929_Learning_through_collaboration__Knowledge_Transfer_and_Sharing_in_Climate_Change_Adaptation_Research_between_European_and_developing_countries_A_CIRCLE-2_research_policy_brief

Lackner, M., & Chen, W. (2020). Handbook of Climate Change Mitigation and Adaptation. *Handbook of Climate Change Mitigation and Adaptation*, October 2017, 0–10. https://doi.org/10.1007/978-1-4614-6431-0

Laukkonen, J., Blanco, P. K., Lenhart, J., Keiner, M., Cavric, B., & Kinuthia-Njenga, C. (2009). Combining climate change adaptation and mitigation measures at the local level. *Habitat International*, 33(3), 287–292. https://doi.org/10.1016/j.habitatint.2008.10.003

Liu, Wenlin, Amanda M Beacom, and Thomas Valente. (2017). "Social Network Theory," no. September. https://doi.org/10.1002/9781118783764.wbieme0092

Lwasa, S. (2010). Adapting urban areas in Africa to climate change: The case of Kampala. *Current Opinion in Environmental Sustainability*, 2(3), 166–171. https://doi.org/10.1016/j.cosust.2010.06.009

Maponya, Phokele, and Sylvester Mpandeli. (2012). "Climate Change and Agricultural Production in South Africa: Impacts and Adaptation Options." *Journal of Agricultural Science* 4 (10): 48–60. https://doi.org/10.5539/jas.v4n10p48

Maurice tsalefac, rodrigue aimé feumba, collins kana, jean-noël ngapgue, boukar chetima, damien kuhn, mesmin tchindjang, wilson fantong, julep maxime nguemadji moussa . (2015). "*National Climate Change Adaptation Plan* (PNA C C)" https://faolex.fao.org/docs/pdf/Cmr192040.pdf

MINEPDED (2021). Presentation Of The Balance Sheet For The Five-Year Implementation Of The Paris Agreement In Cameroon. https://minepded.gov.cm/wp-content/uploads/2021/10/Assessment-of-the-apcs-work.pdf

Mutambisi, T., Chanza, N., Matamanda, A. R., Ncube, R., & Chirisa, I. (2021). Climate Change Adaptation in Southern Africa: Universalistic Science or Indigenous Knowledge or Hybrid. *African Handbook of Climate Change Adaptation*, 1–16. https://doi.org/10.1007/978-3-030-42091-8_8-1

National Climate Change Adaptation Research Facility (NCCARF). (2017). ''What is adaptation to climate change?''. *CoastAdapt*. https://coastadapt.com.au/overview-of-adaptation

Olivier, M., Moffo, Z., & Tsalefac, M. (2011). Floods Risks in the Mfoundi Upstream Drainage Basin in Yaounde: a Response To Climatic Modifications or To Human Impacts? *Present Environment and Sustainable Development*, 5(2). https://pesd.ro/articole/nr.5/2/04.%20Zogning.pdf

Olivier, Maurice, Zogning Moffo, and Maurice Tsalefac. (2011). "Floods Risks in the Mfoundi Upstream Drainage Basin in Yaoundé: A Response to Climatic Modifications or To Human Impacts?" *Present Environment and Sustainable Development* 5 (2). https://pesd.ro/articole/nr.5/2/04.%20Zogning.pdf

Orgbalt, L., Agreement, P., & Laiho, R. (2020). climate change mitigation and adaptation : two different , yet inseparable strategies to tackle. *LIFE OrgBal*. https://www.orgbalt.eu/?p=3908

Ozor N., Acheampong E. and Nyambane A. (2021). ''Climate information needs and services for climate change mitigation and adaptation in cameroon, kenya, malawi, nigeria and tunisia''. *Journal of Tropical Agriculture, Food, Environment and Extension*. http://dx.doi.org/10.4314/as.v20i4.2

Rinawati, F., Stein, K., & Lindner, A. (2013). Climate change impacts on biodiversity-the setting of a lingering global crisis. *Diversity*, 5(1), 114–123. https://doi.org/10.3390/d5010114

Saint-clair, S., & Emmanuel, N. F. (2024). Landslide Hazard Mapping in Mbankolo Yaounde Cameroon : Multi-Factor Analysis and Outlook. 6(12), 94–101. *International Journal of*

Multidisciplinary Research and Publications. https://ijmrap.com/wp-content/uploads/2024/06/IJMRAP-V6N12P88Y24.pdf

Sandrine, G., Kay, N., & Claude, E. J. (2015). Climate Change and Beliefs in Cameroon: A Qualitative Study Among Farmers in the Equatorial and Sudano-Sahelian Zones Eye Tracking View project risk perception course for undergraduate students *View project*. September, 53–64. https://doi.org/10.3968/7273

Stephen J. Collier, Andreas Folkers. ''Climate Futures: Planned and Unplanned''.Closed Panel CP446 at conference EASST-4S (2024) Amsterdam: *Making and Doing Transformations*.https://nomadit.co.uk/conference/easst-4s2024/p/15082

Stott, Clare, and Saleemul Huq. (2014). "Knowledge Flows in Climate Change Adaptation : Exploring Friction between Scales." *Climate and Development* 0 (0): 1–6. https://doi.org/10.1080/17565529.2014.951014

Taewook Huh, Hyung-Ju Kim. (2018). ''Korean Experimentation of Knowledge and Technology Transfer to Address Climate Change in Developing Countries''. *Sustainability*. https://doi.org/10.3390/su10041263

The African Capacity Building Foundation. (2023). Coordination challenges and opportunities for climate adaptation in African agriculture. 29. *ACBF Virtual Library*. https://elibrary.acbfpact.org/acbf/collect/acbf/index/assoc/HASH3f53/1d5a4618/50041b12/09.dir/Knowledge%20Product%20Climate%20Change%20Coordination%20Eng.pdf

Troni, J., Petersen, C., Diouf, H. R., Mills, J. T., Baumwoll, J., Garmer, L. W., Unganai, L., Diop, M. D., & Cote, M. (2018). Climate Change Adaptation in Africa: UNDP Synthesis of Experiences and Recommendations.*GEF* . https://www.thegef.org/sites/default/files/publications/CCA-Africa-Final.pdf

UNEP. (2022). Technology Transfer For Climate. Analysing needs and development assistance suppor t in technology transfer processes. https://unepccc.org/publications/technology-transfer-for-climate-mitigation-and-adaptation/

United Nations. (2009). Disaster Risk Reduction in the United Nations. *International Strategy for Disaster Reduction*, ISDR, 145. https://www.unisdr.org/preventionweb/files/9866_DisasterRiskReductionintheUnitedNat.pdf

Vermeulen, S. J., Aggarwal, P. K., Ainslie, A., Angelone, C., Campbell, B. M., Challinor, A. J., Hansen, J. W., Ingram, J. S. I., Jarvis, A., Kristjanson, P., Lau, C., Nelson, G. C., Thornton, P. K., & Wollenberg, E. (2012). Options for support to agriculture and food security under climate change. *Environmental Science and Policy*, 15(1), 136–144. https://doi.org/10.1016/j.envsci.2011.09.003

Vescovi, L., Bourque, A., Simonet, G., & Musy, A. (2009). Transfer of climate knowledge via a regional climate-change management body to support vulnerability, impact assessments and adaptation measures. *Climate Research*, 40(2–3), 163–173. https://doi.org/10.3354/cr00787

World Bank (2023). ''Budget sensible au climat (BSC) et Gestion des investissements Publique Sensible au Climat (GIPSC)'' *Rapport de mission et feuille de route*

World Bank Group, "Cameroon Country Climate and Development Report." (2022). *Cameroon Country Climate and Development Report*. https://doi.org/10.1596/38242

Ziervogel, Gina, Mark New, Emma Archer van Garderen, Guy Midgley, Anna Taylor, Ralph Hamann, Sabine Stuart-Hill, Jonny Myers, and Michele Warburton. (2014). "Climate Change Impacts and Adaptation in South Africa." *Wiley Interdisciplinary Reviews*: Climate Change 5 (5): 605–20. https://doi.org/10.1002/wcc.295.

Zogning, A., Ngouanet, C., &Tiafack, O. (2007). The catastrophic geomorphological processes in humid tropical Africa: A case study of the recent landslide disasters in Cameroon. *Sedimentary Geology*, 199(1–2), 13–27. https://doi.org/10.1016/j.sedgeo.2006.03.030

7. APPENDICES

7.1 Appendix 1: Interview Guide

PAN AFRICAN UNIVERSITY INSTITUTE OF WATER AND ENERGY SCIENCES INCLUDING CLIMATE CHANGE

INTERVIEW GUIDE

Interview Guide for resourceful persons of the public structures. It should however be noted that, the information collected for this work is for scientific purposes only. It will enable the researcher in writing a dissertation as part of the requirements to obtain a master's degree. Thanks immensely for understanding. We give you double assurance and guarantee the confidentiality of the information collected.

Research topic: ''**KNOWLEDGE TRANSFER FOR CLIMATE CHANGE ADAPTATION AND MITIGATION: SYNERGIZING ACTIONS AND POLICIES IN CAMEROON''**

Resourceful persons at existing establishments involved in climate related knowledge production, management and transfer

To assess the current status of knowledge transfer Frameworks for climate change adaptation and mitigation in Cameroon

1. What is your Name Sir/Madame ____
2. What is the name of your organization/ structure involved in climate and disaster risk information Dissemination____
3. What is your position in this organization? ____________________________________
4. What are the missions of your organization? _____________________________
____
____
____
____
____

5. What are the types of knowledge or climate services and information provided by your organization?

___

6. From where do you obtain this knowledge and information?

___

7. Who are the audience that this climate change knowledge is targeted at?

___

8. What is the administrative set up and functioning of your organization?

___

9. Can you describe the current frameworks or systems for knowledge transfer related to climate change adaptation and mitigation?

___

____

____

10. What is your assessment of their effectiveness?

____

____

____

11. In what areas do you think they succeed or fail?

____

____

____

____

____

____

12. How accessible are these frameworks to communities and policymakers

____

____

2. Identify key actors involved in climate change-related knowledge transfer and power relations between them

10. Who are your main partners and what is their domain of intervention?

Financial assistance____?

Technical____?

Training of personnel____?

11. Who are the main sources of climate change-related information or knowledge in Cameroon? (e.g., government agencies, NGOs, universities, international organizations)____

____

12. How often do you collaborate with other stakeholders (e.g., researchers, policymakers, NGOs) on climate change issues? A) Frequently ___b)Occasionally___ c)Rarely___), d)Never ___
13. To what extent do you think the power relations between actors (e.g., government vs. NGOs) influence the effectiveness of knowledge transfer? A)Strong influence___ b)Moderate influence___ c)Weak influence___ d)No influence ___

14. Who are the key actors involved in transferring climate change knowledge in Cameroon, and what role do they play?

____
____
____
____

15. How does power dynamics (e.g., between government and local communities or NGOs) affect the flow of knowledge on climate change? ______________________

____
____
____

16. Are there any actors that play a dominant role in shaping climate change adaptation policies, and how does this impact others? __________________________________

____
____
____
____

17. What is the role of traditional institutions and indigenous knowledge systems?

____
____
____
____
____

18. What are the national policy frameworks regulating climate knowledge production and dissemination that you know?____

____
____
____

19. What is the nature of collaboration between local institutions and government agencies?____

____
____

3. Identify dissemination channels and processes of knowledge transfer

20. What channels are used for disseminating climate change adaptation and mitigation knowledge in Cameroon? ____

____

21. How often is information disseminated? A) Frequently ___b)Occasionally___ c)Rarely___), d)Never ___

22. What is the language used in communicating these services? ____

____

23. Can you describe the processes used to share climate-related knowledge, from research to implementation? ____

____

____

____

____

24. How accessible are these channels to rural or vulnerable populations?

A) Frequent ___b) Occasionally___ c) Rarely___ d) Never ___

4. Identify key challenges to effective knowledge transfer for climate action and policy in Cameroon

27. What is the level of state engagements..? A) Strong ___ b) Moderate ___ c) Weak ___ d) No engagement ___

28. Are there conflict interests between the stakeholders involved?

____

____

29. What is the role of decentralization and engagements of decentralized authorities?

____

____

30. What are the challenges involved in knowledge production processes?

____

____

____

____

____

30. What are the main obstacles to the effective transfer of climate change knowledge in Cameroon? ____

____

____

____

____

31. How do you think these challenges could be addressed to improve knowledge transfer?

____

____

____

____

____

32. Are there any specific examples where knowledge transfer has failed due to these barriers? ____

____

____

____

5. Assess the extent of knowledge outreach of the existing knowledge transfer frameworks

33. To what extent do you think climate change knowledge is being effectively shared with the general population in Cameroon? a) Very effective___ b) Effective___ c) moderately effective___ d) Ineffective___

34. Are there any specific groups that are being left out of current knowledge transfer efforts? If so, why? ____

____

35. What is the degree of adoption of the recommendations from your organization by the targeted audience (policy makers, the local population and other concerned entities)?
a) Very high adoption, b) High adoption, c) Moderate adoption, d) Low adoption, e) Very low adoption

36. How could the outreach and inclusiveness of climate change knowledge transfer be improved? ____

____

37. Many climate induced disasters have occurred in Cameroon/ Yaoundé in the recent past. Did your institution predict the heavy rains that led to the disaster? If yes, what did they do?

THANK YOU!

7.2 Appendix 2: Research Questionnaire

QUESTIONNAIRE

Questionnaire for the population of the study area. It should however be noted that, the information collected for this work is for scientific purposes only. It will enable the researcher in writing a dissertation as part of the requirements to obtain a master's degree. Thanks immensely for understanding and we give you double assurance and guarantee the confidentiality of the information collected

Section one; Demographic profile of the respondent

Q1. Sex. a) Male b) Female

Q2. Age: a) (20-30) _____b) (30-40) _____c) (40-50) d) (50-60) ____e) (60+)

Q3. Educational level

a) Not a literate ____b) Primary level _____c) Secondary level ___d) High school ____e)University_____

Q4. Occupation a) Primary activities (Farming, Fishing, Livestock, extraction) ___ b) Secondary activities (industrial processes) ___ c) Tertiary activities (Services) ___

Q5. Marital status a) Married, b) Single

Q6. Family size a) (3-4) ___b) (4-5) ___c) (5+) ___

SECTION TWO; SURVEY QUESTIONS

Q7. What is your quarter or location? ____

Q8. Do you agree that the climate in your area has changed over the years which comes along with adverse effects1) Yes_____2) No______

Q9. How do you perceive climate change? a) Extreme rainfall, b) Increasing temperatures and dry spells, c) floods, d) Others

Q10. What are these negative effects that you can site to have been witnessed or still being witnessed____

____

Assess the current status of knowledge transfer frameworks for climate change adaptation and mitigation in Cameroon

Q11. Are you aware of any existing frameworks or systems in place for knowledge transfer on climate change adaptation and mitigation in Cameroon? a) Yes ____b) No ____c) Not sure____

Q12. Which is that? a) ONACC___ b) The meteorological department___ c) Others (specify)

____

Q13. How would you rate the effectiveness of the framework in addressing climate change adaptation and mitigation problems? a) Very effective___ b) Effective___ c) moderately effective___ d) Ineffective___

Q14. What specific knowledge transfer tools or platforms have you used a) workshops___ b) reports___ c) online resources___

Q15. Do you or have you ever receive any climate change information alerts from this body? A) Yes___ B) No___

Q16. How frequently do you receive information or training on climate change adaptation and mitigation from this framework(s)? a) Regularly___ b) Occasionally___ c) Rarely___ d) Never___

Q17. Are there local methods of observing weather changes? ________________________

____

____

If yes, how effective are such? ____

3. Identify dissemination channels and processes of knowledge transfer

Q18. What are the primary channels through which you receive climate change-related knowledge? A) Media ___ (TV, radio), b) Social media___ c) Workshops/seminars___ d)Government reports ___e)Online platforms (webinars, websites)___

Q19. How effective do you find these channels in disseminating climate change information? a) Very effective___ b) Effective___ c) Moderately effective ___d) Ineffective___

Q20. Does or did the information come on time? a) Yes___ b) No___

Q21. Is or was the information understandable to you and those in your community? a)Yes___ b) No___

Q22. Is or was the information useful to you as per this information better your adaptation capacity to the climate change issues you face? a)Yes___ b) No___

4. Identify key challenges to effective knowledge transfer for climate action and policy in Cameroon

Q23. What are the main barriers to accessing climate change-related information or knowledge in your community? A) Lack of resources (internet, libraries) ___ b) Language barriers___ c)

Low government or community engagement___ d) Complexity of the information___ e) Others___

Q24. What challenges do you face in implementing climate change knowledge in your field (e.g., agriculture, policy, education)? a) Financial constraint___ b) Lack of training___ c) Lack of policy support___ d) Lack of coherence with field realities___ e) Other (please specify) ___

Q25. What do you suggest can be done to ameliorate the situation?

____

5. Assess the extent of knowledge outreach of the existing knowledge transfer frameworks

Q26. How well does climate change knowledge reach the following groups? a)Local communities___ b)Policy makers___ c)Educational institutions___ d) NGOs and civil society___

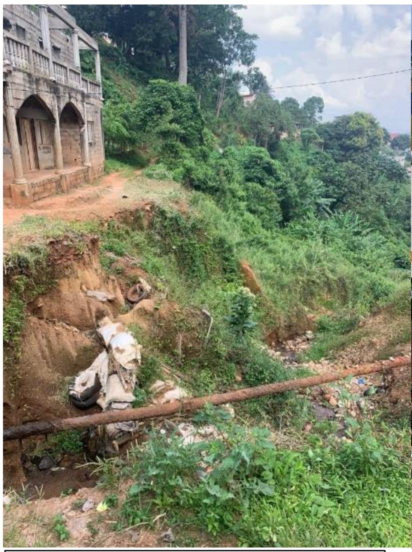
Q27. How do you rate the inclusiveness of current knowledge transfer efforts for different sectors (e.g., agriculture, forestry, urban planning)? a) Highly inclusive___ b) Moderately inclusive___ c) Marginally inclusive___ d) Not inclusive___

Q28. Do you think such initiatives or actions are necessary? a) Yes___ b) No___

THANK YOU!

7.3 Appendix 3: Pictures of questionnaire and interview Administration

Administration of Questionnaire with some respondents



Landslide area in Mbankolo

Interview at IRAD

Interview at ONACC

Interview at CIFOR-ICRAF

Interview at MINRESI

7.4. Appendix 4: Introduction letter for data collection

Institute for Water
and Energy Sciences
(incl. Climate Change)

PAU Institute of Water and Energy Sciences,
(including Climate Change) PAUWES

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Ref : ..415... / PAUWES / 2024

Sujet : Lettre d'Introduction pour la collecte des données

Date: 05/11/2024

De : Prof. Abdellatif ZERGA,
Directeur du PAUWES

A l'attention de :

- **l'Observatoire National sur les Changements Climatiques (ONAAC)**
- **Centre Météorologique National**
- **Population de la zone d'étude**

Cher Madame/ Monsieur,

L'Institut Panafricain des Sciences de l'Eau et de l'Energie (y compris Changement Climatique) PAUWES est domicilié à l'Université de Tlemcen.

PAUWES est un des cinq centres de l'Université Panafricaine établis par l'Union Africaine ayant pour objectifs la promotion de l'enseignement supérieur au niveau Africain et l'encouragement de la recherche et des stages de post-graduation. PAUWES est le quatrième institut après l'Institut pour la Gouvernance, les Sciences humaines et Sociales (PAUGHSS) à l'Université de Yaoundé II au Cameroun ; l'Institut des Sciences élémentaires, de la Technologie et de l'Innovation (PAUSTI) à l'Université d'Agriculture et de Technologie au Kenya ; et l'Institut des Sciences de la Vie et de la Terre (PAULESI) à l'Université d'Ibadan au Nigéria.

L'Institut PAUWES offre aux étudiants de post-graduation l'accès à un haut niveau d'enseignement, de recherche et de stages pratiques dans des domaines vitaux pour le futur du développement africain – l'Eau, l'Energie et le défi du Changement Climatique.

Dans ce contexte, l'étudiant du PAUWES, **Henry SUINYUY Junior,** de nationalité **Camerounaise**, préparant un Master en Sciences de **Changement climatique**, Spécialisation **Gouvernance**, souhaite effectuer la collecte des données au niveau de **l'Observatoire National sur les Changements Climatiques (ONAAC), Centre Météorologique National,** et la Population de la zone d'étude.

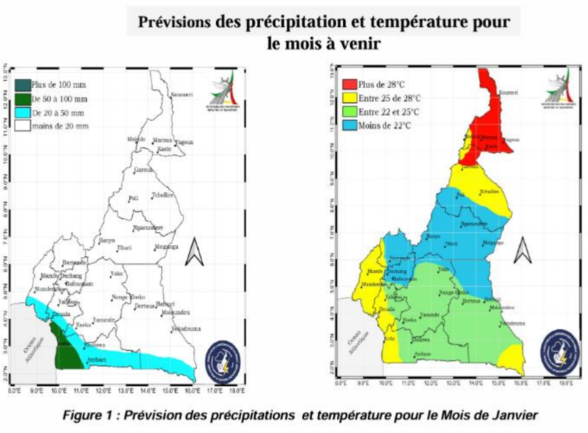
A cet effet, nous apprécierons votre collaboration pour cette étude, et vous prie d'accepter l'expression de mes sincères remerciements

Cordialement.

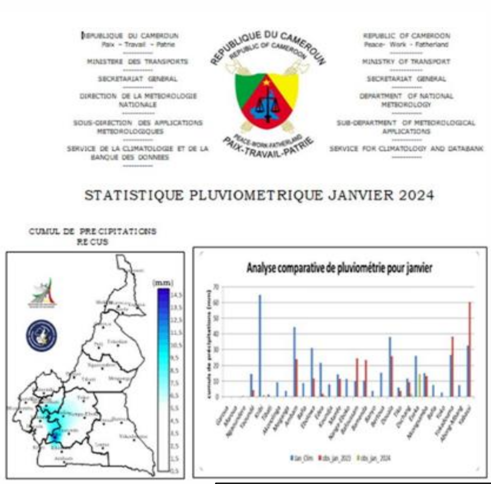
University of Tlemcen
Vice Direction
for Academic Affairs
PAUWES
Pan African University

7.1. Appendix 5: Samples of types of knowledge produced by KT Frameworks

Agricultural Calendar by ONACC

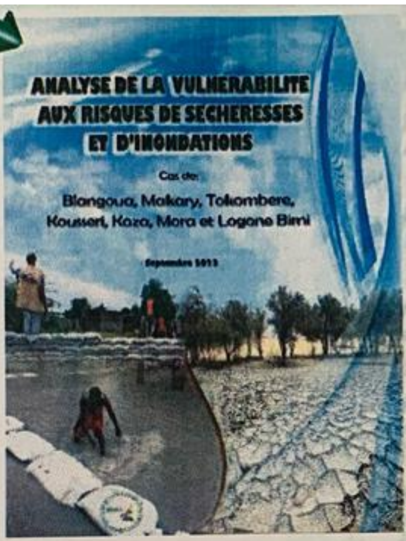


Weather previsions by DMN

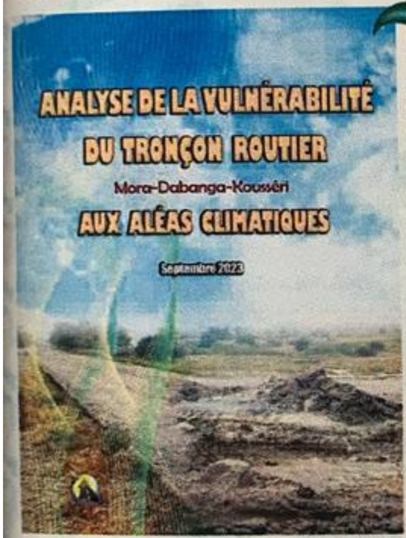


.During the month of January 2024, low rainfall accumulations were recorded in the Centre region and part of the West region. The rest of the country received insignificant accumulations.
Also, accumulations above normal were not recorded in any station.
The town of Eseka received the highest cumulative rainfall in the national territory with a value of 14.5mm.
In 2024, only the city of Eseka recorded the highest accumulation compared to the year 2023 of 14.5mm and 0.0mm respectively.
The month of January 2024 received a precipitation deficit with a percentage of 4.07% compared to the normal.
It should be noted that the month of January 2024 was drier compared to climatology and the year 2023

Weather Previsions by DMN



The study evaluated the **vulnerability of agropastoral actors in the Far North region to climate variability.** The analysis reveals a disruption of seasons, an increase in droughts and floods, as well as fluctuations in agricultural and pastoral production. The adaptive capacity of these communities was assessed through household profiles, their livelihoods, their level of education, and their membership in producer organizations. The results show that men are more affected, with low levels of schooling and low rates of participation in organizations, which limits their ability to adapt to climate change.



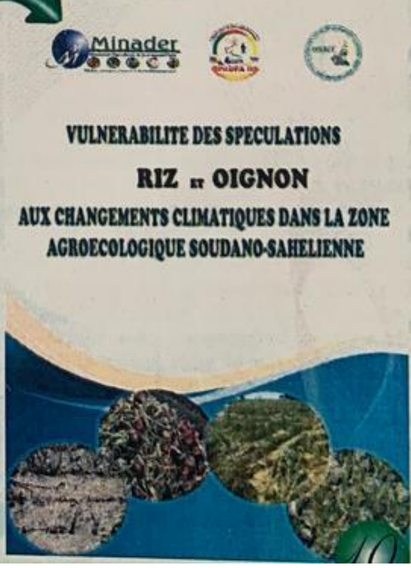
This study **evaluates the vulnerability of the road infrastructure along the Mora-Dabanga-Kousséri corridor in Cameroon to climate hazards, assessing its exposure, sensitivity, and adaptive capacity.** It highlights that incorporating climate considerations into road project planning and design contributes to the long-term sustainability of such infrastructure. However, the analysis also reveals that the road network in this region is vulnerable to the impacts of climate change, particularly high temperatures, disruptions to rainfall patterns, and extreme weather events that accelerate the deterioration of the roads.

The key challenges identified in the study include the inherent uncertainty associated with climate change projections, the need to raise awareness and build the capacity of stakeholders involved in road infrastructure management, as well as the lack of expertise and resources required to comprehensively assess the risks and vulnerabilities of these critical transportation assets.

This study aims to **assess the vulnerability of the rice and onion value chains to climate change in the Sudano-Sahelian zone between 1985 and 2023.** The analysis reveals a high degree of instability in rainfall patterns, an increase in the frequency and duration of droughts, as well as an overall rise in temperatures across the region.

The findings indicate that in the Far North region, rice and onion yields tend to move in the opposite direction relative to precipitation levels. In the North region, the timing of the onset of rains, the amount of precipitation, and the average temperatures all have a negative impact on crop yields.

To address these challenges, the main adaptation strategies adopted by producers include the use of irrigation, organic fertilizers, and resistant crop varieties, as well as improved farm management practices and crop diversification. The study recommends strengthening climate services, equipping cooperatives, promoting organic fertilizers, improving irrigation systems, and facilitating access to improved seeds to enhance the resilience of these agricultural value chains.

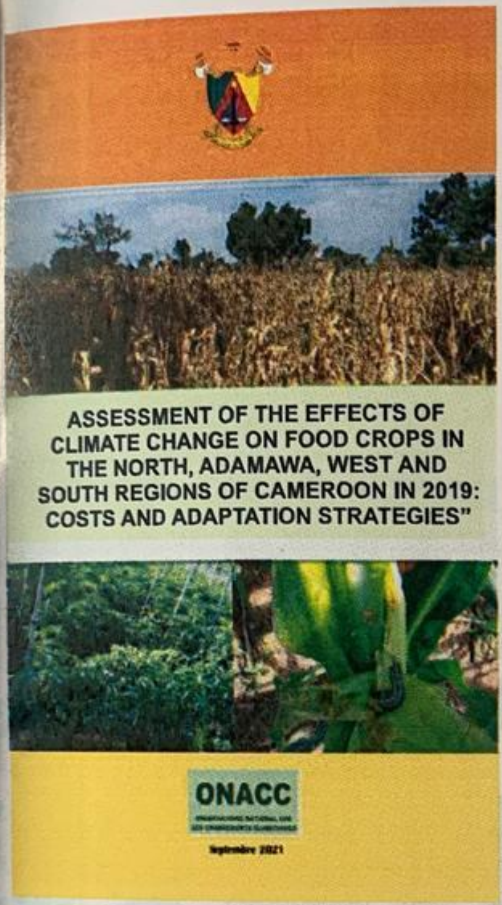


Climate watch and alert services and products by ONACC

ALERTES !!!

Risk type	Region	Locality to be likely affected	Most probable period of occurrence	Expected situation of key determinant
Thunderstorm &Lightning	Littoral& Southwest	Wouri, Nkam, Southern parts of Moungo, Fako, Manyu, Meme, Southern parts of Lebialem &Kupe-muanenguba divisions.	01-10	Extremely high convective activity
	South &Centre	Ocean, Valle de Ntem, Mvila, Dja et Lobo & southern section of the Centre Region	01-10	
	Northwest &west	Momo, Boyo, Mezam, Bui, Ngoketunjia	05-10	
Violent winds	Littoral & Southwest	Across the two regions	01-10	High pressure gradient force
	Northwest &west	Across the two regions	05-10	
	South &Centre	Across the entire zone	01-10	
Meningitis, respiratory illnesses, conjunctivitis	Far-North, North & Adamawa Regions	Across the North, Far-North and Northern part of the Adamawa Regions.	01-10	Dominance of harsh Harmattan winds& high particulate matter in the atmosphere
Farmer-grazer& water related conflicts	North, West Far North, Adamawa, Northwest	Around diminishing water points in the North & Fra-North, transhumance corridors and at frontier zones between grazing land and farm areas	01-10	Scarce water resources & high competition over very limited pasture resources
Bushfire incidence	Far North, North	Across most of the two regions& more especially around predominant grazing zones.	01-10	Extremely high temperatures and dry vegetation
Foggy conditions and poor visibility	Far-North& North	More intense in the Far North and the Northen section of the North region	01-10	Dry dusty harmattan winds coming from the Northeast
	Adamawa	Middle & Northern parts of the Region	01-10	High evapo-transpiration and dusty winds
Extreme heat scenarios	Far North & North	Across the two regions, at the exception of some few isolated mountainous relief zones	01-10	Maximum temperatures attaining 41.8°C
	Littoral	Northern limits of Nkam & Moungo divisions	01-10	Maximum temperatures attaining 38.6°C
	Adamawa	North and middle parts of the Region	01-10	Maximum temperatures attaining 40.9°C
	Centre	Across some isolated parts of the region& and more intense within city centres	01-08	Maximum temperatures reaching 40°C
	Northwest	Across the entire region, and more intense within buildup areas.	01-08	Maximum temperatures reaching 38.2°C
	West	Across the entire region, and more intense within buildup areas.	01-06	Maximum temperatures reaching 39.7°C
	East	More intense in the Northern and central sections of the Region	01-10	Maximum temperatures attaining 40.1°C

Sample of a 10 day Bulletin by ONACC



A study report on the **"Assessment of the effects of climate change on food crops in the North, Adamawa, West and South regions of Cameroon in 2019: costs and adaptation strategies".** This study assesses the impact of climate variables on farm incomes and technical efficiency of farms in these regions, analyzes farmers' perceptions of climate change and the adaptation strategies implemented by farmers to cope with these changes.

The results show that :

- the loss of net agricultural income in 2019 due to climate disturbances in the target regions is estimated at more than CFAF 300 billion;
- The average level of technical efficiency remains relatively low for all farms, i.e. 46.12%. With the same level of total input use, these farms could improve their output volume by an average of 53.88%.
- Farmers who adopt at least one adaptation strategy have a higher average production per hectare (7.332t) of the different crops selected than those who do not adopt any climate change adaptation strategy (6.673t).

Climate vulnerability studies realised by ONACC