

**CLIMATE CHANGE MITIGATION STRATEGIES IN RELATION TO THE
FORESTRY AND ENERGY SECTORS IN SADC REGION WITH EMPHASIS
ON DRC AND RSA AS CASE STUDIES**

By

MUMBERE MBASA NDEMO

Submitted in accordance with the requirements for the degree of

DOCTOR OF LITERATURE AND PHILOSOPHY

In the subject

ENVIRONMENTAL SCIENCE

At the

UNIVERSITY OF SOUTH AFRICA

Supervisor: Professor ELNOUR ABDALLA ELSIDDIG

February 2016

DECLARATIONStudent number: **5092-153-3**

I declare that this dissertation, **Climate change mitigation strategies in relation to the forestry and energy sectors in SADC region with emphasis on DRC and RSA as case studies**, is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.



SIGNATURE

MUMBERE MN (Mr)

FEBRUARY 2016

SUMMARY/ABSTRACT

The main objective of this study is to evaluate climate change mitigation strategies in the forestry and energy sectors in the SADC with emphasis on the DRC and the RSA. This study is evaluative and cross-sectional. Its results were got through interviews of 56 key informants using the interview guide, and four focus group discussions in the DRC based on the focus group guide. The non-probability sample, mainly the purposive sample and the snowballing sampling were used. After the data analysis, the following results were found:

In terms of the strategies for fighting drivers of deforestation both in the DRC and in RSA, it was revealed that the DRC focuses more on the REDD+ projects and NGO activities while the RSA protects its small existing natural forests through Acts, laws, advanced research and establishment of commercial plantations.

The results which are related to the contribution of REDD programmes and NGOs to climate change mitigation in the RSA and the DRC have revealed that there are no REDD programmes in the RSA for carbon stock. In the DRC, the NOVACEL REDD+ pilot project has a carbon stock of 60 000 tons which continues to grow with 8 tons of CO₂ /ha/year; 210 tons/ha/year on the left side of the Congo River, and on the right side 195 tons/ha/year is generated by the Isangi Geographically Integrated REDD+ pilot project. The WCS Mambasa Forestry REDD+ pilot project has 230 tons/ha/year, while 16 000 tons of CO₂/year are stocked under the Luki REDD+ pilot project. The Eco-Makala and Equatorial REDD+ pilot projects have not yet estimated their carbon stocks.

Regarding the involvement of the civil society in activities of climate change mitigation in the DRC, people are more involved in REDD's alternative activities which are funded by the projects. However, in the RSA, people are used as labour in commercial plantations. The RSA derives its major energy from coal (94%) but the DRC has a high potential in hydropower that can generate up to 100 000 MGW. On the use of remote sensing, both the DRC and the RSA employ remote sensing but the RSA has a Spatial Agency while the DRC does not.

Key words:

Climate Change, Mitigation, Forestry Sector, Energy Sector, REDD+ Pilot Projects, Renewable Energy, Drivers of Deforestation, Strategy, Remote Sensing.

LIST OF ACRONYMS

AusAID	: Australia Aid
AWG-LCA	: Ad-hoc Working Group on Long-term Cooperative Action
BAD	: Banque Africaine de Développement (African Development Bank)
BAP	: Bali Action Plan
BMU	: Organisation Allemande (Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety)
CARG	: Conseil Agricole rural de gestion (Rural Agricultural Management Council)
CARPE	: Central African Regional Programme for the Environment
CBFF	: Congo Basin Forest Fund
CBFRM	: Community-based Forest Resource Management
CBNRM	: Management of Natural Resources through Local Communities
CC	: Climate Change
CCC	: Comité de Conservation Communautaire (Community Committee on Conservation)
CDBE	: Council for the Community Rights Defence and Environment Protection
CDM	: Clean Development Mechanism
CERD	: Centre d'énergie renouvelable pour le développement (Renewable Energy Centre for Development)
CERERK	: Centre d'Étude et de Recherches sur les Energies Renouvelables Kitsisa de Kinshasa (Kitsisa Research and Study Centre on Renewable Energies in Kinshasa)
CH ₄	: Methane gas

CI	: Conservation International
CIFOR	: Centre for International Forestry Research
CLD	: Comité Local de Développement (Local Development Committee)
CLP	: Comité Local de pilotage (Local Steering Committee)
CNDP	: Congrès National pour la Défense du Peuple (National Congress of Civil Defence)
CO ₂	: Carbon dioxide
CO ₂ eq	: Carbon dioxide equivalent
COMIFAC	: Commission des Forêts d’Afrique Centrale (Central Africa Forestry Commission)
COSATU	: Congress of South African Trade Unions
COP	: Conference of Parties
CREF	: Conservation et la Réhabilitation des Ecosystèmes Forestiers (Conservation and Restoration of Forestry Ecosystems)
DBH	: Diameter at Breast Height
DEA	: Department of Environmental Affairs
DEAT	: Department of Environmental Affairs and Tourism
DIAF	: Division d’Inventaire et d’Administration Forestière (Directorate of Forestry Planning and Statistics)
DNA	: Designated National Authority
DoE	: Department of Energy
DoRA	: Department of Revenue Services
DRC	: The Democratic Republic of the Congo
DST	: Department of Science and Technology

DTI	: Department of Trade and Industry
EEDSM	: Energy Efficiency and Demand Side Management
EM	: Electromagnetic
EMR	: Electromagnetic Radiation
ENRA	: Enzymes Refineries Association
ENVI	: is the premier software solution for processing and analysing geospatial imagery used by scientists, researchers, image analysts, and GI professionals around the world
ERC	: Energy Research Centre
ESCO	: Is the enterprise that buys cocoa from beneficiaries of the REDD+ Mambasa project
EU	: European Union
FAO	: Food and Agriculture Organisation
FFN	: Fond Forestier National (National Forestry Fund)
FIP	: Forest Investment Programme
FIF	: Forest Investment Fund
FLEGT	: Forest Law Enforcement, Governance and Trade
FPIC	: Free, Prior and Informed Consent
FSE	: Federation for a Sustainable Environment
GCD	: Groupe de Commercialisation et de Développement (Commercialisation and Development Group)
GDP	: Gross Domestic Product
GHGs	: Greenhouse Gases
GIS	: Geographic Information System

GIZ	: Gesellschaft für Internationale Zusammenarbeit ([German] Agency for International Cooperation)
GPP	: Gross Primary Product
GPS	: Global Positioning System
Gt	: Gigaton
GTCR	: Groupe de Travail Climat REDD (REDD Climate Working Group)
GTI	: Geo Terra Image
GW	: Gigawatt
Gwh	: Gigawatt-hour
HSPD	: Homeland Security Presidential Directive
ha	: Hectare
ICCN	: Institut Congolais pour la Conservation de la Nature (Congolese Institute for Nature Conservation)
IEA	: International Energy Agency
IEMA	: International Environmental Management Act
IEP	: Integrated Energy Plan
IFA	: Institut Facultaire d’Agronomie (Faculty’s Institute of Agronomy)
IFDC	: International Fertiliser and Development Centre
IGCCC	: Intergovernmental Committee on Climate Change
I-GES	: Improvement of the Greenhouse gases inventory systems
ILD	: Initiatives Locales de Développement (Local Development Initiatives)
INEP	: Integrated National Electrification Programme
INERA	: Institut National d’Etude et de la Recherche Agronomique (National Institute of Agronomic Study and Research)

IPCC	: International Panel on Climate Change
IPP	: Independent Procurement Programme
IPPPP	: Independent Power Producer Procurement Programme
IRP	: Integrated Resource Plan
ISDR	: International Strategy for Disaster Reduction
ISEAVF	: Institut Supérieur d'Etudes Agronomiques, Vétérinaires et Forestières (High College of Veterinary, Agronomic and Forestry Studies)
ISTA	: Institut Supérieur des Techniques Appliquées (High College of Applied Techniques)
ITIG	: Institut Technique Industriel de Goma (Goma Technical Industrial Institute)
JGI	: Jane Goodall Institute
KHB	: Kahuzi Biega (National Park Kahuzi Biega)
KW	: Kilowatt
LECBP	: Low Emission Capacity Building Programme
LEDS	: Low Emissions Development Strategies
Lidar	: Light Detection and Ranging
LPG	: Liquid Petroleum Gas
LULUCF	: Land Use, Land-use Change and Forestry
MAB	: Man and Biosphere
MECNT	: Ministère de l'Environnement, Conservation de la Nature et Tourisme (Ministry of Environment, Conservation and Tourism)
MRV	: Measuring, Reporting and Verification
MGW	: Megawatts
NAMA	: National Appropriate Mitigation Actions

NCT	: Natal Co-operative Timber (NCT Forestry Co-operative Limited)
NE	: Not Estimated
NEP	: Net Ecosystem Product
NERSA	: National Energy Regulator of South Africa
n.d	: No date
NFA	: National Forest Act
NGOs	: Non-Governmental Organisations
NNR	: National Nuclear Regulator
N ₂ O	: Nitrous Oxide
NOVACEL	: Nouvelle Société d’Agriculture et d’Elevage (New Society of Agriculture and Husbandry)
NPP	: Net Primary Product
NRM	: Natural Resource Management
NSK	: NOVACEL South Kwamouth
NVFFAC	: National Veld and Forest Fires Act
OCEAN	: Organisation Congolaise des Ecologistes et Amis de la Nature (Association of Congolese Ecologists and Friends of Nature)
ONFI	: Office National des Forêts Internationales (National Office of International Forests)
OSFAC	: Observatoire satellital des forêts d’Afrique Centrale (Satellite Station for Central Africa Forests)
OTEC	: Ocean Thermal Energy Conversion
PDD	: Project Design Document
PPA	: Power Purchase Agreement

PDL	: Plan de Développement Local (Local Development Plan)
PECN	: Programme d'Education pour la Conservation de la Nature (Education Programme for Nature Conservation)
PES	: Payment for Environmental Services
PMD	: Programme pour le Maintien de la Diversité Biologique (Programme for Maintaining Bio-diversity)
RBS	: Revised Balanced Scenario
RED	: Reducing Emissions from Deforestation
REDD	: Reducing Emissions from Deforestation and Forest Degradation
REDD-NC	: Coordination Nationale REED (REDD National Directorate)
REDD+	: Reducing Emissions from Deforestation and Forest Degradation and the role of Conservation, sustainable management of forests and enhancement of forest carbon Stocks in developing countries
RFO	: Réserve de faune à Okapi (Fauna Reserve of Okapi)
RFP	: Request for Proposal
RFPI	: Force de Résistance Patriotique de l'Ituri (Ituri Patriotic and Resistant Force)
RIPPPP	: Independent Power Producer Procurement Programme for Renewable Energy
RS	: Remote Sensing
RSA	: Republic of South Africa
SADC	: Southern African Development Community
SAFCOL	: The South African Forestry Company Limited
SASOL	: Industry which converts coal to liquid in South Africa
SNEL	: Société Nationale d'Electricité (National Society of Electricity)

SNV	: Netherlands Development Organisation
SOCO	: Is a British Oil Company
SOP	: Standard Operating Procedure
SWH	: Solar Water Heating
SWHs	: Solar Water Heaters
TCA	: Terrestrial Carbon Accounting
Tree Bool	: Tree Barcode of life Project
UCL	: Université Catholique de Louvain (Louvain Catholic University)
UEA	: Université Evangélique en Afrique (Evangelical University of Africa)
UGADEC	: Union d'associations pour la conservation des gorilles et le développement Communautaire en RDC orientale (Association's Union for Gorilla Conservation and Community Development in Eastern DRC)
ULPGL	: Université Libre des Pays des Grands Lacs (Open University of the Great Lakes Countries)
UN	: United Nations
UNCED	: United Nations Conference on Environment and Development
UNEP	: United Nations Environment Programme
UNDP	: United Nations Development Programme
UNFCCC	: United Nations Framework Convention on Climate Change
UNIKIS	: Université de Kisangani (University of Kisangani)
UNILU	: Université de Lubumbashi (Lubumbashi University)
UN-REDD+	: Consortium FAO, UNEP and UNDP
USD	: United States Dollars

- WCS : Wildlife Conservation Society
- WHRC : Woods Hole Research Centre
- WRI : World Resource Institute
- WSSD : World Summit on Sustainable Development
- WWF : World Wide Fund for Nature
- YME : Norwegian mythology in which a person was transformed mythically, and his body became the soil, the blood became water and the hair became vegetation
- ZAR : South African currency (Rand)

DEDICATION

I dedicate this thesis to the following special people:

My wife for life, Florence Rehema Musongya, for the exceptional support throughout my studies

My son Jotham Musondoli Molo and my daughter Josiane Mulekya Molo, for enduring my absence during the course of the research

ACKNOWLEDGEMENTS

I would like to express my deepest gratitude to my Supervisor Prof Elnour Abdalla Elsiddig for his excellent guidance, patience and invaluable constructive criticism during this research. Prof Elnour has acted uniquely by promptly providing feedback and responding to my queries. I thank you professor for agreeing to supervise this research, and for having showed me the way to succeed.

My heartfelt thanks also go to the ULPGL Management Committee staff members headed by Prof Rector Léopold Kambale Karafuli for the financial support without which this doctoral research would not have been possible. I am thankful to all of you.

I also express my thanks to the following persons and institutions that have assisted and supported me in the completion of this dissertation:

- The respondents from all institutions in both the DRC and the RSA for their willingness to participate in the interviews and for the time;
- The different representatives of the institutions both in the DRC and the RSA for accepting us to be part of this research on behalf of their respective organisations;
- My caring, loving, and supportive wife Florence Rehema Musongya, for her encouragement and willingness to manage our household activities in my absence;
- My children, Jotham Molo and Josiane Molo for their patience and the sacrifices they made;
- My grandfather and grandmother, Mathias Mbasu and Derusila Mulekya for their constant counsel and prayers;
- My parents Phaniel Kasereka Molo and Josée Masika Siherya, Phares Kakule Molo and Yuka Mutsana, Fany Tembo Molo and Gorette Kyuma for their encouragement, prayers and support in different ways from our childhood years;
- My brothers, sisters, cousins, brothers and sisters in law, Neka Mbasu and Orneli Wendo, Mr Kasereka Mbasu, Mr Muisa Mbasu, Ms Safi Mulekya (in memorium),

Furaha Molo and Kambale Lutoto, Tangi Molo and Claude Takenga, Muyisa Molo, Mrs Zawadi Mbaso and Andy Muhindo, Mr Robert Mbaso, Mr Nguge Mbaso, Mr Akhim Mbaso, Mumbere Mandu Mandu and Kavira Vahamwiti, Kavira Kirindera and her husband Nathanael, Kambale Mbugheki and his wife Julie, Kahambu Kahamba and Ndolé Amboko, Kasereka Wasingya, Anicet and his wife Darling, Gerlance and his wife Jisi, Mr Denis and his wife Masika, Mrs Elda and her husband Kaski, and all those who are not mentioned here by name, for their encouragements;

- My Aunt Valerie Molo and her Husband Mr Kamabu, Prof Muteho, Mr Abner Muvughe and his wife Devotte, Mr Modeste and his wife Diena, and Prof Mushagalusa and his wife for their advice;
- My parents-in-law, Mr Feston and Mrs Neria, Mr Seraphin and Mrs Charlotte, Mr Alexis and Mrs Jeanne for their encouragement;
- Sisters and brothers-in-law, Sophie and Elon, Christine and Alain, Zawadi and Thoms, Nzungundi and Despine, Mbitha and Mireille, and Mr Benjamin for their support and encouragement;
- My colleagues Mr Philippe Tunamsifu, Mr Jonathan Kivatsi, Prof Charles Kalwahali, Prof Musolo, Dr Kusinza, Mr Honoré Bunduki, Mr Bolingo, Mrs Kavugho Véronique and Mr Amboko Muhiwa for their support;
- The University of South Africa, for creating this opportunity to translate my age-long dream into reality; and
- All staff members of the Faculty of Community Health and Development at ULPGL Goma, especially Prof Kikoli, Prof Ntabe, Mr Levis, Mr Thasi, Mr Serge, Mr Kasongo, Mr Byaruhanga, Mr Byaombe, Mrs Manayala and Mrs Estha for their assistance and the team work.

TABLE OF CONTENTS

DECLARATION	I
SUMMARY/ABSTRACT	II
LIST OF ACRONYMS.....	III
DEDICATION	XII
ACKNOWLEDGEMENTS.....	XIII
TABLE OF CONTENTS	XV
LIST OF TABLES.....	XXII
LIST OF FIGURES.....	XXII
CHAPTER ONE: INTRODUCTION.....	- 1 -
1.1 General Information	- 1 -
1.1.1 Brief profile of the Republic of South Africa.....	- 1 -
1.1.2 Brief profile of the Democratic Republic of the Congo	- 2 -
1.1.3 Background of the study.....	- 3 -
1.2 The Problem Statement	- 9 -
1.3 Research questions	- 14 -
1.3.1 Main question	- 15 -
1.3.2 Subsidiary questions.....	- 15 -
1.4 Objectives	- 15 -
1.4.1 Main objective.....	- 15 -
1.4.2 Specific objectives	- 15 -
1.5 The Rationale/Justification for Research.....	- 16 -
1.6 Purpose of the Study.....	- 17 -

1.7	Definitions of Key Concepts	- 17 -
1.7.1	Climate change.....	- 18 -
1.7.2	Mitigation.....	- 18 -
1.7.3	Strategy.....	- 18 -
1.7.4	Forestry sector	- 18 -
1.7.5	Energy sector.....	- 19 -
 CHAPTER TWO: LITERATURE REVIEW		- 20 -
2.1	Introduction.....	- 20 -
2.2	Strategies for Combating the Drivers of Deforestation.....	- 20 -
2.3	Contributions of the National REDD Programmes and of other organisations to climate change mitigation.....	- 26 -
2.4	Roles of Civil Society/Local Communities/ Indigenous People in Climate Change Mitigation Strategies.....	- 32 -
2.5	Contributions of Energy Sources to Climate Change Mitigation	- 36 -
2.5.1	Bio-energy.....	- 37 -
2.5.2	Direct solar energy.....	- 39 -
2.5.3	Geothermal energy.....	- 40 -
2.5.4	Hydropower	- 40 -
2.5.5	Ocean energy	- 42 -
2.5.6	Wind energy.....	- 42 -
2.6	Application of Remote Sensing	- 43 -
2.6.1	Definition of remote sensing.....	- 43 -
2.6.2	The advantages of remote sensing use.....	- 45 -
2.6.3	Disadvantages of remote sensing use.....	- 46 -
2.7	Research Frameworks.....	- 48 -
2.7.1	Conceptual framework	- 48 -
2.7.2	Operational framework	- 49 -
2.7.3	Operational definitions of terms	- 50 -
2.7.3.1	Strategic terms	- 50 -
2.7.3.2	General problem.....	- 51 -
 CHAPTER THREE: RESEARCH DESIGN AND METHODOLOGY		- 52 -
3.1	Introduction.....	- 52 -
3.2	Type of Study.....	- 52 -
3.3	Delimitation of Research Area	- 53 -

3.4	Study and Target Populations	- 53 -
3.5	Sample.....	- 53 -
3.6	Data Collection Techniques and Research Tools.....	- 55 -
3.7	Data Analysis	- 56 -
3.8	Data Quality.....	- 57 -
3.9	Ethical Considerations.....	- 58 -
3.10	Research limitations and constraints	- 59 -
CHAPTER FOUR: PRESENTATION OF FINDINGS.....		- 60 -
4.1	Introduction.....	- 60 -
4.2	The Biographical Information of Respondents	- 60 -
4.2.1	Number of organisations and distribution of key informants per organisation in the DRC and the RSA .	61 -
4.2.2	Profile of key informants in the DRC and the RSA based on gender	- 64 -
4.2.3	Number of focus groups per organisation and gender participation in the DRC	- 65 -
4.3	Climate Change Mitigation Strategies in the DRC's Forestry and Energy Sectors	- 65 -
4.3.1	Results from key informants	- 65 -
4.3.1.1	Strategies for combating drivers of deforestation.....	- 65 -
4.3.1.2	Strategies for Reducing Deforestation	- 73 -
4.3.1.2.1	Introduction.....	- 73 -
4.3.1.2.2	The Gorilla Organisation (Number 1 in Table 6)	- 74 -
4.3.1.2.3	CREF Network (Number 2 in Table 6).....	- 75 -
4.3.1.2.4	Yme Great Lakes (Number 3 in Table 6)	- 76 -
4.3.1.2.5	The Research Centre for Environmental Planning (Number 4 in Table 6)	- 76 -
4.3.1.2.6	WCS North Kivu (Number 5 in Table 6)	- 76 -
4.3.1.2.7	The Jan Goodall Institute (JGI) (Number 6 in Table 6).....	- 77 -
4.3.1.2.8	The National Forestry Fund (FFN) (Number 7 in Table 6).....	- 77 -
4.3.1.2.9	The WWF North Kivu (Number 8 in Table 6)	- 78 -
4.3.1.2.10	The North Kivu Ministry of Environment (Number 9 in Table 6)	- 79 -
4.3.1.2.11	The UGADEC Goma (Number 10 in Table 6)	- 80 -
4.3.1.2.12	The North Kivu Provincial Directorate of Environment (Number 11 in Table 6)	- 80 -
4.3.1.2.13	The ICCN North Kivu (Number 12 in the Table 6).....	- 80 -
4.3.1.2.14	The Renewable Energy Centre for Development (CERD) (Number 13 in Table 6)	- 81 -
4.3.1.2.15	The WWF South Kivu Province (Number 14 in Table 6)	- 81 -
4.3.1.2.16	The WCS South Kivu (Number 15 in Table 6)	- 82 -
4.3.1.2.17	The ICCN South Kivu (Number 16 in Table 6).....	- 83 -

4.3.1.2.18	South Kivu Provincial Directorate of Environment and Sustainable Development (Number 17 in Table 6)	- 83 -
4.3.1.2.19	OCEAN Geographically Integrated REDD+ Project (Number 18 in Table 6)	- 84 -
4.3.1.2.20	The Mambasa commission of Agriculture (Number 19 in Table 6)	- 85 -
4.3.1.2.21	The WCS Mambasa Forestry REDD+ Project (Number 20 in Table 6)	- 85 -
4.3.1.2.22	The Eastern Province Directorate of Environment (Number 21 in Table 6)	- 87 -
4.3.1.2.23	The ICCN Eastern Province (Number 22 in Table 6)	- 87 -
4.3.1.2.24	The WWF National Office (Number 23 in Table 6)	- 88 -
4.3.1.2.25	The National REDD Directorate Office (Number 24 in Table 6)	- 88 -
4.3.1.2.26	The UNDP National Office (Number 26 in table 6)	- 89 -
4.3.1.2.27	The National Ministry of Environment (Number 27 in Table 6)	- 89 -
4.3.1.2.28	Geographically Integrated Pilot REDD+ Luki Project (Number 28 in table 6)	- 89 -
4.3.1.2.29	NOVACEL (Number 29 in Table 6)	- 91 -
4.3.1.2.30	The Equatorial Province REDD+ Project (Number 30 in Table 6)	- 91 -
4.3.1.3	Analysis of Table 6	- 92 -
4.4	National REDD+ programme and contributions of other organisations to climate change mitigation in the DRC	- 99 -
4.4.1	Analysis of the contribution of the REDD and other organisations to climate change mitigation in the DRC	- 105 -
4.4.1.1	Introduction	- 105 -
4.4.1.2	Contribution of CREF Network to climate change mitigation (Number 1 in Table 7)	- 108 -
4.4.1.3	Yme Great Lakes Beni (Number 2 in Table 7)	- 109 -
4.4.1.4	Research Centre for Environmental Planning (Number 3 in Table 7)	- 109 -
4.4.1.5	Jan Goodall Institute (Number 5 in Table 7)	- 110 -
4.4.1.6	WWF North Kivu (Number 6 in Table 7)	- 111 -
4.4.1.7	North Kivu Ministry of Environment (Number 7 in Table 7)	- 111 -
4.4.1.8	UGADEC (Number 8 in the Table 7)	- 111 -
4.4.1.9	North Kivu Provincial Directorate of Environment (Number 9 in Table 7)	- 113 -
4.4.1.10	CERD (Number 11 in Table 7)	- 113 -
4.4.1.11	WCS South Kivu (Number 12 in Table 7)	- 114 -
4.4.1.12	OCEAN Geographically Integrated REDD+ Pilot Project (Number 15 in Table 7)	- 114 -
4.4.1.13	WCS Mambasa Forestry REDD+ pilot project (Number 17 in Table 7)	- 115 -
4.4.1.14	WWF national office (Number 19 in Table 7)	- 117 -
4.4.1.15	REDD Climate Working Group (GTCR) (Number 20 in Table 7)	- 117 -
4.4.1.16	UNDP national office (Number 21 in Table 7)	- 118 -
4.4.1.17	National Ministry of Environment (Number 22 in Table 7)	- 118 -
4.4.1.18	Geographically integrated REDD+ Luki pilot project (Number 23 in Table 7)	- 118 -
4.4.1.19	NOVACEL (Number 24 in Table 7)	- 119 -
4.4.1.20	Equatorial REDD+ pilot project (Number 25 in Table 7)	- 120 -
4.5	Roles of the civil society, local communities and indigenous people in climate change mitigation activities	- 121 -
4.5.1	Collaboration between NGOs and local associations on climate change mitigation strategies	- 129 -
4.5.1.1	Gorilla Organisation (Number 1 in Table 8)	- 130 -
4.5.1.2	CREF Network (Number 2 in Table 8)	- 131 -
4.5.1.3	WWF North-Kivu (Number 8 in Table 8)	- 131 -

4.5.1.4	CERD (Number 12 in Table 8).....	- 131 -
4.5.1.5	WWF South Kivu (Number 13 in Table 8).....	- 132 -
4.5.1.6	ICCN South Kivu (Number 15 in Table 8).....	- 133 -
4.5.1.7	Geographically Integrated REDD+ pilot project around the Luki Biosphere (Number 25 in Table 8)	- 133 -
4.5.1.8	NOVACEL REDD+ pilot project (Number 26 in Table 8)	- 134 -
4.6	Energy sources used in the DRC and potential energy envisaged by the government and other organisations in climate change mitigation.....	- 134 -
4.6.1	Gorilla Organisation (Number 1 in Table 9).....	- 144 -
4.6.2	CREF Network (Number 2 in Table 9)	- 145 -
4.6.3	North Kivu Provincial Department of Energy (Number 3 in Table 9).....	- 145 -
4.6.4	CERD (Number 11 in Table 9).....	- 145 -
4.6.5	GTCR (REDD Climate Working Group) (Number 24 in Table 9)	- 146 -
4.7	Application of remote sensing.....	- 147 -
4.8	Results from focus groups discussion in the DRC.....	- 162 -
4.9	Climate Change Mitigation Strategies in the Forestry and Energy Sectors in the RSA.....	- 168 -
4.9.1	Results from key informants	- 168 -
4.9.2	Strategies for combating deforestation in RSA	- 168 -
4.9.2.1	Introduction	- 168 -
4.9.2.2	Strategies for Reducing Deforestation	- 176 -
4.9.2.2.1	Introduction.....	- 176 -
4.9.2.2.2	Department of Environmental Affairs (Number 1 in Table 12).....	- 176 -
4.9.2.2.3	Food and Trees for Africa (Number 3 in Table 12)	- 177 -
4.9.2.2.4	Department of Agriculture, Forestry and Fisheries (Number 4 in Table 12).....	- 178 -
4.10	Contributions of the national REDD+ programme and other organisations to climate change	- 182 -
4.10.1	Introduction	- 182 -
4.10.2	Analysis of the contribution of REDD in the RSA	- 184 -
4.11	Involvement of the civil society, local communities and indigenous people in climate change mitigation strategies activities.....	- 185 -
4.11.1	Introduction	- 185 -
4.11.2	Collaboration between organisations and local associations in climate change mitigation strategies activities	- 190 -
4.12	Energy sources used in the RSA and potential energy seen by the government and other organisations - 190 -	
4.12.1	Introduction	- 190 -
4.12.2	Energy Use in RSA from a Climate Change Perspective.....	- 206 -
4.12.2.1	Department of Environmental Affairs (Number 1 in Table 15)	- 206 -
4.12.2.2	Earthlife Africa (Number 5 in Table 15)	- 210 -
4.13	Application of remote sensing in the RSA.....	- 210 -

CHAPTER FIVE: DISCUSSION OF FINDINGS.....	- 213 -
5.1 Introduction.....	- 213 -
5.2 Biographical Information of Respondents from Both South Africa and the DRC.....	- 213 -
5.3 Findings from the DRC.....	- 214 -
5.3.1 Different strategies or measures adopted to fight drivers of deforestation in the DRC.....	- 214 -
5.3.2 Contributions of national REDD projects and of other institutions to climate change mitigation in the DRC	- 218 -
5.3.3 Roles of the civil society/indigenous people in climate change mitigation strategies through REDD and other programmes in the DRC.....	- 220 -
5.3.4 Existing and energy sources envisaged by the government and other institutions to mitigate climate change in the energy sector in the DRC	- 222 -
5.3.5 Application of remote sensing in the DRC.....	- 224 -
5.4 Findings from the RSA.....	- 225 -
5.4.1 Different strategies or measures against drivers of deforestation in the RSA	- 225 -
5.4.2 Contributions of national REDD programs and other institutions to climate change mitigation in the RSA	- 227 -
5.4.3 Roles of the civil society/indigenous people in climate change mitigation strategies through the REDD and other programmes in the RSA.....	- 228 -
5.4.4 Existing and energy sources envisaged by the government and other institutions for mitigating climate change in RSA's energy sector	- 229 -
5.4.5 Application of remote sensing in the RSA.....	- 231 -
5.5 Similarities and Differences between South Africa and the Democratic Republic of Congo in Terms of Mitigation in the Forestry and Energy Sectors	- 232 -
5.6 Strengths and Weaknesses of Climate Change Mitigation Strategies in the DRC.....	- 233 -
5.7 Strengths and Weaknesses of Climate Change Mitigation Strategies in the RSA	- 233 -
5.8 Proposed Model for Sustainable Mitigation in the Forestry and Energy Sectors of the DRC and RSA -	235
-	
CHAPTER SIX: CONCLUSIONS AND RECOMMENDATIONS.....	- 237 -
6.1 Introduction.....	- 237 -
6.2 Questions and objectives of the study: a recap	- 237 -
6.3 Summary of key findings.....	- 238 -
6.4 Conclusions.....	- 243 -

6.5 Recommendations - 244 -

6.6 Recommendations for future studies - 245 -

REFERENCE LIST - 246 -

LIST OF TABLES

Table 1: Greenhouse Gas Emissions by Sector in South Africa, 1994 (DEAT, 2004)	- 5 -
Table 2: Distribution of Key Informants per Organisation	- 61 -
Table 3: Distribution of the 45 Organisations in the DRC and the RSA according to Main Functions within the Climate Change Mitigation Strategic Plan	- 63 -
Table 4: Distribution of Key Informants according to Gender	- 64 -
Table 5: Distribution of Participants in Focus Group Discussions according to Gender and Respective Organisations in REDD+ Projects	- 65 -
Table 6: Strategies or Measures for Fighting Drivers of Deforestation in the DRC	- 66 -
Table 7: Contributions of National REDD Programmes and of other Organisations to Climate Change Mitigation in the DRC.....	- 99 -
Table 8: Roles of the Civil Society/Local Communities and Indigenous People in Climate Change Mitigation Strategies through REDD and Other Programmes.....	- 121 -
Table 9: Energy Sources Used or Envisaged by the Government or Other Organisations to Mitigate Climate Change in the DRC	- 134 -
Table 10: Advantages and Disadvantages of Remote Sensing in the DRC.....	- 147 -
Table 11: Role of Civil Society/Indigenous People in Climate Change Mitigation Activities.....	- 162 -
Table 12: Strategies or Measures for Combating Drivers of Deforestation in the RSA	- 169 -
Table 13: Contributions of National REDD Programmes and Other Organisations to Climate Change Mitigation in the RSA.....	- 182 -
Table 14: Roles of the Civil Society/Local Communities and Indigenous People in Climate Change Mitigation Strategies through the REDD and Other Programmes in the RSA	- 185 -
Table 15: Energy Sources Envisaged by Governments or Organisations in the RSA for Mitigating Climate Change.-	191 -
Table 16: Advantages and Disadvantages of Remote Sensing in the RSA.....	- 211 -
Table 17: Strengths and Weaknesses of Climate Change Mitigation Strategies in the DRC	- 233 -
Table 18: Strengths and Weaknesses of Climate Change Mitigation Strategies in the RSA.....	- 233 -

LIST OF FIGURES

Figure 1: Global Contributions of Major Economic Sectors to GHG Emission.....	- 5 -
Figure 2: Contributions of Each Sector to GHGs 2003 in the DRC in Percentage.....	- 6 -
Figure 3: Conceptual Framework	- 48 -
Figure 4: Operational Framework.....	- 49 -
Figure 5: Model for Sustainable Mitigation Strategy in the Forestry and Energy Sectors of the DRC and the RSA.....	236 -

CHAPTER ONE: INTRODUCTION

1.1 General Information

1.1.1 Brief profile of the Republic of South Africa

According to the South African Weather Service (2012), South Africa occupies the southern tip of Africa, its long coastline stretching more than 2 500km from the desert border with Namibia on the Atlantic coast, southwards around the tip of Africa, then north to the border with subtropical Mozambique on the Indian Ocean. The low-lying coastal zone is narrow for much of that distance, soon giving way to a mountainous escarpment that separates it from the high inland plateau. In some places, notably the KwaZulu-Natal Province in the east, a greater distance separates the coast from the escarpment.

On dry land, going from west to east, South Africa shares long borders with Namibia and Botswana, touches Zimbabwe, has a longitudinal strip of border with Mozambique to the east, and lastly curves in around Swaziland before rejoining Mozambique's southern border. In the interior, nestled in the curve of the bean-shaped Free State is the small mountainous country of Lesotho, completely surrounded by South African territory.

Although the country is classified as semi-arid, South Africa has considerable variation in climate as well as topography. The great inland Karoo plateau, where rocky hills and mountains rise from sparsely populated scrubland, is very dry, and gets more so as it shades in the north-west towards the Kalahari Desert. Although extremely hot in summer, it can be icy in winter. In contrast, the eastern coastline is lush and well watered, a stranger to frost. The southern coast, part of which is known as the Garden Route, is less tropical but also green, as is the Cape of Good Hope – the latter especially in winter. This south-western corner of the country has a Mediterranean climate, with wet winters and hot, dry summers. Its most famous climatic characteristic is its wind, which blows intermittently virtually all year round, from either the southeast or the north-west. The eastern section of the Karoo does not extend as far north as the western part, giving way to the flat landscape of the Free State, which though still semi-arid receives somewhat more rain.

North of the Vaal River, the Highveld is better watered, and saved by its altitude (Johannesburg lies at 1 740m above sea level; its average annual rainfall is 760mm) from subtropical extremes of heat. Winters are cold though snow is rare. Further north and to the east, especially where a drop in altitude beyond the escarpment gives the Lowveld its name, temperatures rise – the Tropic of Capricorn slices through the extreme north. This is where one also finds the typical South African Bushveld of wildlife fame.

Those looking for opportunity to ski in winter head for the high Drakensberg mountains that form South Africa's eastern escarpment, but one of the coldest places in the country is Sutherland in the western Roggeveld Mountains with midwinter temperatures as low as -15°C. The deep interior provides the hottest temperatures. According to the South African Weather Service, the highest temperature recorded in South Africa was in Dunbrody, in the Sunday River Valley in the Eastern Cape -50°C on 3 November 1918. The hottest place in South Africa is Letaba (Limpopo Province) with a mean annual temperature of 23.3°C and an average annual maximum temperature of 35°C. The coldest temperature ever recorded in South Africa, -18.6°C, was on 28 June 1996 at Buffelsfontein, near Molteno in the Eastern Cape. In fact, Buffelsfontein is the coldest place in South Africa, with a mean annual temperature of 11.3°C and an average annual minimum temperature of 2.8°C.

1.1.2 Brief profile of the Democratic Republic of the Congo

The land area of the Democratic Republic of the Congo is the third largest in Africa (Halim, 2013). Three of the five types of African climate exist in the DRC namely highland, savannah, and tropical rainforest. Savannahs or wide grasslands spread through the south, while highlands and plateaus make up the east with the rainforest covering the northern part of the country.

Many bodies of water mostly lakes and rivers criss-cross and dot the surface of the country. The Congo River flows from the south-eastern corner of the country to the northern sector. It then changes names to the Lualaba River and goes over Stanley Falls before it empties into the Atlantic Ocean. It has many tributaries along its 2,900 miles include the Aruwimi and the Ubangi.

The Democratic Republic of the Congo's central area mostly consists of a large basin across which the Congo River flows, making it fertile. Whereas 0.52% of the land is used for permanent crops, 2.96% is fertile land for potential crops, and 96.52% is used for other purposes. North of the equator, the rainy season lasts from April to October and the dry season runs from December to February. On the other hand, below the equator, the rainy season extends from November to March and the dry season spans April through October.

1.1.3 Background of the study

Climate change is a complex issue, and its effects are felt not only in certain countries. It is a worldwide problem whose solution requires international cooperation in order to stabilise the concentration of GHGs in the atmosphere. Thus, Winkler (2008) argues that mitigation has been in the heart of climate negotiations for many years. Further, Winkler *et al.* (2011) note that,

The considerations on including forests in developing and least developed countries in the formal global efforts to reduce emissions from deforestation were initiated by Papua New Guinea and Costa Rica in 2005 in Montreal, Canada, during the Conference of Parties (COP11) under the UNFCCC. Subsequently, an agenda item that considered the technical processes was launched in 2006.

The United Nations Conference on Environment and Development (UNCED 1992) also report that,

In Rio de Janeiro, the United Nations Framework Convention on Climate Change (UNFCCC) was negotiated, including its ultimate objective and the principles on which climate action is to be based. For developing countries, it is important to underscore that Article 2, the objective of the Convention, not only refers to stabilization of atmospheric concentrations in the atmosphere, but also refers to doing this in a way that allows sustainable development to proceed ecologically (ecosystems adapt), socially (food security) and economic development.

Climate change mitigation activities are beyond the stabilisation of concentrations of GHGs in the atmosphere, but they also can contribute to development of the local people as in the REDD

initiatives. Mitigation activities are debated by national and international institutions, and in this regard, Jackson (2011) points out that,

The Intergovernmental Panel on Climate Change (IPCC) was established by the World Meteorological Organization and by the United Nations Environment Programme in 1988. As an agency of the United Nations (UN), the IPCC seeks to use the information it provides as a tool for promoting its human development goals. It is considered by many to be the most important source of information on climate change. It seeks to be a model for scientific interaction and government policy making so that it can be policy relevant, but not policy prescriptive. The work of the IPCC is organized in panels that meet in plenary sessions. The panels are called working groups, of which there are three. Working Group I deals with the scientific basis of climate change. Working Group II reviews impact, vulnerability, and adaptation arising from climate change. And Working Group III deals with mitigation because of impacts that arise from climate change.

The present research focuses on the mitigation strategies in the forestry and energy sectors in both the Democratic Republic of the Congo and the Republic of South Africa. Forests play a major role in carbon sequestration and carbon storage. However, the use of energy sources with low carbon emission is also recommended.

At the global level, since 1970, GHG emissions from the energy supply sector have increased by over 145 %, while those from the transport sector have increased by over 120%; as such, these two sectors represent the largest increase in GHG emissions (IPCC, 2007). The emissions of the industry sector have increased by close to 65%, LULUCF (land use, land-use change and forestry) by 40%, while the agricultural sector (27%) and the residential/commercial sector (26%) have experienced the slowest growth between 1974 and 2004 (IPCC, 2007a).

The figure 1 indicates that at the global level, the first three sectors with a high proportion of emissions are the power supply, industry, and forestry.

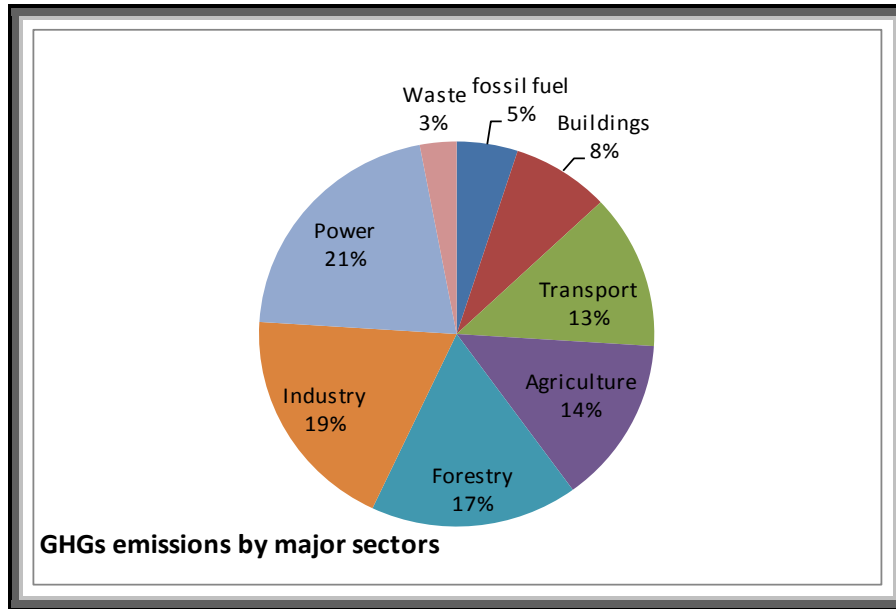


Figure 1: Global Contributions of Major Economic Sectors to GHG Emission

Source: UNFCCC (2009:2)

Table 1 shows that in the Republic of South Africa, the Energy sector emits more greenhouse gases than other sectors. Unfortunately, emissions from the Land Use, Land-use Change and Forestry are not estimated. Therefore, the present research focuses on the forestry and energy sectors with respect to the SADC, and the following table (Table 1) summarises the emissions by sectors in the Republic of South Africa:

Table 1: Greenhouse Gas Emissions by Sector in South Africa, 1994 (DEAT, 2004)

Sectors	Gg CO2 equivalent	% of total
Energy	297563.46	78.4%
Industrial processes	30386.21	8.0%
Solvent and other product use	NE	NE
Agriculture	35461.51	9.3%
LULUCF	-18615.97	0
Waste	16429.07	4.3%
Other	NE	NE
Total (with LULUCF)	361214.28	100%
Total (Without LULUCF)	379840.25	100%

LULUCF= Land use, Land-use Change and Forestry; NE= Not estimated

Source: Department of Environmental Affairs and Tourism, Republic of South Africa (2004)

Figure 2 shows that in the Democratic Republic of the Congo, the biggest proportion of greenhouse gas emissions comes from the land and forests, which is why the present research is also investigating the forestry sector.

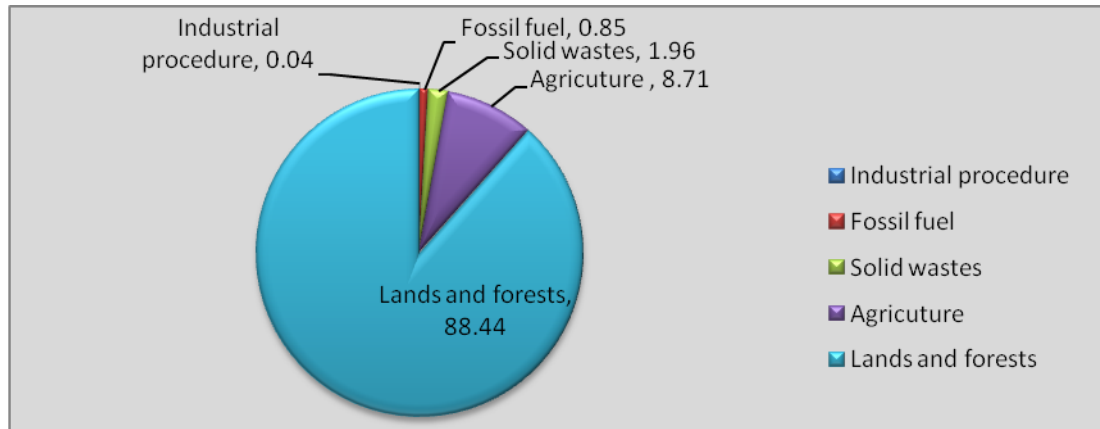


Figure 2: Contributions of Each Sector to GHGs 2003 in the DRC in Percentage

Source: Ministry of Environment, Conservation of Nature and Tourism of the DRC (2009)

There are different sources of GHGs around the world. Some sources might be attributed largely to the activities in the developed countries, such as the energy and industry sectors, and others to developing countries, such as the change in land use, mainly deforestation and forest degradation. All emissions from these sectors have to be reduced in accordance with the agreements signed under the UNFCCC. Thus, the UNFCCC (2009) stated that, in the post-2012 framework, large emission cuts by industrialised countries are needed, and these countries must continue to take the lead in mitigation, given their historic responsibility and economic capabilities. In the same regard, the UNFCCC (2009) acknowledges that developing countries may need incentives to limit their emissions while safeguarding economic growth and poverty eradication, and the need to protect forests as part of efforts to combat climate change.

During the last decade of the 20th century, deforestation in the tropics, and forest re-growth in the temperate zone and parts of the boreal zone remained the major factors responsible for emissions and removals, respectively. However, the extent to which the carbon loss owing to tropical deforestation is offset by expanding forest areas and accumulating woody biomass in the boreal and temperate zones is an area of disagreement between land observations and estimates by

top-down models (IPCC, 2007). Emissions from deforestation in the 1990s are estimated at 5.8 GtCO₂/annum (medium agreement, medium evidence) (IPCC, 2007b).

The forestry sector contributes to the emissions of GHGs mainly in developing countries where governments have tried to protect forests during the past decades. It is well known that, in developed countries, anthropogenic activities have resulted in more GHG emissions than in developing countries. During different negotiations under the UNFCCC, negotiators from developing countries have maintained that developed countries should make funds available for developing countries in terms of compensation. This is because developing countries can play a major role in sequestering GHGs emitted from developed countries. Developing countries are supposed to maintain the good quality of the forests to continue to increase carbon stock and sequestration. Avoiding or reducing deforestation and forest degradation, however, is rather complex.

There is no doubt that forest all over the world need to be protected, as they play a major role in the equilibrium of ecosystems. The IPCC (2007c) demonstrates that,

In the context of global change and sustainable development, forest management plays a key role through mitigation of climate change. However, forests are also affected by climate change and their contribution to mitigation strategies may be influenced by stresses possibly resulting from it.

However, forests also have limited capacities in terms of carbon stock and sequestration. Locatelli *et al.* (2008) explain that, “forests are vulnerable to climate change and implementing forest adaptation measures can reduce the negative impacts.” If climate change takes place and forests are not renewed, then, there is a high risk that these forests could disappear. Although forests can stimulate GHG sequestration when they are not threatened, scientists and developed countries are also working on different technologies to increase the carbon stock. These technologies might not play the same role as the forest, which has a high capacity of carbon stock considering the vast area it covers in the world and the ecological services it provides.

With regard to carbon capture and storage, which is a way of storing GHGs underground or under the ocean, these technologies are not easy to access in developing countries, and they

cannot play the same role as forests because although they can perform carbon capturing and storage, unlike forests, they cannot provide food, firewood and keep biodiversity. In this respect, the protection of forests should be promoted. Forests do not offer only ecological services, but they also play an economic role in the lives of people who depend directly and indirectly on them.

Again, deforestation and forest degradation account for one fifth of greenhouse gas emissions around the world, second only to fossil fuel combustion. While the Kyoto protocol offers no mechanism that aims to stop forest loss, climate negotiators have begun to design a programme to be built into the post 2012 framework that would reward developing countries for “avoiding deforestation” that would otherwise have occurred (McClanahan, 2008).

Unfortunately, the Kyoto protocol did not push developing countries to take action on time by protecting tropical forests. Reducing emissions from deforestation and forest degradation (REDD) is a potential way to regenerate and protect tropical forests. However, REDD is a complex strategy which includes many parameters for its implementation. Developing countries therefore have a key role to play in avoiding emissions of GHGs from deforestation and forest degradation, but countries differ in their commitment to achieve international agreement as well as in their objectives. Whereas activities which aim to reduce carbon emissions and increase carbon sequestration are important, commitment is also a necessary part of strategic development.

According to Parker *et al.* (2009), causes of deforestation are multiple and complex and vary from country to country. Local pressures arise from communities using forests to provide sources of food, fuel, and farmland. It is noted also that poverty and population growth can lead inexorably to the loss of forest cover, trapping people in perpetual poverty. The question of deforestation is a reality in many developing countries. Climate mitigation strategies are uncertain of success when it comes to this dangerous phenomenon of forest loss. Thus, possible ways of achieving success with climate change mitigation strategies include reduction of greenhouse gas emissions in developed countries, or increasing the sequestration and carbon stock of GHGs in developing countries. The implementation of both approaches at the same time might lead to good results.

A major milestone was achieved at COP 11 in Montreal in 2005 when Papua New Guinea and Costa Rica, supported by eight other parties, proposed a mechanism for reducing emissions from deforestation in developing countries (Parker *et al.*, 2009). In theory, the proposed mechanism appears solid, but various factors could hinder its implementation. Causes of deforestation are complex, and strategies to fight deforestation are equally complex. Renewable energy sources constitute a way of reducing emissions of GHGs, but they might also help in protecting the forest. On the other hand, dependence on the forest for firewood also contributes to deforestation. Thus, renewable energy sources do not only decrease emissions of GHGs in the energy sector, they could also contribute to forest protection at a certain level.

In short, this research will examine climate change mitigation strategies in the forestry and energy sectors which are being implemented or envisaged in both the DRC and the RSA.

1.2 The Problem Statement

After repeated warnings from scientists that climate change is already underway and set to accelerate, there are signs that most governments today acknowledge that more effective measures must be taken to tackle global warming. According to Griffiths (2008), it is increasingly recognised that deforestation, particularly in the tropics, contributes between 18% and 20% of all annual global emissions of CO₂, and that in some countries such as Brazil, it accounts for up to 75% of the country's annual release of CO₂ from human activity. Consequently, there is international consensus that future policies to combat climate change must include measures that seek to reduce deforestation in tropical countries.

The Democratic Republic of the Congo is a tropical country, and like most other countries, it is also concerned about GHG emissions even though it has the second largest forest resources worldwide after the Amazon. The country is affected by emissions owing to deforestation and forest degradation.

It has been reported that high temperatures owing to global warming may accelerate organic matter decomposition; hence, it would not inhibit but facilitate the release of carbon into the atmosphere (Hillel & Rosenzweig, 2011). Forests, however, play a major role in regulating global temperatures and carbon sequestration. Thus, Mandla (2011) has raised an important question

concerning the context of afforestation in Africa in the foreword of the book entitled *Green Economy and Climate Mitigation*. The question is how can African governments engage in reducing emissions from deforestation and forests degradation? The forest of the Democratic Republic of the Congo is threatened in different ways through illegal logging and activities related to agriculture. This situation could compromise efforts of climate change mitigation strategies in which different actors are involved.

In the RSA, on the other hand, forestry is a relatively new concept. In fact, the primary species grown for commercial purposes are not native. The country itself varies geographically from low coastal areas to high mountains. As a whole, it is a dry land, where only a relatively small percentage of the total is well suited to forestry. South Africa is reported to have about 1.5 million hectares of forest plantations (24% of which is owned by private individuals), with slightly more softwoods planted than hardwoods. *Pinus patula* and *P. elliotti* are the predominant softwood species while *Eucalyptus grandis* is the main hardwood. Most of the hardwood is used to produce pulp (Donald, 1999). Forestry in South Africa is based in most cases on tree planting because there are a small proportion of the natural forests. The challenge is that only a limited area is suited to forestry because of the dry land and because most lands are owned by private people. How then should we address the issue of increasing CO₂ sequestration by the forestry sector in South Africa?

According to Guiney *et al.* (2012), the South African forest is composed of natural forests ($\pm 0.4\%$), thickets ($\pm 2.4\%$), and the woodlands ($\pm 33\%$). Given these proportions of forests, it is important for South Africa to take strong measures to increase its forest cover.

It has been shown that “when forests are cleared, some of their carbon is released to the atmosphere slowly through decay or quickly through burning. One estimate indicates that land use change, primarily deforestation, releases about 5.9 GtCO₂ (Gigatons or billion metric tons of CO₂) annually, about 17% of all annual anthropogenic GHG emissions” (IPCC, 2007a). Gorte *et al.* (2010) also note that, “most scientists agree that, in the past two decades, tropical deforestation has been responsible for the largest share of CO₂ released to the atmosphere from land use changes. At current rates of deforestation, clearing tropical forests could release an additional 87 to 130 Gt of CO₂ to the atmosphere per year.” Thus, actions should be taken by decision makers to avoid a difficult future. If there were to be double the rate of deforestation in

the DRC, the rate of emissions of GHGs would also increase. Under these conditions, mitigation strategies will be difficult to implement.

There is a REDD Climate Working Group (GTCR - French acronym) of the civil society of the Democratic Republic of the Congo. The National REDD Directorate is still designing the national REDD programme but its effective implementation remains questionable, and it depends on other factors such as the commitment of the government and the promotion of good governance for the implementation of the policies. Thus, climate change mitigation is not yet a reality in the DRC, which, as a developing country, does not have adequate technologies to counter the rate of deforestation. The country relies largely on the expertise of foreigners for climate change mitigation (Diasotuka, 2012: personal communication).

Further,

On governance structures, the civil society deplores the excessive concentration of powers and responsibilities in the hands of the REDD National Directorate (REDD-NC), irregular meetings held by the National Committee and institutional erasure of the inter-ministerial Committee on REDD. All this leads, therefore, to a generalized dysfunction of the governance structures of REDD+ in the DRC (GTCR, 2012).

Thus, projects related to reducing emissions from deforestation and forest degradation cannot succeed without the involvement of local communities or civil society. This might become a major hindrance to the whole process.

Deforestation and forest degradation are not distributed homogeneously on the national territory especially along highly populated areas such as Kinshasa, Lubumbashi, Kananga, Kisangani, Kindu, and the Northern part of the Equatorial Province as well as in the Albertin rift area (North and South Kivu, the eastern part of the Eastern Province). The rate of deforestation in the DRC is estimated at between 0.2% and 0.3% per year which seems to be lower when compared with the worldwide average of 0.6% per year. If nothing is done, the emissions from deforestation in the DRC could be 390 to 410 million tons by 2030 (MECNT *et al.*, 2012).

In addition, the Congolese forests sequester 140 Gt of potential CO₂ emissions, and in 2007, its annual CO₂ emissions were estimated at 190 million tons (UN-REDD, 2012). Although the DRC

forest area is vast, the DRC is among the top ten countries of the world which are losing the most forests cover (MECNT *et al.*, 2012).

Having identified some of the various problems related to climate change mitigation in the DRC, it is important to probe the climate change mitigation strategies by the DRC. The issue of deforestation is not limited to the DRC alone; it is also a concern of other countries of the Southern African Development Community. Thus, it will be helpful to compare the climate change mitigation strategies in the DRC with those of the most advanced countries in the region such as the Republic of South Africa which according to Nhamo (2011) has been recognised as the leading African nation that must show responsibility in terms of mitigating climate change effects.

Mitigation actions in South Africa can be divided into three broad categories:

- Energy efficiency (which reduces the demand for energy, or uses it more efficiently for the same service);
- Changing the fuel mix (moving to lower- or non-carbon-emitting sources); and
- Structural changes to the economy which lower the emissions from it as a whole by shifting economic activities and investment to less energy-intensive sectors, or taking other measures to reduce the need for energy services, such as changing urban planning practices to reduce transport requirements (Winkler & Marquand, 2009).

Different lower or non-carbon-emitting sources in the DRC and the RSA will be compared in this research as well as climate change mitigation strategies in both the forestry and energy sectors. South Africa is classified as a developing country despite its emerging economy, and the fact that it is recognised as the most industrialised country in Sub-Saharan Africa (Chandler *et al.*, 2002).

In many countries, including South Africa, the energy sector is the largest contributor to GHG emissions generation over 90% of all CO₂ emissions. With South Africa's energy sector, the largest source of emissions is the combustion of fossil fuels. Emission products of fossil fuel combustion processes include CO₂, N₂O and CH₄. Based on the IPCC 2006 Guidelines, energy sector emissions sources can be classified as:

- Exploitation of primary energy sources, e.g. coal mining;
- Conversion of primary energy sources into more useable energy forms, e.g. refineries and power plants;
- Use of fuels in stationary applications, e.g. manufacturing industries; and
- The use of fuels in mobile applications, e.g. the transport sector DEAT (2004).

As an industrialised country in Africa, South Africa emits more GHGs from the energy and industry sectors. DEAT (2004) indicates that,

For both the previous (1994) and the current (2000) GHG inventory for South Africa, the energy sector was the largest contributor to GHG emissions. In 1994 it contributed 78.3% of total GHG (DEAT 2004), while in 2000, energy sector emissions amounted to 78.9% (344 106 Gg CO₂eq) of total GHG emissions. Total emissions from the energy sector increased by 15.6% between 1994 and 2000. The largest contributors to energy sector GHGs in the 2000 inventory were energy industries (by source) and CO₂ (by gas), the latter making up 87.5% of total energy GHG emissions. The increase of emissions by 15.6% between 1994 and 2000 poses a huge challenge.

Regarding electricity production, Bazilian *et al.* (2011) critically assess the motivations behind the building of the Medupi coal-fired power station and its consequences for South Africa's climate change objectives. Referring to the pressures that a large proportion of the population without access to electricity will experience as a result of prioritizing climate change in new-build options, they suggest that it is quite possible that the immediate needs of the poor to gain access to electricity services will be put ahead of the impacts of climate change on future generations.

Mitigation strategies contribute to sustainable development. If they are not addressed, future generations might face different problems related to climate change such as desertification, loss of biodiversity, water scarcity and famine.

In addition, Winkler *et al.* (2011) explain that,

Reducing emissions from deforestation and forest degradation in developing countries (REDD+) is regarded by its proponents as one of the more efficient and cost-effective ways to mitigate climate change. There was further progress toward the implementation of this mechanism at the 16th Conference of Parties (COP16) in Cancun in December 2010. Many countries in southern Africa, including South Africa, have not been integrated (do not participate) into the UN-REDD+ programme, probably due to their low forest cover and national rates of deforestation.

The fact that a country has a low forest cover does not stop it from addressing the issue of climate change in the forestry sector. When emissions of GHGs from other sectors increase, it is advisable to consider other alternatives to increasing carbon stocks such as afforestation and reforestation or the protection of existing forests. These three activities should be viewed as national priorities, as in South Africa. Therefore, it is also important to identify different strategies envisaged by the RSA to address climate change in the forestry sector. It is assumed that combining the two approaches, that is, increasing carbon stock and decreasing GHGs from the energy sector can help both the RSA and the DRC to mitigate climate change through forestry and energy sectors successfully.

Energy is the sector that contributes the most GHG emissions in South Africa and internationally. Understanding the mitigation options in the energy sector therefore is critical to any proposed solution to the challenge of climate change. Much of the analysis supporting the international climate change negotiations under the UNFCCC however is insufficiently rooted in the analysis of energy development paths at the national level. Policy options at the national level need to be more fully understood based on in-country analysis (Winkler *et al.*, 2008).

With regard to all these issues, it is important to evaluate climate change mitigation strategies used and envisaged by both the DRC and the RSA in the forestry and energy sectors. The evaluation will help to identify the strengths and weaknesses of existing strategies as well as how these can be improved through alternative recommendations.

1.3 Research questions

The research questions are the following:

1.3.1 Main question

What are climate change mitigation strategies relating to the forestry and energy sectors in SADC with emphasis on the DRC and the RSA?

1.3.2 Subsidiary questions

Besides the main question, the subsidiary questions are as follow:

- What are the existing strategies implemented in the DRC and the RSA to address questions related to deforestation?
- How are national REDD programmes and other organisations contributing to climate change mitigation in the DRC and the RSA?
- How involved or committed are the local communities/peoples to climate change mitigation strategies in the DRC and the RSA?
- What energy sources are used and envisaged by the SADC with specific reference to the DRC and the RSA to mitigate climate change in the forestry and energy sectors?
- What is the level of the remote sensing application in the SADC with specific reference to the DRC and the RSA?

1.4 Objectives

The objectives of the present research are the following:

1.4.1 Main objective

The primary objective of this study is to evaluate climate change mitigation strategies in relation to the forestry and energy sectors in SADC with emphasis on the DRC and the RSA.

1.4.2 Specific objectives

Specifically, the present research aims to:

- Evaluate the performance/efficacy of the strategies currently implemented to reduce the deforestation rate in the SADC with specific reference to the DRC and the RSA;

- Evaluate how national REDD programmes and other organisations contribute to climate change mitigation in the SADC with specific reference to the DRC and the RSA;
- Evaluate how the civil society/local communities are involved in climate change mitigation strategies in the SADC with specific reference to the DRC and the RSA;
- Evaluate what energy sources are used and envisaged in the SADC with specific reference to the DRC and the RSA in contributing to climate change mitigation;
- Evaluate the application of the remote sensing in the SADC with specific reference to the DRC and the RSA.

1.5 The Rationale/Justification for Research

This research focuses on climate change mitigation strategies in the SADC region with specific reference to the DRC and the RSA. Climate change is a current global phenomenon, and because it is not restricted to only a certain number of countries, all nations need to collaborate in efforts to reduce the exposure of their respective populations to climate change, which may affect different sectors of life (health, economic, and social). Poor people are the more affected by climate change effects because they are not able to support the cost of adaptation strategies. As such, it is urgent to explore and review current mitigating strategies and recommend better strategies for the DRC and the RSA.

Regarding the timing and the cost of this research, it is difficult to conduct a study that cuts across the entire SADC region. Hence, the study will compare issues related to climate change mitigation strategies in two countries that have different levels of economic development, the DRC and the RSA. The DRC is chosen because it hosts the second largest forest in the world after the Amazon, which should play a key role in carbon stock and sequestration; and because deforestation and forest degradation, which contribute to emissions of GHGs remain a major challenge. It is important therefore to know how the DRC addresses with the issue of climate change mitigation and envisages mitigating climate change in the energy sector.

Secondly, the study considers the strategies adopted by the RSA because the country is the most industrialised in Africa. Thus, the study has tried to determine how the RSA handles with climate mitigation especially in the energy sector. It is noteworthy that the RSA has low forest coverage, and does not have clear mechanisms for mitigating climate change in the forestry sector. Thus,

the present study has evaluated climate change mitigation strategies in both the forestry and energy sectors in the RSA.

The findings of this study will be useful to decision-makers in the DRC and the RSA, especially those working on environmental issues, environmental NGOs, researchers in the field of environment, and local communities who are mostly affected by climate change and are deprived of certain rights such as access to forest resources that should be managed in a sustainable way. In short, if climate change mitigations strategies are taken seriously, they can guarantee the wellbeing of future generations and promote development. Adaptation and mitigation are two different concepts. Poor countries are not able to support the high cost of adaptation measures but the cost of mitigation actions might be lower than that of adaptation, and mitigation strategies reduce exposure to climate change. Therefore, the scope of the present study has covered the mitigation strategies in both the DRC and the RSA.

It should be mentioned at this point that various programmes have been established by decision makers and NGOs in order to mitigate climate change. One of such programmes in developing countries is the REDD. Other programmes undertaken by various local and international NGOs include reforestation, afforestation, forest protection, etc., as well as initiatives related to renewable energy sources. The present research has evaluated these initiatives in both the DRC and the RSA.

1.6 Purpose of the Study

The purpose of this double case study is to gain a deeper understanding of the climate change mitigation strategies especially in the forest and energy sectors in the SADC with specific reference to DRC and RSA. The research is intended to contribute to the strengthening of academic knowledge on the subject matter, to motivate researchers in furthering climate change studies, and to motivate decision makers to make stronger commitments to mitigation actions. This research focuses on climate change mitigation strategies and reflects on different strategies for reducing greenhouse gases emissions in the forestry and energy sectors in the developing world.

1.7 Definitions of Key Concepts

The definitions of the key concepts are the following:

1.7.1 Climate change

For most people, the expression “climate change” means the alteration of the world’s climate by humans through fossil fuel burning, forest clearing and other practices that increase the concentration of greenhouse gases (GHG) in the atmosphere. This is in line with the official definition by the United Nations Framework Convention on Climate Change (UNFCCC) which states that climate change is the change that can be attributed “*directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods*” (ISDR, 2008).

1.7.2 Mitigation

Along with adaptation, mitigation is one of the two central approaches to the climate change process. Mitigation involves human interventions to reduce the emissions of greenhouse gases by sources or to enhance their removal from the atmosphere by “sinks”. A “sink” refers to forests, vegetation or soils that can reabsorb CO₂ (UNFCCC, 2009). Briefly, mitigation has two important elements namely the reduction of GHG emissions from its sources or the removal of GHS from the atmosphere by increasing carbon sinks.

1.7.3 Strategy

According to Mintzberg (1994), a strategy is a plan, a "how", a means of getting from here to there. A strategy could also be a perspective, that is, vision and direction.

1.7.4 Forestry sector

As in previous studies, the forest sector is defined to cover both forest resources and the production trade and consumption of forest products and services. The analysis of forest resources includes the analysis of biological variables (e.g. forest area, growing stock, increment, fellings and removals) as well as the analysis of forest management and policy related variables (UNCE & FAO, 2005). However, the FAO (2004) explains that there is no commonly agreed definition of the forestry sector. Ideally, the sector should be defined to include all economic activities that mostly depend on the production of goods and services from forests. These would include commercial activities that are dependent on the production of wood fibre (i.e. the production of industrial roundwood, wood fuel and charcoal; sawnwood and wood based panels;

pulp and paper; and wooden furniture). It would also include activities such as the commercial production and processing of non-wood forest products and the subsistence use of forest products. It could even include economic activities related to production of forest services (although it would be difficult to determine exactly which activities are really dependent on forest's services).

1.7.5 Energy sector

The Energy Sector, as defined by HSPD-7, consists of thousands of electricity, oil, and natural gas assets that are geographically dispersed and connected by systems and networks. Therefore, interdependency within the sector and across a nation's critical infrastructure sectors is crucial. The energy infrastructure provides fuel for the nation, and in turn depends on the nation's transportation, information technology, communications, finance, and government infrastructure. The energy systems and networks cross the nation's borders, making international collaboration a necessary component of the sector's efforts to secure the energy infrastructure (United States Department of Energy, 2010)

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter explores the following issues in relation to climate change:

- The strategies for addressing drivers of deforestation;
- The contributions of national REDD programmes and other organisations to climate change mitigation;
- The involvement in or commitment to climate change mitigation strategies of civil society as well as local communities and their members;
- The contribution of energy sources to climate change mitigation; and
- The level of the remote sensing application.

2.2 Strategies for Combating the Drivers of Deforestation

Without forest protection, climate change mitigation strategies are not possible in the forestry sector. It is important therefore to address the drivers of deforestation in this section.

Geist *et al.* (2002) identify two main causes of forest decline namely “proximate causes and underlying causes. Proximate causes include infrastructure development, agricultural expansion, wood extraction, and other factors.” Underlying forces on the other hand include demographic factors, economic factors, technological factors, policy and institutional factors, and cultural factors. It appears that these causes are rather complex. How then can one address them and find a possible sustainable solution? Addressing these issues which would depend on the way each country designed its policy and legal framework should be taken as a priority in order to understand deforestation and reduce its effects. The other question is whether REDD programmes will be able to address these complex issues. To reduce the threats against the forests, people’s benefits from the forests should be substituted in other ways or through other mechanisms. The solution to these issues would not be otherwise easy to implement.

Firewood is a source of energy which in the DRC is used more in rural areas compared to charcoal from trees which is used especially in towns and cities. In the rural and urban areas of

the DRC however, the consumption of firewood and charcoal depends on the type of food being cooked. Clearly, there is a need to plant new trees after having destroyed the forest, but the number of trees which are being cut is higher than what people intend to plant (UNEP, 2013). Thus, alternative energy sources could be one of the potential solutions. The use of alternative energy such as petroleum liquid gas (P.L.G) and solar energy are among successful alternatives to wood energy. The question is how can people in the rural areas have access to electricity, which does not even cover the population in urban areas? The solution appears to lie in the sustainable management of forests.

As argued by the South African Department of Science and Technology (DST, n.d), the South African commercial forests sector contributes more to economy with R14.8 billion in foreign exchange (equivalent to 1 233 333 333.3\$) from exportation products. Many activities in South Africa rely on the raw materials from commercial forests.

It is not bad to get products from the forest for commercial purpose, and though people may remain reliant on forests like in the RSA and DRC, they should distinguish between areas to exploit and other areas that should be considered as protected. The areas to exploit require particular attention, and the renewing of what is being exploited. This should be applied both in the RSA and in the DRC for better conservation.

When there is population growth, there is a need for more land and for the forests to be used in different ways; but population growth can also lead to deforestation. Hence, addressing the drivers of deforestation in order to mitigate climate change is a complex issue. If it is proved that population growth contributes to forest loss, countries should see how to institute demographic policies. The phenomenon of population growth therefore could compromise the mitigation efforts indirectly because the existing forest resources are not sufficient for the population. In addition, if drivers of deforestation are not well defined and well-addressed, it would be actually difficult to reduce emissions from deforestation and forest degradation.

Thus, programmes to reduce deforestation must be accompanied by initiatives to slow the rate of population growth (Grainger, 1990; Waggoner, 1994). These initiatives can help developing countries to decrease the pressure on the existing forests because of high demand due to population growth.

As asserted by Kissinger *et al.* (2012), “people and institutions clear forests in order to derive benefits from them and build infrastructures.” These benefits lead to the destruction of the forest which is followed by emissions of GHGs, and does not promote the reduction of emissions from deforestation and forest degradation. The causes of deforestation arise from differing circumstances in each country. Poor countries, rich in forests, see their forests as a source of funds to cover their economic needs or to pay their debts. Sometimes, the so-called pro-deforestation governments rely more on the forest for economic reasons. The complexity of causes of deforestation requires a thorough analysis which could offer suggestions about strong measures to take in order to reduce deforestation.

Local, national, and international institutions or societies may be involved in forest destruction. It is important to know what prompts all these institutions or societies to clear the forest, who is in favour of these practices, and why. A detailed analysis of these factors is important to stop or reduce forest destruction and degradation, which is the source of greenhouse gas emissions. The drivers underlying deforestation and the extent of the rate of deforestation can be checked by remote sensing analysis over certain periods of time. Arfat (2010) stated that “the remote sensing facilitates the measurement of deforestation rates on an annual basis.” However, REDD also requires such technology. Thus, Ochejo (2003) stated that “it is better know what is going on in our forests to combat deforestation by using the remote sensing which is a powerful tool to provide such information.”

Technologies such as remote sensing should be used in both the DRC and RSA to monitor the rate of deforestation. Unfortunately, the access to this technology is not easy for many developing countries.

The deforestation rate in the DRC (0.3%) is lower than the global average (0.6%). However, it is argued that deforestation (logging, conversion of lands) could become a big issue when stability is ensured and infrastructure is developed. In 2002, almost 40% of the Congolese forests (43.5 million of a total 108 million hectares) were cleared for industrial logging, locked up in 25-year contracts awarded before and during the war (MECNT, 2008).

The battle against the drivers of deforestation should be followed by practical solutions. Thus, governments in developing countries need to reinforce their policies such as the application of the

forestry code to protect forests and to reduce greenhouse gas emissions resulting from deforestation and forest degradation (DRC Forest Code 2002).

On the other hand, Schmook (2011) stated that “there are many causes of forest losses such as fire, hurricanes, or other disturbances which are not anthropogenic, and can lead to unintentional deforestation.” The opposite is the deliberate deforestation.

Although the drivers of deforestation are complex, they have a common origin, that is, in human activities. Threats related to forests can be reduced based on the goodwill of human beings. Self-interest may not be overlooked in this phenomenon of deforestation. The forest and biodiversity can be destroyed, but human beings target only what benefits them.

According to UNFCCC (2011), REDD+ initiatives have been used to address drivers of deforestation in the UNFCCC negotiations referring to the decision 2 of COP 13 in Bali. This decision encouraged parties to address drivers of deforestations using different actions.

It is important for different populations and decision makers to understand that there is a relationship between deforestation and climate change as deforestation contributes by 20% to global GHGs (IPCC, 2007). This shows that this issue should be considered as a priority. Climate change mitigation cannot become a reality unless the drivers of deforestation are addressed. Otherwise, the emissions of GHGs from deforestation will continue to increase in developing countries.

Meetings on environmental issues continue to take place on national and international levels. The problem is whether there is feedback of environmental issues under discussion to local communities. It is good to explore a range of actions as stated above by the UNFCCC; but the question is, what approaches are being used? Are they top down and bottom up approaches or a combination of approaches?

The bottom up approach seems to be the best, because it involves local people in a series of activities to find a solution (UNFCCC, 2010). Addressing the drivers of deforestation is crucial to mitigating climate change in the forestry sector.

According to the UNFCCC (2012), in paragraph 68 of decision 1/CP.16, “all parties are encouraged to address drivers of deforestation and forest degradation. Addressing the drivers is important for reaching the collective aim to slow, halt and sustainably reverse forest cover and carbon loss.” All countries including the DRC and the RSA are invited to act and reduce deforestation. Sometimes people assume that providing a list of the drivers of deforestation is the same as addressing them. However, this step should be followed by concrete actions such as the right application of the forestry code and laws. In this case, addressing the drivers of deforestation should be a priority of governments and communities. If governments do not prioritise implementation, the issue of deforestation will remain a vicious cycle.

On the issue of national level interventions, Börner (2011) states that “national decision-makers in REDD+ have three complementary means to affect drivers at national to local levels, incentives, disincentives, and enabling measures.” Clearly, certain incentives can help to address drivers of deforestation and these include measures to encourage forest protection such as payment for environmental services, credit guarantees, alternative revenue generation activities, and alternative to fuel wood and charcoal. Awareness on the part of all stakeholders, however, is important in taking action. Awareness leads to decision, and decision brings change. The change needed is to avoid deforestation in order to reduce emissions from deforestation and forest degradation. Interventions and strategies for addressing drivers of deforestation are important, but awareness is a key element not only at the international level but also at national and local levels. Further, disincentive measures such as taxes to discourage deforestation may slow down deforestation activities. Unfortunately, such measures may fail because of corruption in many developing countries. Regarding the enabling measures, adequate governance, enforcement, policies and land-use planning as well as secure land tenure should be in place.

Kissinger and Herold (2012) offer a series of strategies for addressing drivers of deforestation and forest degradation such as “sustainable forest management, fuel wood efficiency/cook stoves, institutional strengthening, community forest management/CBFRM, agro forestry and international interventions.”

Unfortunately, there is a wide gap between these strategies and their implementation. Sustainable forest management is a complex intervention which requires training and the involvement of local communities. Nowadays, the bottom up approach has become a slogan. Institutions working

with forest dwellers do not involve them in the processes, as they should. For example, when it comes to financial issues, the latter are excluded. Why talk about sustainable forest management but not sustainable management of funds allocated to forest management? There is no doubt that these issues militate against the good management of the forest. However, if we consider the number of forest dwellers, the question that arises is, what proportion of these people has been trained in sustainable forest management, or how many of those who have been trained organise feedback to other stakeholders? In this situation, the management of these activities requires transparency, awareness, and personal and collective decision making.

Regarding fuel efficiency wood /cook stoves, in most of cases, “efficiency” comes to mind only when there is scarcity of a given product. The availability of abundance of wood does not necessarily persuade people to use it efficiently. Although the DRC hosts the second largest forest in the world after the Amazon, the Congolese people living near the forests probably assume that they have enough wood therefore there is no need to use it efficiently. Efficiency is well understood in the situation of scarcity. It is important, however, to use wood efficiently in situations of both scarcity and abundance. Efficiency in abundance is a key to development.

Improved cook stoves are being promoted by certain environmental NGOs. These special stoves help people to use energy sources efficiently especially charcoal from wood, but access to these stoves is another problem and one wonders how many people in need of these stoves actually have easy access to them. Are these stoves as easily accessible in rural areas as they are in urban areas? The answers to these questions depend on the place and on local circumstances. If these stoves were accessible to a large number of people, they could have a positive impact on forests and the reduction of GHG emissions. However, people should also know why they use them. It is not only for economic reasons, but also for the protection of environment. As earlier mentioned in a quotation from Kissinger and Herold (2012), institutional strengthening is also another strategy for addressing the drivers of deforestation.

Illegal logging is done with no respect for the laws relating to the exploitation of the forest. It is supposed that a country that has a government is able to control all the activities in its national territory. The authority of the state is also supposed to be felt everywhere. How is it then that the state is not aware of illegal logging in its territory? Could it be that illegal logging is favoured by the state? It is difficult not only to control illegal logging, for example, in a situation of war, but

also to apply the law in areas which are not controlled by the government. However, we observe that illegal logging takes place even when the authorities are aware of it. This is a sign of corruption. The research therefore calls for governments which are pro-deforestation. Decision makers should apply policies and laws related to forest protection.

The forest management community/CBFRM/Participatory Forest Management is a key element in forest conservation. However, as mentioned above, the participation of the community should be effective and not limited to a few areas. Local communities should be as committed to forest protection as the government. This is possible if the government respects their rights and involve them in the whole management processes. The term “participatory”, from the verb “to participate”, reflects the complete involvement of all stakeholders. The other the strategies listed above require a high commitment of stakeholders in order to succeed. These interventions seem complex; therefore, their implementation requires both goodwill and a good plan.

According to Alden-Wily (2002), in South Africa, “the Forest Law of 1998 allowed for communities to apply to manage any forest by agreement with the government.” In addition to these changes, a Participatory Forest Management Strategy and support unit operates under the Department of Water Affairs and Forestry, working through Focus Groups in various parts of the country. The involvement of local communities in the management of the forest can be a key to success in both the RSA and the DRC.

Regarding internal interventions, consumer countries and producer countries have a range of tools and interventions to address international activities which drive deforestation. These tools should be respected by all stakeholders in order to have a greater chance to affect driver activity and increase the carbon stock in the existing forests.

2.3 Contributions of the National REDD Programmes and of other organisations to climate change mitigation

Since the publication of the IPCC Fourth Assessment Report (AR4), there have been a few new estimates of the greenhouse gas mitigation potential in either agriculture (Smith *et al.*, 2008), forestry (Kindermann *et al.*, 2008; Golub *et al.*, 2009; Sohngen, 2009; Rose & Sohngen, 2011), or across the land based sectors. The focus of the present research is not the mitigation potential in agriculture, but

in the forestry sector of the DRC and RSA. Regarding mitigation in the agriculture sector, Smith *et al.* (2010) stated that “the challenge of reducing agricultural GHG emissions is intricately linked with the other challenges related to sustainable agricultural production.” However, the present investigation is different from the mitigation in the agriculture sector that deals more with the sustainable agricultural production.

According to Millar *et al.* (2007), “mitigation strategies include options to sequester carbon and reduce overall greenhouse gas emissions.” REDD programmes; afforestation and reforestation are also mitigation strategies to reduce greenhouse gases emissions from deforestation and forest degradation. That is why the present research is investigating on how climate change is being mitigated in the forestry sector of the DRC and RSA.

Climate change can be addressed by mitigation (reducing the sources or enhancing the sinks of greenhouse gases) (Locatelli *et al.*, 2011). The forest in the present research is considered as a source and sink of the carbon dioxide. That is why it can be used to address climate change.

In addition, Canadell and Raupach (2008) stated that “forests can contribute to climate change protection through carbon sequestration as well as offering economic, environmental, and socio cultural benefits.” REDD programmes have a double contribution. They contribute to environmental protection, and at the same time are supposed to contribute to local communities’ development through different alternative activities funded by projects, and carbon credit funds if programmes are successful.

Millar *et al.* (2007) explain that “mitigation strategies include options to sequester carbon and reduce overall greenhouse gas emissions.” The main option that is addressed in the present research as a carbon sink is the forestry sector.

Reducing Emissions from Deforestation and Forest Degradation in developing countries (REDD) is a proposed environmental financial mechanism to address forest conservation and climate change mitigation (Kilawe *et al.*, 2010). Sustainable forest conservation and management are important elements in the REDD process.

Sathaye *et al.* (2007) stated that “the reduction of deforestation and degradation contributes to the increase of carbon stock in the short term per ha and per year globally, and about 350-900

tCO₂/ha are not emitted when deforestation is prevented.” Mitigation in the forest sector is the one alternative for developing countries. The concern, however, is how to make it succeed when measures to avoid deforestation are not yet successful. Unfortunately, REDD is not yet a reality both in the DRC and RSA. This programme should be part of the priorities of the governments of the DRC and RSA.

Dixon *et al.* (1994a) are of the opinion that forest ecosystems merit consideration in biogenic mitigation strategies because they can be both sources and sinks of CO₂. As mentioned earlier, the idea from Dixon *et al* is related to REDD programmes because the latter are used as sinks of CO₂ to get carbon credits. Developing countries that have protected their forests are supposed to use the forestry sector as a sink of CO₂, but not a source of CO₂ emissions.

Even though some degraded lands are unsuitable for forestry, there is considerable potential to mitigate CO₂ by better management of forest lands for C conservation, storage, and substitution (Sathaye *et al.*, 2000). The sustainable forest management is part of REDD+, and merits more attention in the climate change mitigation through the forestry sector.

According to Winkler *et al.* (2008), to achieve the objective of the UNFCCC, deeper emission reductions will be required in all developed countries, but the growth of emissions in developing countries also needs to slow rapidly. Involvement of developing countries may take several forms.

Many options can be used to mitigate climate change depending on each sector. In developing countries, however, the forestry sector is the practical option, to which can be added the potential of renewable energy sources. The present study focuses on the forestry and energy sectors both in the DRC and in the RSA. In the DRC, hydropower is used more in towns and cities but the power supply is not frequent. This situation forces the people to use firewood as a source of energy. On the other hand, in South Africa, a part of energy is produced from coal plants, which are sources of pollution.

Parker *et al.* (2009) stated that “local communities depend on the forest as a source of fuel, food, medicines and shelter”. Thus, the implementation of REDD projects should not deprive the local

communities of their rights to exploit some forest products. The exploitation should be done according to policies related to the forest management.

In the same perspective for a better forest conservation, Tacconi *et al.* (2010) show that REDD would require the provision of financial incentives to developing countries to conserve their forests which could include payments for forests' dwellers.

Each country including the DRC and the RSA must have issued policies that would protect forest resources before the REDD process came out as in the case of Costa Rica which tried to organise the payment for environmental services despite financial issues in order to motivate forest dwellers. In the case of REDD, if funds are available, they have to be managed in a sustainable way. The involvement of local communities in all activities is very important in order to maintain transparency in the whole process. For this reason, Guiney *et al.* (2012) argue that in South Africa, local communities are important in the development and implementation of REDD+.

In addition, the legal decree establishing the monitoring structure, adopted in November 2009, mandates the National Directorate team in the DRC to “encourage and ensure a participatory approach to the REDD process through the involvement of, and consultation with, the stakeholders”. However, the involvement of all “stakeholders” is not guaranteed. According to reports received from the civil society, most local communities have not even been informed about the process and lack knowledge about REDD and its implications (Forest People Programme, FPP, 2010). This is a big challenge for the DRC because people who are supposed to contribute to the success of the project are not even aware of what REDD is all about.

According to Andrews *et al.* (2011), REDD in developing countries was first considered during the COP 11 in Montreal (2005) and was later included in the Bali Action Plan (BAP) (2007). It was RED at the beginning and progressed to REDD and lastly to REDD+.

A detailed analysis was carried out by the DRC National Ministry of Environment and civil society organisations before it was shown how deforestation and forest degradation contribute to greenhouse gas emissions. The agreement that was signed by the participant parties was good. The implementation of the agreement, however, requires more effort and good will of all the

parties. The importance and objectives of REDD should be publicised to create greater awareness – in schools, universities, and other sectors, because it is a new concept to many people.

Similarly, Andrews *et al.* (2011) also explain that the Cancun conference agreements in 2010 (COP 16) contained provisions for adaptation, mitigation, finance, REDD+ and helped to solidify the central role of the UNFCCC within the international climate policy.

Clearly, REDD, mitigation, and adaptation actions require funds. The three elements cannot be achieved without the availability of funds but mitigation and REDD converge. The concept of mitigation can be applied to all sectors but REDD, in its philosophy, is oriented only towards the forestry sector. REDD cannot be achieved without forest dwellers. For Dooley (2011), the goal of REDD is to slow the loss of forest cover and carbon emissions. Therefore, there is a need of addressing the drivers of deforestation.

Mitigation in the forest sector is possible if the forest cover is restored. The REDD process requires financial means to make it a reality. The idea of good governance is very broad, but in the forest sector, it reflects the sustainable management of forests. Before the implementation of REDD activities, it is important to know who the owners of the land or forest are to prevent conflicts. Good governance is also a key element in addressing the drivers of deforestation and managing the incentives for stakeholders well.

Body (n.d) highlights that measuring, reporting and verifying emissions reductions is important to slow climate change and promote transparency between nations.

Reducing emissions from deforestation and forest degradation was not part of the Kyoto protocol. In the forest sector, the estimates of emission reduction can be appreciated only by comparing previous emissions to the present ones. Developing countries are also supposed to measure and report whether there was improvement in forest mitigation activities. The success of mitigation in the forest sector is to prove that deforestation is slowing down and the carbon stock is increasing. Thus, remote sensing is used in the forest sector to appreciate the rate of deforestation. Incentives become more meaningful when the carbon sequestration increases and emissions from the forest are reduced.

In the same vein, Body (n.d) is of the opinion that since the Bali Action of 2007, “MRV” has become a significant concept because it presents the results of developed countries’ mitigation commitments and provides transparency on developing countries’ mitigation actions.

Both developing and developed countries are invited to reduce emissions of GHGs through different methods. Historically, developed countries are responsible for high emissions of GHGs, and they should slow down these emissions by respecting their commitments under the UNFCCC negotiations. However, developing countries are also invited to prioritise the reduction of GHGs from deforestation and forest degradation. They should not wait for international funds such as in REDD initiatives. Governments can implement afforestation and reforestation without assistance from outside. This is very important because with climate change, populations from developing countries are more vulnerable than those from developed countries. Climate change mitigation has greater benefits for developing countries.

Winkler *et al.* (2011) further note that, “as dry biomass is approximately 50% carbon, forests play an important role in the global carbon budget, by acting either as sinks or sources of carbon”. Besides its ecological role, the forest is good and is a source of wealth. All developing countries should be able to improve the state of their forests and not transform them into a source of gas emissions. The goodwill of each state could make this possible at a certain level, and incentives related to the forest protection may not have significant impact if governments do not show transparency in their management.

According to Castillo *et al.* (2012), “the Intergovernmental Panel on Climate Change (IPCC) in its last assessment (2007) noted that reducing deforestation is the mitigation option with the largest and most immediate carbon stock impact in the short term per hectare and per year globally”. Mitigation through forests should be considered as a priority by policy makers. This option was overlooked at the beginning of the negotiations under the UNFCCC. Nowadays, all stakeholders are requested to collaborate and make the mitigation strategies a reality.

Increasing forest area and enhancing productivity of existing forests are two options being considered by US policy makers to mitigate global climate change through the sequestration of carbon in forests and forest products (Alig *et al.*, 1997). The RSA and DRC should see how to

expand areas of forests in their respective countries in order to sequester more carbon and increase its productivity.

As mentioned earlier, climate change affects forests and contributes to its degradation. That is why Dale *et al.* (2001) stated that “some disturbances, such as fire, insects, disease, and drought, are due to climate change and destroy forests.” Thus, climate change should be prevented by sequestration of more carbon in the forestry sector.

Fearnside (2000) stated that “the most pressing question regarding sinks in the land-use change and forestry (LUCF) sector is whether avoided deforestation can be made a viable mitigation option under the Kyoto Protocol.” In the LUCF aspect, the present research analyses more the forestry, and REDD+ programmes are not possible without the identification of drivers of deforestation. That is why Birdsey (2006) stated that “recent data and knowledge of the general behaviour of forests after disturbance suggest that the rate of forest carbon sequestration is declining.” The increase of the forest carbon stock is possible if forests are well managed, and this is the objective of REDD+ programmes. Mckechnie *et al.* (2011) also add that forests can contribute to greenhouse gas (GHG) mitigation strategies through capturing and storing atmospheric CO₂. Forests need to be protected so that they can play correctly the role of capturing carbon from the atmosphere.

2.4 Roles of Civil Society/Local Communities/ Indigenous People in Climate Change Mitigation Strategies

Climate is a global phenomenon with potentially catastrophic effects on the economically and politically marginalized social groups in many areas of the world (Adger, 2001). As poor communities are the most affected by climate change, they should be involved in climate change mitigation strategies.

There is increasing potential for African countries and small-scale farmers to be involved in voluntary markets for carbon and international market mechanisms such as the CDM (Clean Development Mechanism) (FAO, 2010). Voluntary markets for carbon and international markets are not possible without the involvement of local communities.

Strategies to reduce carbon emissions through community based afforestation and reforestation projects, agro forestry and REDD+ to reduce deforestation are being tested and adopted (Gordon, 2010). Projects related to climate change mitigation in the forestry sector cannot be successful without the community involvement.

In other circumstances, as mentioned by Schelhas *et al.* (2010), community members have been trained in reforestation and given access to forest land on which they can plant trees, and get economic benefits. It is a way of involving communities in climate change mitigation activities and contributes to the promotion of the ownership.

The accelerated loss of forest vegetation is often perceived to result from increased unsustainable exploitation by poor rural populations for their livelihood needs (Kalame *et al.*, 2010). The loss of forest can be prevented if the ownership has taken place.

International efforts to address global climate change include Africa's forests, for example through efforts to reduce emissions from deforestation and forest degradation (REDD) (Sandker *et al.*, 2010). It is the case of the present research that deals with climate change mitigation strategies in the forestry sector.

Schelhas *et al.* (2010) state that "the success of these efforts depend on how programmes are designed to estimate the current forest carbon stocks." Estimating the carbon stock is important, but should be coupled with the community involvement.

According to Lund *et al.* (2010), "increased attention is being paid to climate change mitigation but while ambitious national targets are hard to come by, several regions, cities, towns, institutions, and communities have taken matters into their own hands." Rather than await international agreement or national targets, communities and governments have established their own ambitious targets for reducing carbon dioxide emissions and are in the process of finding ways and means to meet these targets.

The success of projects is possible if community members are involved from the point of design to implementation. This is also applicable to climate change mitigation strategies. Climate change is a challenge for all communities especially those living in poor countries. Such communities need to understand the phenomenon and the level at which they can contribute in order to avoid

exposure to effects of climate change. Working without the involvement of the community is possible. However, if communities are not involved in such activities, the projects hardly succeed. Communities often feel that whatever is done for them without them is somehow against them. Individuals or civil society members should be made to feel that they are central stakeholders in climate change mitigation activities. The role of mitigation is already well known to governments. Decision makers therefore should sensitise community members to the issues and not wait until international agreements take place. When the water cycle is disrupted because of massive deforestation, local communities are the first to suffer from the lack of equilibrium that ensues.

For this reason, the civil society's working group in the DRC stated in October 2009 that it was seeking to increase its involvement in the work with the National REDD team. The working group expressed particular concern about the delay in setting up consultations (Civil Society, 2009). Civil societies in both the DRC and RSA should take up their commitment to climate change mitigation.

Regarding civil society's involvement in the REDD process, Agrawal *et al.* (2011) stated that "REDD+ has created a global network of many actors from the civil society over the past decade, and has brought them to be active in policy debates, international negotiations and REDD+ projects."

It is good to involve civil society members in the REDD process and to show how they will participate actively in its implementation. The protection of the rights of civil society members and indigenous people can be defined clearly in reports and declarations. However, when it comes to implementation these rights might not be respected. What then ensures that they are respected, and if they are not respected, who should do follow up the situation? These questions are very important and constitute a key element in involving local communities in mitigation strategies.

Castillo *et al.* (2012) are of the opinion that "despite widespread recognition that local ownership is a key to REDD+ success, the scope and intensity of their participation has not always been adequate and often there is lack of clarity about their role in implementation". Local ownership is at the centre of the implementation of REDD projects. Local communities are supposed to

participate actively in these projects, and their roles should be well defined. Their involvement is necessary for the success of these mitigation projects.

On the other hand, Castillo *et al.* (2012) state that in addition to being owners of carbon stocks, “local communities are also recommended to participate in other mitigation activities such as producing renewable energies and natural resources’ conservation projects.”

Mitigation through forests and renewable energy sources are two key areas in which local communities should be actively involved even if their roles in these activities are not yet well defined. Policy makers should work on these issues by clarifying the roles which local communities can play in the process.

Emissions from developing countries are projected to increase substantially in the coming years. Energy decisions made by indigenous peoples therefore could greatly affect efforts to limit total global emissions. Indigenous and local peoples are participating in various important Clean Development Mechanism (CDM) projects (Castillo *et al.*, 2012). The involvement of indigenous people in mitigation activities is not yet noticeable in developing countries. A high number of local communities do not know what mitigation is or why it should be promoted. Active participation is possible if communities knew of the advantages of mitigation activities. In general, the policies of countries should give room to local communities to express themselves and to contribute freely to the reduction of greenhouse gas emissions. Thus, Badrinarayana *et al.* (2013) suggest that “REDD+ could offer an effective vehicle for addressing the multiple threats faced by indigenous forest-dwellers.” The potential can be realised in Brazil only if REDD+ is designed and implemented in a way that promotes the participation of indigenous people equitably.

Regarding the DRC, UN-REDD presents the engagement of indigenous peoples and civil society in REDD processes as a good example, nonetheless, it states that the implementation of the right to free, prior and informed consent (FPIC) is still at the definition stage (Decree No 09/40 of 26/11/09 of REDD creation in the DRC). The involvement of indigenous people can be effective if their rights are respected. Therefore, the DRC government should take into account the active participation of communities in the REDD process and should promote their rights.

In addition, Guiney (2011) notes that “there is no formal policy/strategy on REDD+ in the RSA.” However, national policies are in place to address the role of communities in the environmental protection. The South African government should also seek to make REDD activities a reality by involving local communities. However, during this process, the rights of local communities should be respected.

2.5 Contributions of Energy Sources to Climate Change Mitigation

Renewable technologies are considered as clean sources of energy and optimal use of these resources minimize environmental impacts (Panwara *et al.*, 2011). There is a relationship between energy sources and climate change. A good choice of energy sources can reduce greenhouse gases emissions.

According to Bruckner *et al.* (2014), “options to reduce GHG emissions in the energy supply sector reduce the lifecycle GHG emissions intensity of a unit of final energy (electricity, heat, fuels) supplied to end users.” The reduction of GHG emission in the energy sector is possible if people can use efficiently the available energy sources especially by shifting to the use of renewable energy sources.

As Africa has only 9.5% of the world’s proven oil reserves and contributes 12% to global oil production, the need to switch to renewable resources is great. Of the 54 African countries, only four are exporters of oil, while the majority are net energy importers. The renewable energy revolution in Africa could imply substantial benefits for climate change solution and development policy, locally and globally; and curbing problems associated with fossil fuels is now a worldwide priority (Bamiloke *et al.*, 2011).

As mentioned in the previous paragraph, Africa has no justification for relying on fossil fuels since it has enough potential for exploiting renewable energies which can lead to the reduction of GHGs. The challenges with respect to the exploitation of renewable energies are many such as lack of financial means and technologies. However, African governments should make efforts to train experts in this field and implement projects related to renewable energies. They would have participated therefore in climate change mitigation at a high level.

Moomaw *et al.* (2011) stated that “social and economic developments are not possible if sustainable energy services with low environmental impacts and low GHGs emissions are not available.”

Life is not possible without energy services, which should not be chosen at random, but the first criterion should be to know whether they could contribute more or less to emissions of greenhouse gases. The choice of energy services could be oriented towards energy sources available in a given place or country. This is the case with forest dependent people who are compelled to use firewood as a source of energy. However, before using firewood, it means that trees have to be cut down, and this contributes to forest loss if other trees are not being planted. Therefore, to avoid GHG emissions, alternative energy sources are crucial to living in harmony with the environment.

Moomaw *et al.* (2011) also add that, “renewable energy sources play a role in providing services in a sustainable manner and, in particular, in mitigating climate change”. Governments and policy makers in developing countries are urged to promote development by using energy sources which contribute to climate change mitigation. These renewable energy sources require sufficient financial means, but pilot projects may help decision makers in collaborating with local communities to find a solution in time. By using renewable energy sources, the environment is protected. This relationship between renewable energy sources and protection of the environment should be understood well by all stakeholders.

The energy sources below will not be addressed in a technical way, but the focus will be on whether they contribute or not to climate change mitigation. Bamiloke *et al.* (2011) demonstrate that “renewable energy sources can assist to limit the use of fossil fuels, reduce pollution and lower dependency on imported fuels.” Unfortunately, there are many challenges related to the implementation of renewable energy sources in developing countries.

2.5.1 Bio-energy

According to the IEA (2010), the use of energy from hydropower, wind, solar, geothermal, modern biomass and marine energy is currently increasing, replacing the consumption of traditional biomass in developing countries.

There are two types of biomass namely traditional and modern biomass. Traditional biomass releases carbon dioxide to the atmosphere but modern biomass such as ethanol does not pollute. Biomass energy, which refers to a wide range of natural organic fuels such as wood, charcoal, agricultural residues, and animal waste, is often used in its traditional unprocessed form, and Africa is the world's largest consumer of biomass energy. The use of traditional biomass energy has serious environmental drawbacks, but it remains the source of energy for the majority of the poor.

It accounts for 70 to 90% of primary energy supply in some countries and as much as 86% of energy consumption. In some other countries, biomass energy contributes as much as 97% of the total energy supplies (Bamiloke *et al.*, 2011). In developing countries, the need to shift from traditional to modern biomass is crucial in order to protect the environment by reducing GHG emissions. The use of charcoal from trees is among major causes of forest loss. Charcoal is used more in urban areas than rural areas because of absence of electricity. This contributes to the pollution of the atmosphere. Thus, the advantages and disadvantages of bio-energy should be assessed before tapping into it.

Smith (2010) stated that “using bio-energy can be beneficial to achieve environmental objectives, reduce CO₂ emissions compared to fossil fuels and support rural development efforts.” The bio-energy is important in the present study because its use contributes to climate change mitigation by reducing CO₂ emissions.

Bio-energy is embedded in complex ways in global biomass systems for food, fodder and fibre production and for forest products; in wastes and residue management; and in the daily life of people from the developing countries (Chum *et al.*, 2011).

Biomass is available in developing countries to produce bio-energy. The sensitisation of communities to these practices is not enough. A major challenge is the shortage of experts in the field. In the international accords therefore, it was suggested that developed countries should transfer technologies to developing countries to mitigate climate change. Intellectual property issue also appears to be a barrier to this process. The ethanol from Brazil is one of bio-energy which contributes to climate change mitigation.

In the DRC, it is shown that with efficient collection systems in place, waste from agricultural production can be utilised as fuel for power and heat production (UNEP, 2013). Ignorance is also a factor that prevents Congolese people from using waste from agricultural sector as an energy source. Therefore, capacity building of communities should also be a priority.

In South Africa, there is a demographic trend of urban migration from the countryside. The trend portends a decline in the use of biomass for household energy in the future, although widespread poverty might well counter this decline (Davidson *et al.*, 2006). The use of biomass in South Africa should continue to respond to the energy need of the rural population.

2.5.2 Direct solar energy

Solar energy has many applications such as lighting, comfort heating, hot water for buildings and industry, high temperature solar heat for electric power and industry, photovoltaic conversion for electrical power, and production of solar fuels, for example, hydrogen or synthesis gas (syngas) (Arvizu *et al.*, 2011).

The heat from the sun is real energy which can be used in different ways. It depends on the frequency of the sun's heat in a given place or country. Nowadays, solar panels can be found in many developing countries but access to them is not easy because of financial constraints. Sun heat is available in many developing countries, but solar energy could be compromised by the low frequency of sun heat. In this case, it should be supplemented by some other types of energy sources such as hydropower.

Arvizu *et al.* (2011) affirm that, "solar energy has been considered desirable because it poses a much smaller environmental burden than non-renewable sources of energy." Energy sources should not contribute to emissions of GHGs. Solar energy, despite its high costs, should be considered one of the priorities in developing countries. In the same vein, Bamiloke *et al.* (2011) indicate that, "solar cooking uses the heat of sunlight as a source of energy to cook food. It is low cost and low technology compared to gas, charcoal, or burning wood stoves." Governments in Africa should not wait to undertake complex projects in solar energy. They can even begin by providing solar cookers in order to reduce charcoal use in households for example. This would depend on the goodwill of each government but the main objective of such initiatives is to

contribute to the reduction of greenhouse gas emissions. Therefore, the use of solar energy is possible because Africa is one of the richest parts of the world with access to sun heat.

2.5.3 Geothermal energy

According to Goldstein *et al.* (2011), “the geothermal energy is produced from the Earth’s interior stored in both rock and trapped or liquid water, and it plays an important role in mitigating climate change by reducing greenhouse (GHG) emissions.”

The technique of using geothermal energy fits into the concept of climate change mitigation. However, access to these technologies in developing countries is difficult and a major barrier. Thus, technology transfer under the UNFCCC negotiations is rather crucial.

However, the use of the geothermal energy has some negative impacts on the environment such as noise, vibration, dust, visual impacts, surface and ground water impacts, ecosystems, biodiversity as well as specific geothermal impacts (Goldstein *et al.*, 2011). The impacts should be well controlled by technicians who are in charge of the installations, and technology transfer through international negotiations on climate change should be well handled. In places with volcanoes, it is possible to get energy from the heat underground. In the DRC, especially in Goma town, the Nyiragongo Volcano erupted last in 2002, and people do not get regular supply of electricity. The availability of the technology to tap energy from this volcano could improve the energy supply.

Plans to use the potential of geothermal energy in Eritrea, Tanzania, and Uganda are at different stages. Algeria, Egypt, and Tunisia currently have projects obtaining geothermal energy for direct heat. In some countries, such as Morocco, the geothermal energy available is suitable for direct heat but not electricity (Bamiloke *et al.*, 2011).

Geothermal energy should be tried by African governments in collaboration with local communities. Investigations related to geothermal energy sources should be one of the priorities of African governments.

2.5.4 Hydropower

With regard to hydropower, Kumar *et al.* (2011) explain that “it is produced thanks to the flow of water in rivers, driven by the force of gravity.”

Hydropower is the common energy source in developing countries despite its cost. Some countries like the DRC have large rivers which could help to produce electricity. Their governments, however, do not have money to implement such projects. In South Africa, it is difficult to implement hydropower projects because there are not so many rivers.

Dam construction contributes at the beginning to deforestation and it may also displace a large number of people from their ancestral land. This happens frequently during mega dam construction. Other ecosystems, such as fishery ecosystems, may also be disturbed. Therefore, the advantages and disadvantages of dam construction should be analysed before implementation. It is important to prove that at the national level there is a need to generate energy and to build more dams which can affect the environment. Dams are often built for commercial purposes, and part of the energy could be sold to neighbouring countries for cash. However, this could be a disadvantage to the environment.

The building of larger dams should respect regulations and guidelines to ensure that they could not have negative impacts on the environment. (Kumar *et al.*, 2011).

In the midst of all possible negative impacts of dam construction, governments in developing countries should ensure that these projects do not contribute to greenhouse gas emissions. Thus, Bamiloke *et al.* (2011) affirm that, “hydropower is a renewable, economic, non-polluting, and environmentally moderate source of energy.”

According to the Department of Energy, DoE (2012), “74% of households in South Africa have access to electricity. However, this is limited by the affordability of the connected electricity as well as the quality of that supply.”

It is sometimes difficult in developing countries for people to access electricity even when the country has enough dams. In the case of South Africa, there are not too many rivers to enable the government to invest in hydropower. Therefore, regional cooperation is important in order to import hydropower to South Africa from other countries. In the DRC, the Inga dam is considered one of the biggest dams in Africa. Unfortunately, its existence does not benefit populations because power supply is not frequent and it can be found only in some urban areas.

Clearly, the use of hydropower is more practical for developing countries which have their own rivers. When it comes to international rivers, hydropower projects have to be discussed by riparian countries. These renewable energy sources contribute more to climate change mitigation.

2.5.5 Ocean energy

The renewable resources in the ocean come from six distinct sources, each with different origins and requiring different technologies for conversion. These sources are:

- Waves – derived from the transfer of the kinetic energy of the wind to the upper surface of the ocean;
- Tidal Range (tidal rise and fall) – derived from the gravitational forces of the Earth-Moon-Sun system;
- Tidal Currents – water-flow resulting from the filling and emptying of coastal regions as a result of the tidal rise and fall;
- Ocean Currents – derived from wind-driven and thermo-haline ocean circulation;
- Ocean Thermal Energy Conversion (OTEC) - derived from temperature differences between solar energy stored as heat in upper ocean layers and colder seawater, generally below 1000m;
- Salinity Gradients (osmotic power) – derived from salinity differences between fresh and ocean water at river mouths (Lewis *et al.*, 2011).

These technologies are found in high proportions in developed countries. Countries which are located near oceans such as the Republic of South Africa and the Republic of the Congo in the Bas Congo province, can acquire energy from these techniques.

2.5.6 Wind energy

Denmark aims to provide 40–50% of its national electricity generation from wind power by 2030 and remains the main exporter of wind turbine technology (Sims *et al.*, 2003). Denmark has invested more in wind energy, and it is a model that should be copied by countries with wind energy potential.

Bamiloke *et al.* (2011) notes that, “wind power systems capture the kinetic energy of wind for use as mechanical energy of electricity.” This does not entail the use of fuels to acquire the power. In addition, “wind energy potential is sufficient for electric power generation in coastal regions, and in some interior areas of Africa. Countries with good potential include Cape Verde,

Eritrea, Kenya, Madagascar, Mauritania, Morocco, South Africa and Tunisia” (Bamiloke *et al.* (2011). Pilot projects should be conducted in order to make wind energy a reality in these respective countries.

Wind energy is used for reducing greenhouse gas (GHG) emissions and its production depends on the speed of the wind (Wiser *et al.*, 2011).

Wind is available in many developing countries. However, it is difficult for governments of many developing countries to exploit it as a source of energy. Some areas in a country might not have enough wind. Therefore, a study of all these parameters should be done before the implementation of projects. By its nature, wind energy is important in reducing greenhouse gas emissions.

Wind energy contributes directly to climate change mitigation, and it should be expanded in many developing countries to reduce greenhouse gases emissions. Wind is available but the lack of the expertise in this field pushes people in developing countries to stay without energy and continue to pollute the atmosphere by using non-renewable energy sources.

2.6 Application of Remote Sensing

2.6.1 Definition of remote sensing

According to Nagesh (n.d), remote sensing is an art and science of obtaining information about an object or feature without physically coming in contact with that object or feature. Humans apply remote sensing in their day-to-day businesses through vision, hearing and sense of smell. The data collected can be in various forms – variations in acoustic wave distributions (e.g. sonar), variations in force distributions (e.g. gravity meter), variations in electromagnetic energy distributions (e.g. eye), etc. These remotely collected data through various sensors may be analysed to obtain information about the objects or features under investigation.

As mentioned by the author, remote sensing provides information in distance. It does not require the presence of people on the field where elements of observation are. The feature under investigation in this study is the forest cover which is being transformed by human activities. Firuz Al-Wassai & Kalyankar (2011) explain that remote sensing on board satellites techniques

as a science, deals with the acquisition, processing, analysis, interpretation and utilisation of data obtained from aerial and space platforms (i.e. aircrafts and satellites). Therefore, this science requires more attention and training of people to master all these processes.

Thus, remote sensing is used to detect and measure electromagnetic (EM) energy emanating or reflected from distant objects made of various materials so that the objects can be identified and categorised by class or type, substance and spatial distribution (American Society of Photogrammetry, 1975).

Remote sensing is not only used to do the monitoring of the forest cover, but also other types of ecosystems such as water. It is useful in different domains. This is confirmed by Sajjad *et al.* (2015) who show that the Geographical Information System (GIS) and remote sensing are becoming an important part of watershed management, urban planning, hydrological modelling, drought prediction, and forest cover mapping.

Abdulrahman (2010) also notes that remote sensing is the process of acquiring data/information about objects/substances not in direct contact with the sensor, by gathering its inputs using electromagnetic radiation or acoustical waves that emanate from the targets of interest. An aerial photograph is a common example of a remotely sensed (by camera and film, or now digital) product.

The information which is supposed to be acquired from remote sensing depends on the target of interest. It is the forest cover in the context of this study for both the DRC and the RSA. The concern is to know whether this technology is used in both countries to do the monitoring of the forest cover.

Monitoring carbon in forest plantations using methods based on remote sensing is an important component of REDD+ efforts, and can support country-level assessments (Patenaude *et al.* 2005). REDD is not only a mechanism that contributes to climate change mitigation, but also to development through the credit carbon.

This is related to the remark that monitoring the dynamics of forest biomass at various spatial scales is important for better understanding of the terrestrial carbon cycle as well as improving the effectiveness of forest policies and forest management activities (Wang *et al.*, 2013). It is

very dangerous when there is no follow up of activities in the forests. The monitoring reflects the good management of these activities.

Remote sensing applications include monitoring of deforestation in areas such as the Amazon Basin, the effects of climate change on glaciers and Arctic and Antarctic regions, and depth sounding of coastal and ocean depths (Abdulrahman, 2010).

Briefly, remote sensing helps researchers to monitor inaccessible areas in a short time. As this technology is expensive, Blay *et al.* (2008) demonstrate that ground-based measurements and ground truthing are needed to validate remote sensing results and to provide more reliable estimates of change. The ground truthing is important because it helps the researcher to have the reality from the ground.

2.6.2 The advantages of remote sensing use

According to Koch (2010), the advantages of remote sensing use are the following:

- Full coverage of the area in relatively short time;
- Less costs due to reduced sampling intensity (some satellite data are freely available);
- Visual documentation of the situation and the changes;
- Generation of map data;
- Accessibility of information from terrestrially inaccessible or difficult to access areas;
- Increase of national capacity in mapping, monitoring and reporting;
- More harmonised information assessment for the whole country and
- Retrospective assessment of changes (the changing situation from the past until today).

The above-mentioned advantages can help both the DRC and the RSA to follow their forest cover for many years. This can help them to know whether or not the forest cover was improved, and take strong measures if it is being affected negatively. That is why Zheng *et al.* (2008) stated that “being aware of spatiotemporal changes in forest biomass is particularly important for assessing the effects of different forest management practices and forest policies on forest carbon sequestration.”

The forest carbon sequestration depends on the situation of the forest cover. If degraded, the sequestration decreases, and more CO₂ stays in the atmosphere contributing to the greenhouse effect. In the same vein, Nagesh (n.d) outlines the following advantages of remote sensing use:

- Provides data of large areas;
- Provides data of very remote and inaccessible regions;
- Able to obtain imagery of any area over a continuous period of time through which the any anthropogenic or natural changes in the landscape can be analysed;
- Relatively inexpensive when compared to employing a team of surveyors;
- Easy and rapid collection of data and;
- Rapid production of maps for interpretation.

The advantages of remote sensing use for both authors are the same even if they are given in different ways, but the obtaining of imagery of any area over a continuous period of time depends on the types of remote sensing that is being used. In the case of air-borne remote sensing, images are taken as an aircraft passes above a given area. However, satellite remote sensing gives information in a permanent way. It depends also on whether it is a passive or an active remote sensing.

2.6.3 Disadvantages of remote sensing use

Nagesh (n.d) also outlines disadvantages of remote sensing use as follow:

- The interpretation of imagery requires a certain skill level;
- Needs cross verification with ground (field) survey data;
- Data from multiple sources may create confusion;
- Objects can be misclassified or confused and;
- Distortions may occur in an image due to the relative motion of sensor and source.

The skill used in the interpretation of images is an important aspect which refers to the availability of people qualified in this field. The use of remote sensing in both the DRC and the RSA would make sense if people were already trained in this field. Otherwise, its use does not

make sense and can lead to data misinterpretation. Both the DRC and RSA need to train people in remote sensing technology. Regarding the use of this technology in forest monitoring, Sajjad *et al.* (2015) explain that “geographic information system (GIS) techniques and remote sensing (RS) from satellite platforms offer the best way to identify areas of deforestation.”

The verification on the ground is important even for experts in the field because confusion is evident with images of high and less resolutions. It is the case of for example to know who or what is on the base of deforestation on the ground and distinguish well the forest and non-forest zones.

Similarly, Koch (2010) notes that the following elements pose obstacles to integrate especially space-borne remote sensing data:

- Data availability (can I get the data I need and where can I get it?);
- Weather conditions;
- Long-term perspective for space-borne systems (are the data over long time period available?)
- Problems of clear assignment of areas with or without trees to forest according to the respective definitions;
- Additional costs if existing terrestrial sampling design is retained;
- Limitations to deriving the traditional set of forest parameters from airborne and space borne data;
- Missing technical capacity; and
- Flight permission for air-borne data.

Several challenges are linked to the use of remote sensing but lack of technical capacity and accessibility to data is the major challenge. The spot images with high resolution are expensive and not many developing countries have access to them. The technical capacity requires the training of more people in the field of remote sensing.

2.7 Research Frameworks

Bellow are described the conceptual and operational frameworks.

2.7.1 Conceptual framework

Strategic terms

Strategies for addressing drivers of deforestation

Contribution of REDD programs and other organisations to climate change mitigation

Involvement of local communities in mitigation strategies through REDD and other programs

Energy used and envisaged in mitigating climate change

Advantages and disadvantages of remote sensing

General problem

Insufficient/inefficient mitigation actions/strategies in the forestry and energy sectors in the DRC and the RSA

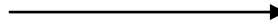


Figure 3: Conceptual Framework

2.7.2 Operational framework

Strategic terms

Strategies for addressing drivers of deforestation

- Application of the forestry code and laws
- Protected areas creation
- Use of the remote sensing

Contribution of REDD programs and other organisations to climate change mitigation

- Carbon emission reduction
- Carbon sink enhancement
- Forest protection
- Implementation of REDD pilot projects

Involvement of local communities in mitigation strategies through REDD and other programmes

- Involvement in REDD activities
- Involvement in afforestation and reforestation programmes
- Involvement in forest protection
- Involvement in conservation program (improved cook stoves)

Energy used and envisaged in mitigating climate change

- Use of renewable energy sources

Advantages and disadvantages of remote sensing use

- Meaning of remote sensing
- Advantages of remote sensing
- Disadvantages of remote sensing

General problem

Insufficient/inefficient mitigation actions in the forestry and energy sectors in the DRC and the RSA

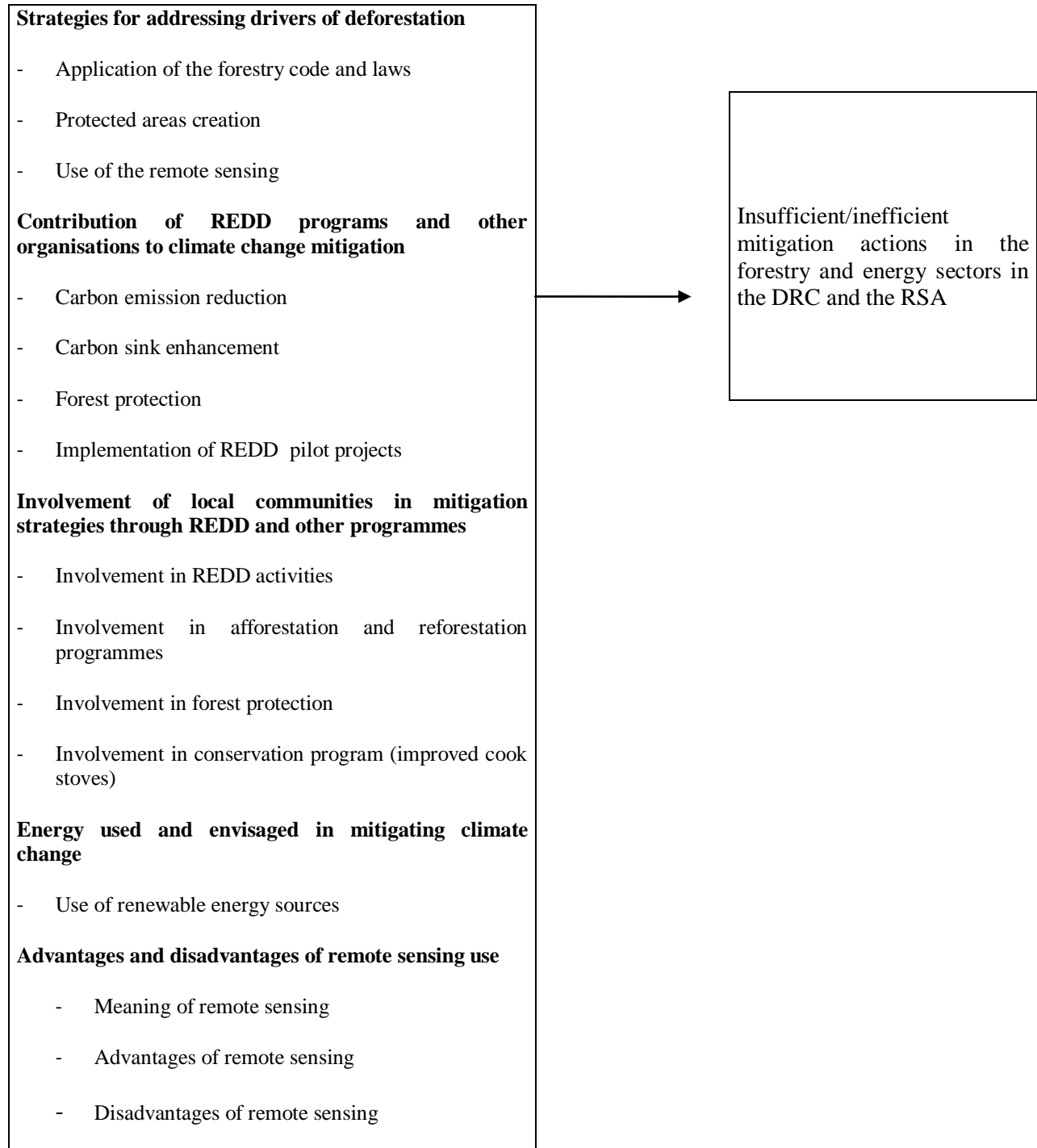


Figure 4: Operational Framework

Personal conceptual and operational frameworks show the relationship between strategic terms and the general problem which is the insufficient mitigation in the forestry and energy sectors of the DRC and the RSA. This frame shows that if strategic terms are reinforced to contribute to climate change mitigation, mitigation strategies will be more improved. These conceptual and operational frameworks are the result of the researcher's field experience.

2.7.3 Operational definitions of terms

These definitions are formulated based on the data the researcher expects to obtain from respondents. Therefore, it is not necessary to cite references for these definitions.

2.7.3.1 Strategic terms

- Use of remote sensing technology - the present research aims to determine whether the DRC and the RSA need to improve their strategies for addressing climate change issues by improving their remote sensing technology and its application in assessing changes in deforestation. It also aims to probe the availability of remote sensing expertise and to clarify whether it could be introduced as a strategic approach;
- Application of the forestry code - this is the use of the forestry code and laws in the DRC and the RSA to protect the forests;
- Protected areas creation – this relates to the creation of places which cannot be exploited by local communities with the aim of environmental protection;
- Carbon emission reduction – it is the contribution of REDD programmes and other organisations to the reduction of greenhouse gas emissions from the forestry sector;
- Carbon sink enhancement – this refers to a set of projects which was and is being implemented to remove the greenhouse gases from the atmosphere;
- Forest protection – this is the use of the forest in a sustainable way. The forest can be used and protected at the same time;
- Implementation of REDD pilot projects – these are projects which prepare countries for their national REDD programmes;

- Involvement in REDD activities – this is the participation of local communities/indigenous peoples/civil society members in the whole process of designing and implementing the national REDD programme;
- Involvement in afforestation and reforestation – this is the participation of indigenous peoples/local communities/civil society members in activities of afforestation and reforestation organised by the local or national governments and local and international environmental NGOs;
- Involvement in forest protection – this is the sustainable use of the forest by local communities/indigenous peoples/civil society members;
- Involvement in conservation programme (improved cook stoves) – this is the use of technologies which emit fewer greenhouse gases by using, for example, less firewood and charcoal from trees;
- Use of renewable energy sources – this is the use of energy sources which do not pollute by emitting more greenhouse gases;
- Remote sensing – concept is defined by the way it is understood in both DRC and the RSA;
- Advantages of remote sensing – benefits from the use of remote sensing in both the DRC and the RSA;
- Disadvantages of remote sensing – limitations that accompany the use of remote sensing in both the DRC and the RSA.

2.7.3.2 General problem

Insufficient or inadequate mitigation actions in the forestry and energy sectors of the DRC and the RSA mean that there is a continuation of GHG emissions from the forestry and energy sectors despite the mitigation efforts made in these two sectors in both the DRC and RSA.

CHAPTER THREE: RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

According to Burns and Grove (2005), “the research design is the supporting structure of a study.” However, Mouton (2001) explains that “the research design focuses on the product: what kind of study is being planned and what kind of results are aimed at?” Mouton (2001) makes a distinction between research design and research methodology, showing that the latter focuses on the research process and the kind of tools and procedures to be used.

3.2 Type of Study

The present study is empirical in character. Mouton (2001) asserts that, “empirical studies use primary data such as surveys, experiments, case studies, programme evaluation, and ethnographic studies”. This research has relied on focus groups and interviews to get primary data. It is also considered as a double case study because it investigates two contexts – the DRC and RSA. Creswell (1998) also affirms that “a case study is an exploration of a bounded system or a case (or multiple cases), over time through detailed, in-depth data collection involving multiple sources of information rich in context.”

Furthermore, this study is also descriptive, evaluative, cross-sectional, and comparative, and uses a qualitative approach. It is evaluative because it has assessed the climate change mitigation strategies in the DRC and the RSA in the forestry and energy sectors, and comparative because it has helped to compare the climate change mitigation strategies employed by both the DRC and the RSA. According to Creswell (1998), “a qualitative study is used because of the need to present a detailed view of the topic.” With regard to the current research, a detailed description of issues relating to climate change mitigation strategies both in the DRC and in the RSA using primary data from multiple sources of information is presented. The study is also cross-sectional because data is collected only once in a given timeframe and not for a long period.

3.3 Delimitation of Research Area

The present study was conducted in the Democratic Republic of the Congo (DRC) and the Republic of South Africa (RSA). The DRC is chosen in this research because it has the second largest forest in the world and has much potential for energy production. However, the energy production can also emit GHG from deforestation and forest degradation. On the other hand, the RSA is chosen because it is advanced fast developing country in Africa and is characterised by pollution from its energy sector. It also has a low forest cover which might not fully help in carbon sequestration.

3.4 Study and Target Populations

The study population is composed of the population of the SADC while the target population entails the DRC and the RSA populations.

3.5 Sample

The present research has used a non-probability sample, mainly, the purposive sample. According to Lavrakas (2008), “a purposive sample, also referred to as a judgmental or expert sample, is a type of non-probability sample.” Mack et al. (2005) add that,

A purposive sampling is one of the most common sampling strategies, group participants according to preselected criteria relevant to a particular research question. Sample sizes, which may or may not be fixed prior to data collection, depend on the resources and time available, as well as the study’s objectives. Purposive sample sizes are often determined on the basis of theoretical saturation (the point in data collection when new data no longer bring additional insights to the research questions). Purposive sampling is, therefore, most successful when data review and analysis are done in conjunction with data collection.

In this study, the choice of the sample is based on a certain number of criteria which include:

- Being a member of institutions or organisations involved in climate change mitigation activities or environmental protection;
- Being a member of local or forest dwellers communities; and

- Being a member environmental civil society's organisations.

As mentioned above, a non-probability sample can be defined as a sample in which all the people in the target population do not have the same chance of being selected as respondents. All participants in interviews and focus groups discussions were selected according to the criteria aforementioned.

Regarding the in-depth interviews and focus group discussions conducted in the DRC, the sample was composed by key informants from institutions involved in the field of environment protection. One individual was selected for interview from each of the following institutions: Gorilla Organisation, Réseau CREF (CREF Network), CERD (Centre for Renewable Energy and Development), North Kivu Provincial Department of Energy, NSK (NOVACEL Pilot REDD+ Project on Agro-forestry in South Kwamouth, and Geographically Integrated REDD+ pilot project around the Luki Biosphere. Other institutions include the FAO's national office, national office of the WWF, the National REDD Directorate, GTCR (REDD Climate Working Group) of the national office of the civil society, Equatorial REDD+ pilot project, OCEAN Geographically Integrated REDD+ pilot project in Isangi, and the WCS Mambasa Forestry REDD+ pilot project, Mambasa Commission of Agriculture, and Eastern Province Directorate of Environment. The others are ICCN Eastern Province, Eastern Province Department of Energy, the YME Great Lakes Beni, Research Centre for Environmental Planning, WCS North Kivu, WWF South Kivu, Jane Goodall Institute (JGI), ICCN South Kivu, South Kivu Provincial Directorate of Environment and Sustainable Development, FFN (National Forestry Fund) North Kivu, WWF North Kivu, and North Kivu Ministry of Environment. The remaining participant institutions are UGADEC Goma (Association of Unions for Gorilla Conservation and Community Development in the Eastern DRC), North Kivu Provincial Directorate of Environment, South Kivu Provincial Department of Energy, UNDP National Office, National Ministry of Energy, National Ministry of Environment and ICCN North Kivu. This means a total of 33 target persons participated after using the snowballing sampling. Each institution selected a representative in the research.

Four focus group discussions were organised with:

- Beneficiaries of the Mambasa Forestry Pilot REDD+ project;
- Beneficiaries of the Isangi REDD+ Pilot project;

- Beneficiaries of the Luki REDD+ Pilot project and
- Beneficiaries of the Eco-Makala REDD+ pilot project.

Given that this study is comparative, similar interviews were organised in South Africa. One person (or a maximum two individuals) was selected for interview from the following institutions: SunFire Solutions Company, the Department of Environmental Affairs (national office), Earth Life Africa, Food and Trees for Africa, the Department of Energy (national office), Energy Research Centre (University of Cape Town), Department of Forestry, Agriculture and Fisheries (national office), Cirrus Group South Africa, WWF South Africa Gauteng office, WWF South Africa Cape Town office and the Federation for a Sustainable Development. This makes the total number of participants 11 target persons in the RSA using the snowballing sampling.

This list of participants suggested at the beginning of the research was not exhaustive. The study combined the purposive sampling with the snowballing sampling in order to get sufficient information on climate change mitigation strategies in the forestry and energy sectors of the DRC and the RSA. On snowballing, Mack *et al.* (2005) note that,

A third type of sampling, snow-balling – also known as chain referral sampling – is considered as a type of purposive sampling. In this method, participants or key informants with whom the contact has already been made use their social networks to refer the researcher to other people who could potentially participate in or contribute to the study. Snow-balling sampling is often used to find and recruit hidden populations, that is, groups not easily accessible to researchers through other sampling strategies.

The strategy of using snowballing has helped the study to receive more information about issues related to climate change mitigation strategies in the forestry and energy sectors of the DRC and RSA. During the interviews, the pre-selected participants directed the researcher to other people who could provide information about issues relating to climate change mitigation actions in the DRC and the RSA.

3.6 Data Collection Techniques and Research Tools

Prior to data collection, the researcher received an ethical clearance from the Department of Environmental Sciences and ensured that the logistics of interview were in place. The recording

equipment and the venue of the interviews were also prepared. In focus group discussions, notebooks and recording equipment were set up before the meetings, and the meeting venue was prepared beforehand to enable participants sit comfortably and in a satisfactory manner.

Different instruments were used to collect data during in-depth and focus groups interviews. The interview guide with open-ended questions was used during interviews with different key informants from the abovementioned institutions and organisations, and focus group discussions were organised with civil society members/ local communities/indigenous people who are beneficiaries of different REDD+ pilot projects. The suitable instrument for collecting data in focus group discussions was the focus group guide with open-ended questions. The interview is the data collection technique which was used to acquire data from the respondents.

According to Mack et al. (2005),

In-depth interviews are useful for learning about the perspectives of individuals, as opposed to, for example, group norms of a community, for which focus groups are more appropriate. They are an effective qualitative method for getting people to talk about their personal feelings, opinions, and experiences.

During the data collection, the research participants described their own experiences and shared their own views about climate change mitigation strategies in the forestry and energy sectors. Data collection was carried out first in the Democratic Republic of the Congo, and then in the Republic of South Africa.

3.7 Data Analysis

The views of key informants were summarised in tables based on similar views and differences. Regarding focus groups, information from participants was summarised in tables and similarities and differences were highlighted. The results from the DRC were then compared with those from the Republic of South Africa. Bernard (1995) notes that, “in judgment sampling, it is not even necessary to decide up front what kinds of units of analysis to study.” Nevertheless, the present research being a double case study, probes the unit of analysis which is composed of climate change mitigation activities and programmes which are implemented in the forestry and energy sectors of the DRC and the RSA. Data collected were described, and a thematic analysis was

done of this qualitative study. A manual method was used during the analysis, which means that the analysis was not computerised. The thematic analysis helps to identify the similarities and especially the differences between the elements in a comparative study. During the analysis, data were coded manually and grouped into categories or objectives. In addition, the thematic analysis was used to develop categories into themes which were considered as climate change mitigation strategies in the forestry and energy sectors. However, the strengths and weaknesses of these mitigation strategies were also obtained from these themes.

3.8 Data Quality

The researcher did not explain the purpose of the study and research tools to the participants before the inception of the focus group. The reason for this is that respondents could influence one another, and data collected could be biased due to lack of objectivity.

If the record equipment broke down or participants refused to have their statements recorded, the researcher made a quick analysis of such data immediately after the focus group or interview so that he would not forget and would be able to reproduce all responses provided by the participants. If this was not done, the quality of data could be affected negatively.

Regarding reliability and validity, both concepts are more used in quantitative research but the present research is qualitative. It seems that when quantitative researchers speak of research validity and reliability, they usually refer to a research that is credible but the credibility of a qualitative research on the other hand depends on the ability and effort of the researcher (Golafshani, 2003). Although reliability and validity are treated separately in quantitative studies, these terms are not viewed separately in qualitative research. Instead, terminologies that encompass both, such as credibility, transferability, and trustworthiness are used.

Consequently, the present research, being qualitative, did not measure the reliability and validity as in quantitative research. The researcher focused rather on the quality of the research. Eisner (1991) indicates that although the term “reliability” is used for testing or evaluating quantitative research, the idea is most often used in all kinds of research. Thus, the most important test of any qualitative study is its quality. Stenbacka (2001) also shows that “this relates to the concept of a good quality research when reliability is a concept to evaluate quality in quantitative study with a purpose of explaining while quality concept in qualitative study has the purpose of generating

understanding”. Stenbacka’s explanation is in line with the purpose of the present research which is to gain a deeper understanding of the climate change mitigation strategies in the forestry and energy sectors in the SADC with specific reference to DRC and RSA. Thus, reliability and validity are not relevant concepts to this qualitative research. It is the quality of the research which was guaranteed.

3.9 Ethical Considerations

In terms of ethical issues, the informed consent of participation in the research and information about the purpose of the research, confidentiality, and the right to withdraw were taken into account during interviews and focus group discussions. Confidentiality means that the researcher could not divulge views expressed by participants in the course of the data collection, and participants also had to ensure that would not disclose the content of the discussions or the identity of fellow respondents to those outside the group.

Moreover, the researcher did not disclose the views of a participant to fellow participants, and participants were urged to discontinue any discussion or exchange of ideas about the topic after the end of the focus group meetings. Names of participants did not also appear on the interview and focus group guides or in the final report, except for the demographic information. Participants had the right to withdraw from or participate in the research process at any point in the process. The principle was that if one of the participants wished to withdraw, the researcher should not become upset but thank him/her and pay for his/her transport costs if necessary, that is, as compensation and not as a payment.

During the data collection process, the researcher began by asking whether participants agreed that the information provided be recorded. Before the interviews and focus groups began, the participants were also made to understand that there would be no benefits for answering questions. The informed consent of participation in the research was confirmed by the ethical clearance issued in advance by the department, that is, in accordance with the recommendation by Mack *et al.* (2005) that,

In general, data collection activities that require more than casual interaction with a person require individual informed consent from that person, regardless of whether community-level permissions exist. Examples of such activities include in-depth interviews and focus groups. During interviews and focus groups, participants should be told:

- The purpose of the research;

- What is expected of a research participant, including the amount of time likely to be required for participation;
- Expected risks and benefits, including psychological and social;
- The fact that participation is voluntary and that one can withdraw at any time with no negative repercussions;
- How confidentiality will be protected;
- The name and contact information of the local lead investigator to be contacted for questions or problems related to the research; and
- The name and contact information of an appropriate person to contact with questions about one's rights as a research participant (usually the chair of the local ethics committee overseeing the research).

All the aforementioned elements were respected during the research process especially during interviews and focus group discussions.

3.10 Research limitations and constraints

Research limitations are the problems the researcher could encounter during the research process, especially during data collection, which might affect the quality of the collected data. There are no noticeable limitations in the present research except that the Conservation International in the DRC did not respond to our request for interview. The use of the snowballing sampling helped us to overcome this limitation as more respondents from other organisations which work in partnership with the Conservation International were contacted.

Research difficulties are a series of problems which could crop up during the research process but which do not affect the quality of data collected. The main difficulty was the large size of the research area and the complexity of mitigation strategies in the forestry and energy sectors of both the DRC and the RSA. The data collection was prolonged because the researcher had to travel to different provinces both in the DRC and in the RSA. In addition, a number of the institutions especially in the DRC did not respond to the request for interviews sent to them, and there was delay in getting feedback which was required by the ethical committee of the department from some of them. Some institutions and respondents insisted that there was no need for them to write a letter of consent because they had already accepted to participate in the research. They insisted that verbal consent was adequate whereas the ethical committee by principle requires written consent. The insecurity in the eastern part of the DRC especially in terms of the killings around the town of Beni and the presence of armed groups discouraged visits to a number of the protected areas.

CHAPTER FOUR: PRESENTATION OF FINDINGS

4.1 Introduction

The present chapter outlines the results of data obtained on climate change mitigation strategies in relation to the forestry and energy sectors in SADC region with emphasis on DRC and RSA as case studies. The results were obtained based on a guide of interview addressed to key informants in both countries and a focus group guide to members of the civil society involved in climate change mitigation activities in the forestry and energy sectors. It should be noted that focus groups were organised only in the DRC while in the RSA only key informants responded to questions. Due to the comparative nature of the study, this chapter is divided into three main sections containing:

- a) The biographical information of respondents
- b) The results of mitigation strategy from the Democratic Republic of the Congo
- c) The results of mitigation strategy from the Republic of South Africa

To come up with the findings, the researcher followed several steps in qualitative study which are:

- ✓ The condensation of the raw and varied data, most of which are provided in a summary format;
- ✓ Establishment of links between the research objectives and categories derived from raw data; and
- ✓ Development of emerging themes or climate change mitigation activities related to each of the subsidiary objectives.

4.2 The Biographical Information of Respondents

This section presents the biographical information regarding the respondents and the organisation or institution that they represent.

4.2.1 Number of organisations and distribution of key informants per organisation in the DRC and the RSA

The total number of organisations from which the key respondents were drawn is 45, 34 of which are from the DRC and 11 from the RSA. Table 2 below shows the distribution of the key informants interviewed from the different organisations in the DRC and the RSA showing the main function of the organisation.

Table 2: Distribution of Key Informants per Organisation

N°	Name of organisations and their respective provinces	Country	Number of respondents
1	Gorilla Organisation (<i>Forestry</i>)	DRC	1
2	Réseau CREF [CREF Network] (<i>Environmental network</i>)	DRC	1
3	CERD [Renewable energy centre for development] (<i>Energy</i>)	DRC	2
4	North Kivu Provincial Department of Energy (<i>Energy</i>)	DRC	1
5	NSK [NOVACEL REDD+ pilot project of agro-forestry in South Kwamouth] (<i>Forestry and food security</i>)	DRC	1
6	Geographically integrated REDD pilot project around the Luki Biosphere (<i>Forestry</i>)	DRC	3
7	FAO's national office (<i>Land use</i>)	DRC	1
8	WWF's national office (<i>Forestry</i>)	DRC	2
9	National REDD Directorate (<i>Forestry</i>)	DRC	1
10	GTCR (REDD Climate Working Group) of the civil society's national office) (<i>Forestry</i>)	DRC	1
11	Equatorial Province REDD+ pilot project (<i>Forestry</i>)	DRC	1
12	OCEAN Geographically Integrated REDD+ Pilot Project in Isangi (<i>Forestry</i>)	DRC	2
13	WCS Mambasa Forestry REDD+ pilot project (<i>Forestry</i>)	DRC	2
14	Mambasa Commission of Agriculture (<i>Land use</i>)	DRC	1
15	Eastern Province Directorate of Environment (<i>Environmental coordination</i>)	DRC	1
16	ICCN Eastern Province (<i>Nature conservation</i>)	DRC	1
17	Eastern Province Department of Energy (<i>Energy</i>)	DRC	1
18	YME Great Lakes Beni (<i>Forestry</i>)	DRC	1
19	Research Centre for Environmental Planning (<i>Environment</i>)	DRC	1
20	WCS North Kivu (<i>Environment</i>)	DRC	1
21	WWF South Kivu (<i>Environment</i>)	DRC	1
22	Jane Goodall Institute (JGI) (<i>Environmental education</i>)	DRC	1

23	ICCN South Kivu (<i>Nature conservation</i>)	DRC	1
24	South Kivu Provincial Directorate of Environment and Sustainable Development (<i>Environmental coordination</i>)	DRC	1
25	FFN (National Forestry Fund) North Kivu (<i>Forestry</i>)	DRC	1
26	WWF North Kivu (Eco-Makala REDD+ pilot project) (<i>Forestry</i>)	DRC	1
27	North Kivu Ministry of Environment (<i>Environmental management</i>)	DRC	1
28	UGADEC Goma (Association of Unions for Gorilla Conservation and Community Development in the Eastern DRC) (<i>Nature conservation</i>)	DRC	1
29	North Kivu Provincial Directorate of Environment (<i>Environmental coordination</i>)	DRC	1
30	South Kivu Provincial Department of Energy (<i>Energy</i>)	DRC	1
31	UNDP National Office (<i>Development</i>)	DRC	1
32	National Ministry of Energy (<i>Energy</i>)	DRC	1
33	National Ministry of Environment (<i>Environmental management</i>)	DRC	1
34	ICCN North Kivu (<i>Nature conservation</i>)	DRC	1
35	SunFire Solutions Company (<i>Energy</i>)	RSA	1
36	Department of Environmental Affairs (National office) (<i>Environmental management</i>)	RSA	2
37	Earth life Africa (<i>Environmental protection</i>)	RSA	3
38	Food and Trees for Africa (<i>Land use, food security and environmental protection</i>)	RSA	1
39	Department of Energy (National office) (<i>Energy</i>)	RSA	1
40	Energy Research Centre (University of Cape Town) (<i>Energy</i>)	RSA	2
41	Department of Forestry, Agriculture and Fisheries (National office) (<i>Forestry and land use</i>)	RSA	2
42	Cirrus Group South Africa (<i>Forestry</i>)	RSA	1
43	WWF South Africa Gauteng Office (<i>Energy</i>)	RSA	1
44	WWF South Africa Cape Town Office (<i>Forestry and Energy</i>)	RSA	1
45	Federation for Sustainable Development (<i>Development</i>)	RSA	1
TOTAL			56

Table 3: Distribution of the 45 Organisations in the DRC and the RSA according to Main Functions within the Climate Change Mitigation Strategic Plan

Serial	Function	Number	Function	Country	Number	Country
1	Forestry and land use	14	Forestry activities to reduce deforestation	DRC	3	RSA
2	Environmental conservation and management	14	Forest management to avoid deforestation and emissions	DRC	3	RSA
3	Energy	6	Efficient use of energy and use of alternatives	DRC	5	RSA
Total		34		DRC	11	RSA

Overall, the interviews covered 45 government institutions, national organisations, projects and NGOs that adopt measures and activities supporting increase of forest cover by directly increasing afforestation or reducing deforestation and through increasing conservation, protection, development and sustainable management of the forestry resources (Table 2). Of this number, 34 are in DRC and 11 are in RSA (Table 3). All these functions contribute to climate change mitigation as indicated by Table 2 which shows the different institutions and organisations as well as their major functions and distribution in the DRC and the RSA. Although the activities of the organisations are in some cases pilot, they could enhance strategic development to support climate change mitigation at the national level. Above, Table 3 shows that 14 organisations in the DRC are involved with forestry including REDD+ and land use activities, while another 14 are involved with environment and environmental conservation, and six of them focus on energy.

Eleven organisations in the RSA are distributed across forestry and land use (3), environment (3), and energy (5) as shown in Table 3. These organisations offer a strong foundation for climate change mitigation strategies and support its implementation in the DRC and the RSA as indicated by the various measures and activities by these organisations in Table 6. The existence and functional activities of these organisations are compatible with the conceptual framework (section 2.7.1), the operational framework (section 2.7.2) and the operational definitions of terms (section 2.7.3) in this study. The forests in the DRC cover about 66% of the national territory and there

are many state institutions and NGOs in the country which belong to the forestry sector and which handle several projects.

The DRC is a vast country which is divided into 26 provinces compared to its former 11 provinces. The character of the forestry and energy sectors in each province is different but about 66% of the national territory is covered by forests which means that the DRC has many projects and role players in the forestry sector, as shown by the many state institutions and NGOs that focus on the forestry sector in (Table 3) above. The number of respondents interviewed from the 34 organisations in the DRC and the 11 in RSA ranges from 1 to 3 (Table 2). This is because sometimes the available respondents from a particular organisation might not be able to respond to a question which requires the input of a specialist in the field. The peculiarity about South Africa is that it has a small natural forest and most of the data about the country's forestry and energy sectors is controlled by the Department of Environmental Affairs, the Department of Energy, and the Department of Forestry, Agriculture and Fisheries. Thus, the researcher was able to visit only 11 institutions.

4.2.2 Profile of key informants in the DRC and the RSA based on gender

Table 4: Distribution of Key Informants according to Gender

Gender	Number	Percentage
Male	47	83.9
Female	9	16.1
Total	56	100

As the Table above shows, the majority of participants in the research were male with a proportion of 83.9 % males to 16.1% women. This shows that women are not leaders or the experts in most of the institutions that handle environmental protection. This situation therefore calls for public awareness programmes among women to strengthen their roles and involve them in power sharing in environmental issues.

4.2.3 Number of focus groups per organisation and gender participation in the DRC

Table 5: Distribution of Participants in Focus Group Discussions according to Gender and Respective Organisations in REDD+ Projects

Organisation	Number of focus groups	Number of participants		Total no. of participants	%
		Male	Female		
Mambasa pilot RED+ project	1	8	4	12	27.3
Isangi REDD+ pilot project	1	7	3	10	22.7
Luki REDD+ pilot project	1	8	2	10	22.7
Eco-Makala REDD+ pilot project (WWF North Kivu)	1	6	6	12	27.3
TOTAL	4	29	15	44	100%
Percentage		65.9	34.1	100%	

Table 5 above shows the number of participants in the focus group discussions. Four focus groups were organised in the DRC with 10 to 12 participants in each group in four REDD+ projects. Although the representation of gender in some projects is almost equal, in total, male participation is 65.9 % compared to 34.1% of females. This is because men seem to be more active in issues of environmental protection than women. However, improving women’s representation in the field needs to be considered.

4.3 Climate Change Mitigation Strategies in the DRC’s Forestry and Energy Sectors

4.3.1 Results from key informants

The results presented below cover all the research objectives.

4.3.1.1 Strategies for combating drivers of deforestation

Table 6 provides statements concerning the interviewees in response to the question: *What are the different strategies or measures that can be used to counter drivers of deforestation in the DRC? (Question 1, Appendix A)*

Table 6 shows the large number of institutions, projects and organisations that carry out activities related to forestry and energy development in the DRC. These institutions handle various

activities and functions that contribute substantially to climate change mitigation through forestry and energy strategies. They are reviewed in Table 6 which provides intensive data collected through interviews and discussions with key informants which constitute a broad representation of the institutions. They provided baseline data which was analysed based on the qualifying information.

The functions and activities are described and analysed in detail at the end of Table 6. Strong relationships exist between each of the organisations and the communities in the different regions of the DRC. The links between the organisations, institutions, communities and networks served as a strong platform for the climate change mitigation strategies in the forestry and energy sectors of the DRC. The functions and activities of the organisations complement the strategies of the DRC on climate change mitigation; all are streamlined towards tackling deforestation and forest degradation.

Table 6: Strategies or Measures for Fighting Drivers of Deforestation in the DRC

N°	Organisation	Specific strategies or measures adopted by each organisation
ORGANISATIONS FROM THE NORTH KIVU PROVINCE		
1	Gorilla Organisation (Works to reduce deforestation)	<ul style="list-style-type: none"> - Evaluation of different causes of deforestation mainly in the area where Gorilla has its intervention around the Virunga National Park; - Sensitizing communities to the war against deforestation; - Popularisation of individual and community tree planting in sites such as Kyavirimu around the park where Gorilla works to promote conservation and the improvement of agricultural techniques of indigenous people; - Besides its operation in Kyavirimu, the Gorilla also carries out tree planting activities in Kalehe around the Kahuzi Biega Park, Rusayo, and other activities in urban areas to sensitise the people to the urgency of tree planting as they supply the people with seeds to plant trees in Goma town, especially on Goma Mountain; and - Sensitizing the youth in secondary schools and universities to the importance of conserving the forest.
2	Réseau CREF (CREF Network) (Works to reduce deforestation)	<ul style="list-style-type: none"> - The CREF Network uses different strategies to tackle the drivers of deforestation including tree planting to reduce deforestation caused by people who fell trees for firewood and building materials; - The organisation also carries out environmental education through the media at the local level to promote sustainable management of ecosystems and environment, and sustainable development; - The Network has planted trees on 2000 hectares of land in Walikale; the estimated number of trees per hectare is 2m x 2m

		<p>spacing for 2500 plants, and 1.5 m x 1.5m spacing for 4 444 plants per hectare;</p> <ul style="list-style-type: none"> - A bulletin on environmental issues is also published periodically to help the people understand the importance of environmental protection; - The Network also makes use of image boxes to provide the people with graphic illustrations of how the environment is being threatened; and - Since 2012 in Beni town during the international day of the environment and the tree, CREF Network's team has been visiting schools especially primary schools to organise competitions on environmental issues.
3	YME Great Lakes Beni (Forestry)	<ul style="list-style-type: none"> - YME engages in reforestation programmes around the Virunga National Park which encourage the participation of villagers. The organisation has succeeded : - In the creation of nurseries in Beni, Kalunguta, Busamba and Kipese to support tree planting and - In collaboration with the North Kivu Ministry of Environment, YME Great Lakes urges the people involved in illegal logging to start planting trees. This awareness campaign is carried out in collaboration with traditional and village chiefs.
4	<p>Research Centre for Environmental Planning</p> <p>(Works to reduce the rate of deforestation)</p>	<ul style="list-style-type: none"> - The Research Centre establishes nurseries to prepare plants that will be used in a pilot project that involves 100 households in Goma town and - The centre targets the restoration of the agro-forestry with fruit trees especially in Goma town by distributing trees to each household and working in collaboration with some other role players such as churches.
5	<p>WCS North Kivu</p> <p>(Conservation and REDD programme)</p>	<ul style="list-style-type: none"> - WCS is preparing strategies to fight against deforestation and it submitted request for funds to support climate change mitigation at the Hoyo Mountain; - WCS also supports the ICCN in its efforts to protect areas such as the Hoyo Mountain and the Virunga National Park, and on the socio-economic level, it supports efforts to raise people's awareness about the need to protect the Park.
6	<p>Jan Goodall Institute (Environmental Conservation)</p>	<p>The JGI is involved with the environmental education of pupils in a target area of 110 schools with approximately 35, 000 pupils.</p>
7	<p>FFN (National Forestry Funds)</p> <p>(Forestry)</p>	<p>FFN is a state institution that was established to rebuild or reconstruct the forestry capital. Its interventions aim at funding projects on tree planting and reforestation, and the evaluation of tree planting activities and the promotion of tree planting activities, as well as following up the activities relating to forest conservation.</p>
8	<p>WWF North Kivu (Eco-Makala REDD+</p>	<p>WWF engages in the promotion of tree planting associated with the advertisement of the improved cook stoves. WWF is planting trees</p>

	pilot project) (Forestry)	in five of the districts in North Kivu Province except Walikale namely Beni, Lubero, Rutsuru, Nyiragongo and Masisi.
9	North Kivu Ministry of Environment (Forestry)	<ul style="list-style-type: none"> - The ministry pioneered the tree planting efforts in the whole province; - It planted trees along the roads of North Kivu province; - It encourages all partners such as NGOs which work in the field of environmental protection to take seriously the task of tree planting and - It engages in the maintenance of protected areas in the province such as parks.
10	UGADEC Goma (Association of Unions for Gorilla Conservation and Community Development in the Eastern DRC) (Forestry)	UGADEC was involved in the Tayna REDD project as it trains local community members on climate change mitigation and the importance of forest conservation.
11	North Kivu Directorate of Environment (Forestry)	<ul style="list-style-type: none"> - Since 2012 and 2013, the Directorate has initiated a program that could transform North Kivu into a green province; - The Directorate also metes out penalties to offenders as prescribed by the law. If someone is caught cutting a tree without authorisation, he or she is obliged to plant at least three trees in replacement and to pay a fine for the offence. The details of such clauses are found in the DRC forest code, in the green code, and in Acts 012 and 013 promulgated last year by the President of the DRC to address matters of nature conservation and - It sensitises the communities to the importance of environmental protection and tree planting.
12	ICCN North Kivu (Congolese Institute for Nature Conservation) (Reducing deforestation)	<ul style="list-style-type: none"> - The Institute organises workshops to sensitise people who exploit the forest to the dangers of their activities; - The ICCN North Kivu provides funds to civil society organisations to carry out tree planting activities and reforestation and - It also sees to the electrification of villages around the Virunga National Park.
ORGANISATIONS FROM THE SOUTH KIVU PROVINCE		
13	CERD (Centre for Renewable Energy Development) (Promotes renewable energy)	<ul style="list-style-type: none"> - The CERD was founded by the GIZ (German Agency for International Cooperation) in collaboration with international organisations that work on environmental protection to promote renewable energy sources in order to reduce deforestation by using alternative energies from renewable sources; - The CERD also organises a programme to maintain Biodiversity (PMD) and sustainable management of forests with the aim to not only reduce deforestation, but also the consumption of energy

		<p>sources in households;</p> <ul style="list-style-type: none"> - The Centre was established when GIZ did a study on wood energy (wood market in Bukavu) which revealed that 97 000 tons of wood enter Bukavu annually and only 90 000 tons of charcoal. Therefore, CERD is assigned the task of informing communities through different means (public awareness programmes, launches and documentation) about how the use of renewable energy can help to protect the environment.
14	WWF South Kivu (Forest Conservation)	<ul style="list-style-type: none"> - The WWF tries to identify the target of conservation; - It also tries to determine the pressure on the forest and the types of harmful activities that people carry out in the forest; - The WWF organises programs on environmental education; - It promotes the sustainable use of natural resources; - It also promotes ecotourism, - The WWF also engages in the capacity building of community based organisations and indigenous people in the planning of conservation projects and land planning. This is to curb illegal activities and deforestation.
15	WCS South Kivu (Conservation)	<ul style="list-style-type: none"> - The WCS engages in environmental conflict resolution initiatives in collaboration with the ICCN. - The WCS in collaboration with the ICCN also offers rotating micro credits to the residents of the Bugobe area in order to engage them in alternative activities to the exploitation of the Kahuzi Biega Park, tree cutting and charcoal production.
16	ICCN South Kivu (Conservation and reducing deforestation)	<ul style="list-style-type: none"> - The ICCN has put in place a committee to manage community conservation in the forest territories of its sites; - The ICCN creates public awareness on emissions and relays information about tree planting and the consequences of deforestation; - It also organises workshops at the provincial level which involve discussions by provincial authorities and customary chiefs on ways to combat deforestation. - The ICCN organises awareness campaigns among soldiers who also contribute to the destruction of the environment by cutting trees and exploiting other products
17	South Kivu Provincial Directorate on Environment and Sustainable Development (supports reforestation)	<p>The Directorate runs a project on wood energy with the GIZ (an international German organisation) and it has founded five nurseries that are being developed into tree plantations in five villages especially at Businga and Nyangezi.</p>
ORGANISATIONS FROM THE EASTERN PROVINCE		
18	OCEAN Geographically Integrated REDD+	<ul style="list-style-type: none"> - OCEAN organises public awareness programmes and field sessions while using animation techniques to show communities the importance of the forest;

	pilot project in Isangi	<ul style="list-style-type: none"> - It uses images to sensitise people to the consequences of destroying the forest and the advantages of keeping it; - The Isangi project has put in place some alternatives such as organising domestic breeding of animals for people who engage in hunting to prevent them operating in the forest; - Agro-forestry system is encouraged among the people as they are supplied with crops that grow quickly to enable them practice intensive agriculture in the same areas for many years. They can even do it in the secondary forest instead of destroying the primary forest by extending their farms and burning them. They are encouraged to utilise the small spaces behind their houses instead of occupying large spaces. - OCEAN works also with Ifa Yangambi which not only deals with the pilot farm and multiplication of genitors, and distribution of crops, but also runs a veterinary pharmacy. The tree planting and agro-forestry are done by INERA (National Institute for Agronomic Research). OCEAN also manages the PECN (Educational Programme for Nature Conservation) based in Isangi which handles publicity. The pilot farm in Yangambi has a surface of 20 acres or 2000m² (1 acre is 100m²).
19	Mambasa Commission of Agriculture (Reducing deforestation)	<ul style="list-style-type: none"> - To combat deforestation, Mambasa commission of agriculture creates public awareness about methods which discourage bush burning or about non-incineration techniques that leave the soil more fertile, and - Organising awareness programmes on emissions in local medias so that the message can reach the whole community.
20	WCS Mambasa Forestry REDD+ pilot project	<ul style="list-style-type: none"> - In the CARPE programme (Central African Regional Programme for the Environment), WCS Mambasa project targets the strategy that was put in place to reduce deforestation and strengthen the capacity building of institutions at the local, national, community and international levels; - WCS Mambasa has also put in place a planning system of land utilisation at the rural level; - WCS Mambasa works with communities to improve the techniques for increasing agricultural yield in order to reduce the destruction of the primary forests when agriculture is practiced in the same place; - It also promotes the breeding of goats and chickens to reduce poverty; - The WCS further works with the state services to publicise laws that relate to forest management and that govern the use of the forest; - It supports agro-forestry essentially of cocoa production.
21	Eastern Province Directorate of Environment	<p>The directorate engages in:</p> <ul style="list-style-type: none"> - The adoption of agro-forestry strategy to conserve a large portion of the forest and

	(Forestry)	- The introduction of a system of reforestation to regenerate the forest especially where it has lost its structure.
22	ICCN Eastern Province (Congolese Institute for Nature Conservation) (Forestry)	- The institute established a nature reserve called RFO (Okapi Fauna Reserve) at Epulu and protected areas. - The ICCN also employs the services of law enforcement officers called park guards in the reserve.
ORGANISATIONS FROM THE URBAN AREA AND KINSHASA PROVINCE		
23	WWF National Office (Works to reduce deforestation)	- The WWF identifies the drivers of deforestation in its intervention zone as well as the real causes and consequences of deforestation, and suggests solutions to these problems with the help of the target population. - Another aspect of its operation is the control of bushfire which is also an important driver of deforestation. Therefore, WWF shows how communities can practice sustainable agriculture without causing bushfire.
24	National REDD Directorate (Coordinates REDD)	The national Directorate office for REDD implements strategies for preventing deforestation and forest degradation called REDD process or REDD mechanism.
25	GTCR (REDD Climate Working Group) of the Civil Society National Office	- The GTCR coordinates the interests of the different organisations with the aim of influencing decisions regarding the reduction of GHG emissions at the international level ; - The identified drivers of deforestation include agriculture and the woodcutting for energy. Thus, to reduce deforestation, communities should learn to engage in mechanised agriculture on small lands and not expand them. Here the GTCR and its partners need to educate, train the people and supply them with good quality crops. They can even learn to farm around their houses with modern methods or techniques, and without using chemical substances, they can harvest more, even with less efforts. - However, the GTCR also encourages agriculture in degraded zones such as the swamp or marsh which are not useful for maintaining the forest. The forest has about 40% of swampy land where rice can be cultivated. - Another problem involves charcoal making. Charcoal production has long been a source of income generation. It is used in areas where there is no electricity or alternative energy. REDD project plans to adopt interventions to reduce deforestation caused by charcoal making.
26	UNDP National Office (Works to reduce deforestation)	The UNDP engages in projects on Nationally Appropriate Mitigation Actions (NAMA), Low Emissions Development Strategies (LEDS), and green growth.
27	National Ministry of Environment of the DRC (Works to reduce	The Ministry handles: - The inventory system regarding emissions from the forest and other sectors in collaboration with other partners; - Project on Nationally Appropriate Mitigation Actions (NAMA),

	deforestation)	Low Emissions Development Strategies (LEDS) and green growth; and - The REDD National Frame Strategy of the DRC.
ORGANISATION FROM THE BAS CONGO PROVINCE		
28	Geographically Integrated Pilot REDD+ project around the Luki Reserve Biosphere (REDD forestry)	<p>The general objectives of this project are:</p> <ul style="list-style-type: none"> - To consolidate the National Frame Strategy of the DRC; - To plant 1000 ha of trees called Kwazunu; - To promote the assisted natural restoration of the savannah which means not to burn it; - To promote the local system of management; - To develop 30 pilot model farms in order to improve the living conditions of the people; - To obtain financial support from the Congo Basin Forest funds to save and protect 20 000 hectares in the Luki protected area with the help of 60 eco-guards or eco-keepers who are appointed by the project management; - Seeds and crops for agro-forestry are given to communities (1.0 ha of acacia + hives in order to produce the honey). It is what is called apiculture in agro-forestry; - In its first year, the project supplied each beneficiary with 1.0 ha of cassava, 1.0 ha of maize, 1.0 ha of peanuts, 1.0 ha of avocados, orange and lemon trees, and chilli; - In its second year, the project supported beneficiaries with 1.0 pond, 5.0 hives per farmer with equipment related to the production of the honey, and the capacity building of beneficiaries which is considered as the technical part of how to manage their projects especially integrated agriculture and marketing. Furthermore, more than 800.0 acres of palm oil would be added so that beneficiaries could begin to sell oil to increase their income; - 600 000 trees have to be produced and the project needs 75 nurseries to produce all these plants. Once plants have been produced, the WWF project buys them for 50 Congolese Francs each; - The project also engages in afforestation and reforestation of lands where trees were cut in the last ten years; and - Payment for environmental services to people who do not burn the savannah for cultivation. They are paid USD5 per hectare per annum, if they respect the required laws.
ORGANISATION FROM THE BANDUNDU PROVINCE		
29	NSK (NOVACEL REDD+ Agro-forestry pilot project in South Kwamouth (REDD, Forestry)	<ul style="list-style-type: none"> - NOVACEL is a REDD+ private pilot project with three associates and it works on agro-forestry since 2008; - The project works with local communities to plant trees and to practice the subsistence agriculture (cassava), - NOVACEL also engages in pure forestry focusing only on tree planting. It has already planted 2500 ha of trees, that is, 1200 ha through the pure forestry project and 1300 through agro forestry. In

		2011, it received USD 4 million from the Congo Basin Forest Fund (CBFF) to secure 10 000 hectares of pure forestry and agro-forestry.
ORGANISATION FROM THE EQUATORIAL PROVINCE		
30	The Equatorial Province REDD+ pilot project	<ul style="list-style-type: none"> - The project works on how to receive REDD funds in order to develop conservation activities and work on awareness programmes that would involve the community; - Communication with and sensitisation of the community to their operations; and - Facilitating the use of agro-forestry and tree planting including palm trees for palm oil.

4.3.1.2 Strategies for Reducing Deforestation

4.3.1.2.1 Introduction

There are six REDD+ pilot projects whose main strategies and functions are directed towards reducing deforestation and forest degradation in order to reduce emissions from these sources (Table 6). The six projects enjoy the support of the REDD National Coordination Mechanism and of organisations that contribute to the REDD national process, participating in all steps including drawing of the REDD proposal and the experimentation of practical strategies that could help to reduce deforestation. Some of the organisations and networks support research on the extent of and the driving forces behind deforestation as well as promoting awareness among the people (Table 6).

From Table (6), it is evident that all institutions and organisations understand the role of forests and energy sectors in climate change policy reform and mitigation. They have plans and capacities to perform their functions in collaboration with other stakeholders.

There are 34 institutions in all, 23 of whose operations directly relate to reducing deforestation and increasing forest cover through reforestation. Nine of these institutions base their operations on REDD projects while some follow the DRC forest code and others engage in forest activities within the limits of the law. The plans and programmes of the institutions are carried out in conformity with the forest policy and climate change mitigation needs as well as the situation of the zone where the organisation works. Their proposals take into account the drivers of deforestation hence their programmes are executed to reduce deforestation as in the example of Gorilla Organisation.

All the REDD projects and all the forestry institutions plan their activities in view of the present situation of the forest cover and deforestation drivers that occur within their activity zones. It appears that deforestation drivers differ from one intervention zone to another but some of the organisations also collaborate in their effort to combat deforestation. The strategies employed by each organisation to reduce drivers of deforestation as a climate change mitigation measure are outlined as follows:

4.3.1.2.2 The Gorilla Organisation (Number 1 in Table 6)

Table 6 shows that the Gorilla Organisation evaluated the different causes of deforestation that occur in its intervention Zone. Deforestation is driven in that zone by people who are in permanent need of firewood and wood for cottage industry and crafts, as well as for medicinal plants. Apart from the search for medicinal products, all the other needs push people to depend more on the forest which leads to deforestation in the Virunga National Park. It is difficult to combat the drivers of deforestation without identifying them. That is why it was important for the Gorilla Organisation to evaluate them before designing strategies and taking strong measures against them.

The public awareness programmes by Gorilla to encourage the local people to improve their agricultural techniques is important to increasing agricultural yield and reducing deforestation, because many local people in agriculture tend to engage in bush burning. This practice contributes greatly to deforestation and damages the quality of the soil.

The use of fire in agriculture does not promote the practice of agro-forestry because all trees are cut and burnt without exception. Public awareness programmes against drivers of deforestation help people to understand the consequences of deforestation and involve them in the fight against deforestation since they are already aware of the dangers. In many cases, the people do not believe that their activities affect the environment when they degrade the forest; they are unaware of the consequences of reducing the forest cover. For this reason, Gorilla focuses on raising public awareness.

Gorilla focuses on an urban area like Goma town because most of the trees in the urban areas have disappeared except for the Goma Mountain which appears to be the only green space in Goma town which can contribute to carbon sequestration in the state. Sensitizing youth in schools and universities to the situation is a way of preparing them to become active in environmental

protection especially in knowing how to mitigate climate change through the forestry and energy sectors. According to the respondent from the Gorilla Organisation, it is difficult to estimate with accuracy the expanse of land on which trees have been planted but it is clear that in the last eight years, Gorilla has engaged with local communities and its tree planting operation has covered many hectares of land. It is understood that cutting trees and planting others in their place are key to maintaining the potential of existing trees.

4.3.1.2.3 CREF Network (Number 2 in Table 6)

It is understood that deforestation in CREF's intervention zone is caused by many factors which include land use and changes in land use, mode of farming, animal husbandry, exploitation of trees, agricultural expansion, and the use of fire for sanitizing the land. People displacement due to conflict especially in North Kivu and the high demand for firewood and building material constitute a major cause of deforestation in the area and heighten the challenge of deforestation. Thus, the CREF Network invests in the cultivation of tree plantations to decrease the pressure on the forest and reduce deforestation.

The Network's environmental education helps people to understand that when they destroy the forest they contribute to greenhouse gas emissions and the destabilisation of the agricultural seasons as witnessed in the North Kivu Province and other parts of the DRC. It is important therefore to counteract the practices that result in deforestation by planting trees in order to contribute to the mitigation of climate change in the forestry sector. The target population for environmental education includes all categories of the population. The newsletter published periodically by CREF Network creates awareness about the management of natural resources in the Virunga National Park, the environmental impacts on the Virunga National Park if SOCO insists on exploiting oil from it, the ecological corridors, and the solution to the conflicts between people living around the Virunga National Park and the managers of the Park.

As noted also in Table 6, the 2000 hectares of trees planted by CREF Network could provide the people with enough firewood and building material if the plantation is managed sustainably. The plantation will decrease the pressure on the existing forests and serve as an example of how to reduce deforestation. Competitions on environmental issues organised by the NGOs under CREF Network have an impact in schools in the sense that the winners of the competition are offered scholarships to cover their fees. The competitions focus on environmental protection and

motivate students about the need to plant more trees. The students in turn spread the message to their colleagues and respective communities.

4.3.1.2.4 Yme Great Lakes (Number 3 in Table 6)

The Yme Great Lakes was founded in Beni in 2011 with the aim of engaging in tree planting on a high scale. The WWF North Kivu supplies the seedlings which are planted during the rainy season, and a minimum of 55 hectares of trees has been planted so far. In this case, cooperation between organisations facilitates the efforts against deforestation. The Yme collaborates with the WWF North Kivu to get seedlings with the support of CIFOR. CIFOR also provides funds for the WWF. In 2011, the IFDC funded nurseries, which helped reforestation efforts in the whole of the YME intervention zone, as more trees were grown.

4.3.1.2.5 The Research Centre for Environmental Planning (Number 4 in Table 6)

The collaboration between the Centre and churches is significant because the churches have a strong influence on many people in the region. The idea is that each church representative should encourage his or her church members to plant trees to commemorate special events in their lives such as first sacrament or wedding. Parents are also encouraged to plant trees on the birth of each of their children. This kind of philosophy or tradition can push people to plant many trees without knowing.

4.3.1.2.6 WCS North Kivu (Number 5 in Table 6)

The WCS North Kivu issued a strategy for protecting the Hoyo Mountain and the Virunga Park against charcoal making based on two approaches. The WCS supports fishing activities by training the people in the use of fishing implements and fishing techniques in the area. It helps anglers to improve the quality and quantity of their fish production with the aim of stopping them from making charcoal inside the park, thereby reducing deforestation. In addition, the WCS has hired security agents to help the ICCN to protect the Virunga National Park. It also supports guards at the Hoyo Mountain and Virunga Park by providing them with uniforms, boots, hats, belts and various equipment excluding guns and ammunitions.

The guards carry out their patrol using Smartphones supplied by the WCS. They just integrate data in the Smartphone instead of writing on paper. When they arrive in a place with network signal, they download all data and send to the central office. They also save the data in the database of the Department of Research and Monitoring. These data help to monitor forest cover, illegal activities and the movement of animals.

WCS North Kivu supports patrol activities at the Hoyo Mountain by providing funds to feed the guards and pay for fuel for their motorbikes to enable them move around easily. Before 2012, illegal exploitation of wood for commercial purpose was rampant in the Hoyo Mountain, but with the intensification of patrol activities and seizure of tree-felling machines, the forest has begun to flourish again.

4.3.1.2.7 The Jan Goodall Institute (JGI) (Number 6 in Table 6)

The task of JGI is to preserve the territory occupied by chimpanzees and to conserve the ape population. The deforestation in this case concerns only the habitat. The JGI has three themes in its project namely health, sanitation, and environmental education, and it supports different categories of people such as hunters by training them at a high level to enable them to provide for their families or households. Therefore, in its fight against deforestation, the JGI employs a strong strategy of providing environmental education for pupils and students. Since deforestation can easily affect the habitat of chimpanzees, the JGI works around the Kahuzi Biega and Maiko Parks, and Walikale which serve as its intervention zone. The task of maintaining the habitat of the chimpanzees is indirectly a strategy for controlling deforestation.

4.3.1.2.8 The National Forestry Fund (FFN) (Number 7 in Table 6)

The strategy adopted by the FFN to combat the drivers of deforestation is to plant trees in the North Kivu Province. Approximately 8 000 trees have been planted by the FFN in Masisi in collaboration with the ISDR Great Lakes. The FFN has also reforested a private field of Mwami Kalinda by planting 4000 trees. In 2013, the FFN supported tree-planting efforts in ITIG Goma by supplying key materials such as tools and plastics for plants. It supplies in particular eucalyptus and acacia seedlings for planting in ITIG Goma. The role of the FFN is to tax the

people who exploit the forest, but forestry management is the task of the provincial Directorate of the environment.

4.3.1.2.9 The WWF North Kivu (Number 8 in Table 6)

In North Kivu, the drivers of deforestation are mainly the charcoal making industry and the practice of sawing trees. To mitigate this, the WWF has opted for tree planting and the promotion of improved cook stoves. In 2008, a study in Goma town focused on the rate of charcoal consumption. It revealed that charcoal consumption is between 51 and 59 tons per year, and that 80% of this charcoal comes from the Virunga National Park. That means charcoal consumption is a key source of deforestation and degradation because there are no alternative sources of energy in view; the WWF North Kivu suggests tree planting and the improved cook stoves to decrease the consumption of charcoal and wood energy. Although the WWF helps the ICCN to patrol the Virunga National Park, it cannot ban people from using the park without offering an alternative solution.

The WWF plants trees in five territories except Walikale as noted in the table above. The first phase of tree planting took place at the end of 2007 and the second phase began in 2013. Only 5 500 hectares of land were covered during the first phase, and in the second phase, the WWF planted 3 000 hectares of trees. The estimated number of improved cook stoves already distributed between 2007 and 2015 is 50 000. If people actually use these stoves, then, they can indirectly decrease the rate of deforestation with the less consumption of charcoal.

The WWF in North Kivu expects to plant the total of 8 500 hectares but the project plans to cover 20 000 hectares of land. The improved cook stoves, on the other hand, help to decrease charcoal consumption by up to 50%, while 10 000 ha of trees are being planted solely for the purpose of providing charcoal for the people. However, with the increase in population, other alternatives should also be sought. With the case of the clean development mechanisms, for the first phase, the WWF counted to valorise the tree planting by doing reforestation and afforestation. The fact that the WWF has evolved in the discussion post Kyoto, it is planning to use the Gold standard because in it there are afforestation and reforestation, but there are also the improved cook stoves.

4.3.1.2.10 The North Kivu Ministry of Environment (Number 9 in Table 6)

The North Kivu Ministry of Environment is aware of the degradation of the forest and tries to contribute to the maintenance of environmental balance. In terms of tree planting, the ministry has targeted all green spaces in the province especially the plantations controlled by the state such as Luofu which has around 70 hectares. Strong measures are being taken to restore tree-planting activities in Luofu. The planting of trees along roads is an ambitious and ongoing project that began in Masisi. Many programmes are carried out in collaboration with NGOs involved in environmental protection. Thus, the ministry encourages the NGOs to decrease the effects of climate change by making tree planting their main activity. Regarding the issue of protected areas, the ministry is convening meetings with managers of protected areas about how the areas can be protected. At a practical level, the North Kivu Ministry of Environment is planting trees with the WWF North Kivu through the REDD project called Eco-Makala+ initiated by the WWF. The big challenge is that there is an increase in population in North Kivu, which is creating additional pressure on the park. Therefore, tree planting is taking place around these protected areas to decrease the pressure on them.

For the sake of the future and of sustainable development, the Ministry of Environment is collaborating with the Ministry of Energy to discourage people from depending solely on the forest. Through this initiative, other alternatives such as gas exploitation can help at a certain level to decrease the pressure on protected areas and forests. In Luofu, the ministry has already planted 20 hectares in 2015, and in Goma town, 15 000 trees have been planted at the ITIG cemetery. The ministry is also educating people to set up nurseries for example in schools. It has also initiated a project of distributing seedlings in schools. In the 2013 season, 10 000 seedlings were distributed in schools, and in 2014, the ministry set up a nursery in Goma town with more than 100 000 plants that would be distributed in schools. In addition to the schools, the ministry is also encouraging leading cattle farmers in the Masisi area to plant trees at the boundaries of their farms because they have also contributed to the high level of deforestation in the area through their breeding activities.

4.3.1.2.11 The UGADEC Goma (Number 10 in Table 6)

In the fight against drivers of deforestation in the Tayna area, the UGADEC creates awareness about the importance of trees and about what should be done to reduce deforestation. UGADEC also counsels people to limit the fields for agriculture and use specific spaces for breeding or husbandry in order to reduce deforestation. As the Tayna REDD project has been implemented in two vast areas in the Lubero territory, that is, in Batangi and in Bamate, UGADEC was able to create awareness about the dangers of deforestation in several villages in these two areas. These include Kasuo, Basekeseke, Bunyatenge, Muhanga, Kulimba, Mbuyi, Mbihira and others in Katondi, Butondo, Mutenda, Mpinga, Feki and Kisimba.

4.3.1.2.12 The North Kivu Provincial Directorate of Environment (Number 11 in Table 6)

The goal of the Directorate is to transform North Kivu into a green province by reconstituting the forestry capital of the province that has been degraded for a long time. In 1994, with the genocide in Rwanda, a large Rwandan population crossed the border and entered the DRC territory especially in the North Kivu Province. There were more than one million refugees in this space and the high demography has disrupted urban life. There was a great demand for wood energy to satisfy the energy need of both the DRC residents and the Rwandan refugees.

This phenomenon has contributed to a huge loss of the tree vegetation of natural and artificial forests ravaged by the refugees. To find a solution to wood energy needs, the Directorate has begun to establish nurseries and plant trees in collaboration with local and international partners. In 2013, six nurseries with capacities of 5000-6000 plants per year were established in six different territories. Tree planting activities covered Goma Mountain, schools and roadside, and the Directorate has already planted about 200 000 trees in the North Kivu Province.

4.3.1.2.13 The ICCN North Kivu (Number 12 in the Table 6)

The ICCN North Kivu organises workshops to create awareness about the dangers of exploiting the forest, and it provides funds to civil society organisations for tree planting activities, reforestation and electrification of villages around the Virunga National Park.

4.3.1.2.14 The Renewable Energy Centre for Development (CERD) (Number 13 in Table 6)

In its effort to combat the drivers of deforestation, the CERD analysed the 97 000 tons of wood entering Bukavu town to determine the degree of the effect on deforestation and the cost for households in terms of charcoal consumption. The valuations of the tons of wood served as an alert to help the people and decision makers to consider how to slow down the rate of deforestation. The documentations provided by the CERD are significant considering the absence of libraries and data on renewable energy in the DRC, and on techniques that can help the people to improve their energy and wood consumption, thereby contribute indirectly to the reduction of deforestation.

4.3.1.2.15 The WWF South Kivu Province (Number 14 in Table 6)

According to the findings from the WWF South Kivu Province, it is possible to fight or take strong measures against the drivers or causes of deforestation when the target of conservation is known. Part of the WWF South Kivu targets includes a mountain forest stratified into forest of low altitude, bamboo forest and the types of vegetation that can be found in the countryside. Therefore, if the forest is controlled properly, knowing its extent or surface, and its current situation, can help to protect the forest against deforestation. The second element is to understand the pressure on the targeted forest which is caused mainly by human beings. This pushed the WWF South Kivu to study villages that are inside and around the target forest. The WWF therefore planned to establish some meteorological centres that would help in data collection and with time determine whether there are consequences of climate change trends in the Itombwe Reserve.

However, in fighting deforestation, it is important to consider the activities in the surrounding villages which can affect resources in the reserve as well as alternative activities that could decrease the human pressure on the reserve. Hydropower can also help because the main rivers in the region cut across the intervention zone of the WWF South Kivu. These alternatives can help to decrease the pressure on the forest.

On the other hand, the implementation of the law should be strengthened by eliminating all armed groups that contribute to deforestation and promoting some socio-economic activities that

could help to decrease the pressure on the forest. A number of strategies could be combined to decrease deforestation. Environmental education does not only target the villages around the Itombwe Natural Reserve, but also other external groups. The target is outside the reserve because the pressure usually comes from other places and not from the surrounding villages per se. Environmental education can be promoted on any occasion, and meetings create an opportunity to sensitise the target population to the need to reduce deforestation. The WWF educates community-based organisations that are identified as members of the civil society in collaboration with ICCN staff members. It appears that the strategy and activities against deforestation should be complementary and should consider all factors and target groups.

4.3.1.2.16 The WCS South Kivu (Number 15 in Table 6)

The WCS South Kivu collaborates with the ICCN in the case of environmental conflict resolution. There is often conflict between the population around the hills near the Kahuzi Biega Park (KHB) and the park guards because people come to gather bamboo and wood for energy and other uses. If these activities continue, there is a high risk of losing the forest. Thus, the WCS South Kivu has initiated a pilot project in the densely populated Bugobe area on the way to the Kahuzi Biega Park. The project engages in the cutting of bamboos and selling them in Bukavu town.

In this case, the WCS South Kivu and the ICCN South Kivu recognised the need to give revolving micro-credits to the Bugobe people especially those who have been educated about the dangers of exploiting the park resources. The micro-credits would help the people of Bugobe to work on other jobs instead of exploiting the bamboo in the forest. These revolving micro-credits are now being distributed to the third group of beneficiaries. The first group is composed of food sellers, the second are agriculturists, and the third group is composed of breeders. For the first and second groups, the amount was reimbursed at 90%, and this pushed the WCS to educate more people. The WCS noticed that after these programmes, illegal activities in the park reduced which shows that there is a positive impact on the people. In the case of other target groups, the facilities offered to the Bugobe community will be extended to Kashondu and Bunyakiri communities using the revolving micro-credit approach because the populations also live near the park.

The number of households provided with the revolving micro-credit is continuously increasing because the money is reclaimed within 6-9 months and used for others. The amount given to each beneficiary is between USD100 and USD 200.

4.3.1.2.17 The ICCN South Kivu (Number 16 in Table 6)

To fight deforestation, the ICCN South Kivu has set up a community committee on conservation called CCC in the ICCN site and intervention zones. The committee plans projects on tree planting and reforestation which are funded by the ICCN partners. The ICCN also engages in dialogue with soldiers who participate in the destruction of the environment. Such soldiers are often viewed as untouchable because they are armed but many of them are simply ignorant of the importance of tree conservation. The ICCN South Kivu approaches them to explain that the trees do not belong to the ICCN but to all the people and the whole nation. The explanation was made in the first meeting with the soldiers who were made to understand the consequences of deforestation as well as the importance of protecting trees. It seems that the strategy employed by the ICCN and its partners of initiating dialogues with the different interest groups in the community is successful.

4.3.1.2.18 South Kivu Provincial Directorate of Environment and Sustainable Development (Number 17 in Table 6)

The coordinating unit adopts a national strategy on the REDD+. The different drivers of deforestation observed in the South Kivu Province are the search for wood energy, agricultural expansion and the use of fire for sanitizing land. Thus, the coordinating unit and the GIZ try to combat drivers of deforestation through the wood energy project by establishing five nurseries in five villages. The project aims to plant about 700 hectares of trees. However, only 50 hectares have been planted so far, that is, 25 hectares of whole tree plantations, and 25 hectares of agro-forestry. In the case of wood energy, the strategy is to implement pure tree plantations so that the populations around them can access wood energy.

The project on exclusive tree plantations will continue up to the end of 2018. The Directorate is working on it progressively until the 700 hectares are covered. In Bukavu town, the coordinating unit has also initiated a project of tree planting along the main roads in order to contribute also to the mitigation of climate change. In addition to this project, there are other tree planting

initiatives at Mwenga, Kabare and Walungu which should be rehabilitated in the same way, and another 10 000 hectares of tree planting is proposed by the South Kivu Provincial Ministry of Environment. All these projects are planned because people cut trees without authorisation. However, tree cutting is allowed by permit after the necessary tax payment and for other purposes such as building when the due process initiated by the Directorate unit is followed. Otherwise, defaulters pay penalties.

4.3.1.2.19 OCEAN Geographically Integrated REDD+ Project (Number 18 in Table 6)

The Isangi project is implemented by an organisation called OCEAN (Organisation of Congolese Ecologists and Friends of Nature) even though it belongs to the Congolese government. Communities relate directly to the forest and their practice of incineration contributes largely to deforestation. However, the project aims to introduce these communities to eco-friendly agriculture which does not contribute to forest degradation. Communities are trained to cultivate their fields in a sustainable way without shifting. This REDD+ project was initiated in 2011 but it has encountered many problems relating to the market and the irregularity of funds from donors. The project may terminate by the end of 2016 if it has adequate financial support.

Additionally, the Isangi project engages in animal husbandry through which it supplies different types of animals such as pork, goats and chickens to the community. The project conducts experiments on these animals on a pilot farm located in Yangambi considered as a place with a good climate for breeding. After experimentation and once the genitors are multiplied, these animals are distributed to the beneficiary communities. The institution that works on these animals is IFA Yangambi. In respect of agriculture, the project is distributing some climate resistant varieties of cassava to communities. One of the varieties of cassava that is being distributed is called “variety sense Obama”. There is also the maize that is adapted to the Isangi climate. With the agro-forestry and tree planting in the degraded forests, carbon sequestration is possible. The INERA is the partner institution which is in charge of reforestation and tree planting.

4.3.1.2.20 The Mambasa commission of Agriculture (Number 19 in Table 6)

The commission creates awareness among farmers about the use of alternative methods that can reduce burning during the ploughing season. If incineration is used, the fire destroys the nutritive elements in the soil. The infertility of the soil reduces crop yield and forces farmers to expand the agricultural land to increase production thereby increasing deforestation. The consequence is that the primary forest is further damaged when agriculture land is being expanded. The monitoring is usually done by Mambasa Commission of Agriculture which verifies whether people actually employ these methods and whether farmers are giving positive feedback about the relevance of the methods, that is, whether the methods help them to organise their agricultural activities within the same spaces for many years. In general, the challenge is that there are not enough technicians to monitor the activities in the villages.

4.3.1.2.21 The WCS Mambasa Forestry REDD+ Project (Number 20 in Table 6)

The Mambasa project has a planning system of land utilisation with three types of large land - protected areas, community forests and zones for commercial logging such as forestlands, agriculture lands and mineral lands. These three types are recognised by the CARPE programme. Therefore, the WCS runs a programme in which the countryside is placed under land utilisation. In Ituri, the RFO is a protected area, the forestland of ENRA and three areas of community management of natural resources. Regarding agriculture, the WCS engages in the promotion of cocoa agriculture in the shade to help communities increase their income by using the same spaces for agriculture in an intensive and sustainable way. It is estimated that a community farmer makes a profit of USD 1 500- USD2 000 annually from one hectare of cocoa, and that is enough money for people living in Mambasa. The strategy is that the people become so busy with these activities on small farms that they do not have even time to start new fields or farms. They also do not have enough time to make charcoal, manage big farms, and engage in illegal logging and other activities for money.

In addition, the WCS trains farmers to process their agricultural products. The farmers form associations, and process their products and immediately sell them to get money. For example, the local fresh rice from the field called PADI does not have much value when sold raw, but the WCS makes mills available to associations to process the PADI before it is sold. Similarly, the

cassava farmers are also project beneficiaries as the WCS mills help them to process their cassava into flour before selling. This way, the farmers make more profit from the cassava flour than the raw cassava.

The WCS Mambasa husbandry project also supplies chickens and goats to beneficiaries to discourage them from hunting game in the bush. Many beneficiaries residing in different areas of the project already have fenced plots where they breed chickens and goats. The main activities of the WCS aimed at reducing the rate of deforestation in its intervention area therefore include improving agriculture by increasing yield and reducing cultivated land, promoting agro-forestry, and enlightening the people about the laws that govern the use of the forest. In addition, the WCS trains community members to consider alternative activities and strategies and not to rely solely on logging. The WCS engages in these activities on behalf of the DR Congolese government through the national REDD project. The WCS has participated in all stages of the planning such as the writing of the proposal to REDD planning and the implementation of practical strategies that could help reduce deforestation.

For example, the WCS manages a government project called the geographically integrated REDD+ pilot project in Mambasa which aims to reduce deforestation by improving the living conditions of the local people. In the context of this project, 1 000 people have planted cocoa. The goal of the REDD project is to plant 1 000 hectares of cocoa under community management, and the project is in the process of reaching 1 500 000 plants of cocoa. The WCS has already produced 400 000 cocoa plants for planting, and in the nurseries there are more than 1 000 000 plants that could be transplanted in the coming seasons. Cocoa farming started in 2009 and the first beneficiaries of the project are already at the phase of production.

Regarding commercial logging, the ENRA is the only company licensed to cut trees and its forestland is in the Mambasa territory. The WCS has trained ENRA staff members in the territory, helped them to do the biological evaluation on the ENRA land in the area of flora and fauna, and set up the forest cover monitoring equipment that helps to monitor the growth of trees in order to establish a rhythm of utilisation that respects the natural growth of the forest.

4.3.1.2.22 The Eastern Province Directorate of Environment (Number 21 in Table 6)

The Eastern Province Directorate of Environment has adopted the agro-forestry system with farmers to reduce the pressure on the forest as well as to boost the conservation of a large portion of the forest and prevent its destruction. The organisation considers two aspects of its strategy crucial to reducing deforestation in a responsible way. The Eastern Province has an office that monitors the forest as well as the deforestation process.

Loggers are made to pay for the logs and the money is used for reforestation and restoring species that are exploited for economic purposes. When illegal loggers are caught, they pay fines. It is possible for the provincial Directorate to carry out these activities because it is a state organisation. Unfortunately, there are serious problems in the DRC because when the illegal loggers are found to be soldiers, it is difficult to arrest or penalise them. In some cases therefore, illegal loggers are considered untouchable because they are people in authority or protected by people in power. The “untouchable” loggers are military personnel and local politicians who do not respect the law. In spite of this situation, other illegal loggers are always punished and there is much pressure on them to stop their activities. In Banalia, an estimate of 1 000 to 1 500 hectares of trees has been planted, and the Eastern provincial office is also planting trees on the main roads of Kisangani Town.

4.3.1.2.23 The ICCN Eastern Province (Number 22 in Table 6)

The strategy of the ICCN in the Eastern Province is to protect the reserve or the protected area by providing equipment and incentives to the guards. The ICCN protects the reserve by preventing illegal entry of loggers and thereby protecting the trees. This step helps to decrease the pressure on the RFO. The WCS Mambasa REDD+ project supports the ICCN financially, which shows a type of cooperation between projects and organisations. The main goals of the ICCN include protecting both fauna and flora, and promoting scientific research and tourism as long as it is compatible with nature conservation. Thus, by conserving the flora, the ICCN Eastern Province contributes to the reduction of deforestation and increase of carbon stock. It is the WCS Mambasa that deals with carbon issues.

4.3.1.2.24 The WWF National Office (Number 23 in Table 6)

The WWF builds on the operations of OSFAC. Specifically, it charts the maps of the DRC forest cover which help the WWF to observe zones with high rates of deforestation and to monitor species that are becoming extinct. However, the WWF tries to combat the causes of deforestation in partnership with the communities and share experiences with other international NGOs. The intervention zones of the WWF are Kinshasa, Bas Congo, Bandundu, the Equatorial, Kasai in the Salonga, and North and the South Kivu provinces. Since it is difficult to fight drivers of deforestation without identifying them, research on the causes of deforestation becomes a priority. The GTCR coordinates various organisations to enable them influence decisions jointly at the international level on ways to reduce GHG emissions.

4.3.1.2.25 The National REDD Directorate Office (Number 24 in Table 6)

The goal of the Directorate is to reduce deforestation in the DRC and the REDD approach is gaining grounds at the international level. The objective is to fund tropical countries that strive to conserve their forests. As REDD is a United Nations apparatus, the government of the DRC also subscribes to its regulations because it could help contribute to civil development and the conservation of DRC's forests. Thus, in 2009, the DRC officially adopted the REDD through a government edict. The REDD operation is piloted by the Ministry of Environment, while the National REDD Directorate Office was established to carry out the activities and the coordination of the projects.

The National REDD Directorate is supposed to maintain a database which should serve as an important tool for regulating the REDD projects in the DRC, but this tool has not been operational. Although the database was launched, some technical aspects are yet to be finalised. The REDD National Directorate plans to work on it in 2016 in order to make it fully operational and available to the public. The database needs to be functional for the programme to move to the phase of investment, and in order to test the National REDD strategy and its potential on a large scale. As required by the World Bank, the second phase can be funded if the criteria for the preparation phase have been met.

4.3.1.2.26 The UNDP National Office (Number 26 in table 6)

The UNDP sponsors programmes in collaboration with the Ministry of Environment and the community members within the NAMA project. The objective is to participate in the regulation of the climate by reducing emissions, protecting the carbon sinks and reducing ecological and climatic footprints in the DRC. The programme was launched in September 2012 to integrate the issue of climate change and environmental threats in policies and development programmes in all sectors of the DRC.

The support of the UNDP national office has helped the DRC to maintain its position among the top 25 countries in the world (eight are in Africa) in the first global initiative by the NAMA, because of its important efforts on reduction of emissions from deforestation and forest degradation.

4.3.1.2.27 The National Ministry of Environment (Number 27 in Table 6)

The task of the ministry is to coordinate the Project on National Appropriate Mitigation Actions (NAMA), Low Emissions Development Strategies (LEDS) and green growth in collaboration with the UNDP and other partners. Its task also includes the development of national inventories and reliable data collection in order to reduce the uncertainty in GHG's inventory. Improving data collection is a necessity because the two previous national inventories provided data with numerous errors due to substandard ways of collecting and handling data.

4.3.1.2.28 Geographically Integrated Pilot REDD+ Luki Project (Number 28 in table 6)

The REDD+ project around the Luki Reserve Biosphere in the Bas Congo Province fights deforestation by increasing the forest cover, promoting the savannah forest regeneration, reducing deforestation and improving the living conditions of the people. Targeting about 30 model farmers, the goal of the project is that farmers should concentrate all their activities on the same piece of land and not occupy more land. The project engaged a model farmer that conducts all his activities within short distances of different farm locations. The aim is to promote what is called sedentary agriculture or avoid nomadic agriculture. Incentives are provided to farmers in the form of seeds and crops for agro-forestry. Cash incentives are also given to beneficiaries who operate

on small spaces such as 0.5 acre of land and able to organise intensive activities within limited spaces such as 1.0 ha by using technology to increase yield. As the project aims to get concrete results, it disburses USD 400 per farm to beneficiaries to enable them prepare the land for agriculture. The selection of the model farmers is done by the CLD (Local Development Committee).

The strategy of the geographically integrated REDD+ pilot project around the Luki Biosphere in the Bas Congo Province provides models that could be useful for climate change mitigation. The issues of the model farmer and the Gold Standard should be further probed. The criteria for the selection of beneficiaries also take into account other dynamisms. For instance, a farmer who is not actively engaged in agriculture cannot benefit from the funds. Other criteria include ethical consciousness proven by the practice of tree planting on the farmer's own land and access to water on the farmland. The objective of the Luki project is to sell the carbon credit or avoid emissions. There is an obligation to adhere to the procedures and to the standards called Gold Standard. Adherence to the Gold Standard equals eligibility for the carbon market. It is the forest and non-forest methodology. In short, the goal of this Luki REDD+ project is to commercialise the carbon credit of certified emissions after fulfilling all the requirements of the Gold Standard. The project is based on a voluntary market and the International Forestry Office (ONFI) determines the standards of the projects. The WWF buys trees from the farmers in charge of the nurseries as a way of promoting the process of reducing deforestation. Certain criteria also apply to lands on which trees are planted.

The Gold Standard is new and is being tested in the six REDD+ pilot projects that comprise the National REDD strategy of the DRC. Further development in the use of the Gold Standard requires validation and evaluation of the success rate as well as capacity building.

The Gold Standard used in the Luki REDD+ pilot project helps to sell the carbon credit because it adheres to the market criteria. Therefore, the monitoring and evaluation of the field process should be conducted accurately to ensure that the required standards are met. This ensures that community members who engage in tree planting reap the benefits without seeing the exercise as a waste of time if they lose the carbon credit. The OSFAC provides forest and non-forest maps to ensure that trees are planted at the right place and according to the requirements. Therefore, it is important to certify the sites for tree planting first to ensure that the technicians are in the right place.

4.3.1.2.29 NOVACEL (Number 29 in Table 6)

NOVACEL is one of the six REDD+ pilot projects in the DRC that tries to organise alternative activities with local communities to discourage them from illegal logging. For example, the project encourages the people to engage in cassava farming and the use of agro-forestry which helps beneficiaries to acquire alternative skills and secure funds rather than depend on illegal logging. Thus, in 2008, NOVACEL was licensed by the UNFCCC to sell the carbon sequestered by the project which also contributes to the welfare of the beneficiaries. The beneficiaries become engaged in other activities and forget the forest. Local communities are funded by the project to improve their economic conditions without destroying the forest. To promote further development, the World Bank approved the payment of the NOVACEL carbon project in 2011.

4.3.1.2.30 The Equatorial Province REDD+ Project (Number 30 in Table 6)

The REDD+ conservation project in the Equatorial Province which is integrated with the social and structural activities of the community, employs modern cartography to identify the remaining forest space. Communication and public awareness are important because they help the people to understand the problems on the ground. Specific activities are organised to highlight the main causes of deforestation such as bush burning, and to promote agro-forestry which could help generate additional income and improve the living conditions of the people.

Moreover, the planting of palm trees around homes and in small parcels of land (less than 1.0 hectare) helps the community to engage in soap making and generate daily income from palm oil. These kinds of activities help local communities to decrease the pressure on the forest by generating small income and promoting sedentary agriculture that does not entail moving from one place to another. Regrettably, the project operates on small scale as it does not cover large areas of land – only about 1 500 hectares of land has been covered – and no cartographic information of its coverage is available. This is because the research centre that oversees the project is new and does not handle big projects. The research centre plans to develop and test the viability of the different methods and approaches.

4.3.1.3 Analysis of Table 6

The GHG inventory of the DRC forest made by the National Ministry of Environment has revealed that between 2000 and 2010 the carbon sequestration capacity by the DRC forest was seriously eroded. While emissions of GHG in the DRC were stationary during this period, the sequestration reduced. The results of emissions during the period described in the third national communiqué shows a progressive decrease of sequestered emissions. The DRC could reverse this trend by arresting the two main drivers of deforestation and forest degradation, which are bush burning and the active dependence of urban and rural households on wood energy. In other words, the shift to renewable energy sources is expedient, and the use of improved cook stoves can reduce deforestation and forest degradation because fewer trees would be cut.

The various institutions and organisations in the DRC adopted various strategies and measures to promote the reduction of deforestation and forest degradation directly through afforestation, reforestation and the control of deforestation or indirectly by adopting measures and strategies that consider sustainable forest management and forest conservation. The use of efficient energy systems and management of the nature reserve are part of these measures.

As noted above, the DRC officially adhered to the REDD recommendations in 2009 through a government edict. Once it was launched, about the project began to consider the mechanisms and strategies that could be put in place to reduce the pressure on the forests and to improve the living conditions of the people who depend on the forests. The situation in the DRC which is a vast country with 2 345 000 km² of land mass requires both expertise and financial support. In 2009, government experts worked in partnership with donors especially the World Bank through the partnership funds for forestry carbon as well as the UN REDD consortium - the FAO, UNEP and UNDP.

Thus, an action plan was put in place for the whole REDD process which comprises of three phases. The first phase is the preparation, the second is the investment phase, and the third is the implementation phase. In the preparation phase, the project tries to prepare the people, and considers various aspects of the context such as the legal framework, the territorial structure, and strategies for coordination. The various stakeholders which also include the institutions and civil society members deliberate together in order to identify the causes of deforestation and forest degradation in the country and come up with what is called the National REDD strategy.

However, the REDD process is rather complex; the people wondered what would happen after they plant trees. To whom would the carbon stock belong, and if the carbon is sold, how would the income be shared? To surmount these problems, the preparation phase and a detailed National REDD strategy that would consider two options were proposed. On the one hand, the project would conduct feasibility studies that would consider various theories and come up with a national consensus on the causes of deforestation. The studies were done with the participation of the civil society and other interest groups and organisations (Table 6). After identifying the causes of deforestation, there would be need to conduct experiments on the ground, and it is for this purpose that six geographically integrated REDD+ pilot projects were initiated.

With these six geographically integrated pilot projects, the DRC was able to gain financial support from the World Bank through the Congo Basin Forest Fund (CBFF) to the tune of USD 25 million. It is regarded as geographically integrated because the DRC is composed of four forestry ecosystems namely the mountain forests, the dry forests around the Miombo, the dense forests, and the forests around Bas Congo and Bandundu provinces. Thus, the Luki project around the Luki Biosphere (or the geographically integrated project around the Luki Biosphere) was identified and implemented by the WWF (Table 6).

The agro-forestry project in South Kwamouth also was implemented by NOVACEL, a private organisation. NOVACEL plans to test a model that is based on public and private partnership in the case of REDD, and because South Kwamouth is a zone with savannah and small trees, NOVACEL tries to determine whether these savannah lands could be converted into forests on large surfaces. The success of the NOVACEL REDD project in organising alternative activities with the local people lies in the fact that it basically improves agriculture by providing an alternative to wood cutting for income generation. The strategy of the geographically integrated REDD+ pilot project around the Luki Biosphere in the Bas Congo Province offers possible models for climate change mitigation projects, in particular the model farmer and the Gold Standard initiatives.

Another project was identified in the Equatorial Province; the REDD+ Project implemented by the Woods Hole Research Centre (WHRC). It is a project that focuses on capacity building in the case of REDD.

The Mambasa commission of Agriculture organises public awareness programmes among farmers and promotes the use of alternative techniques to reduce bush burning during the planting

season. Encouraging farmers to adopt modern agricultural techniques to work on small parcels of land is also a strategy of the REDD Climate Working Group (GTCR). The WCS North Kivu supports fishing activities through public awareness programmes and controls instruments used for fishing and fishing techniques. The WCS also supports fishermen, helping them to improve the quality and quantity of their fish production with the aim of improving their lives and discouraging them from making charcoal inside the park in order to reduce deforestation.

Another example of contributions in terms of strategy is shown by the ICCN North Kivu that organises public awareness workshops about the dangers of exploiting the forest. To combat the drivers of deforestation in the Tayna area, UGADEC Goma launched a public awareness campaign about the importance of trees and ways to reduce deforestation. UGADEC also encouraged the people to reduce the size of their farmlands and to designate specific places for breeding or husbandry in order to limit deforestation. In addition, the Eco-Makala REDD+ pilot project in the North Kivu Province promotes the establishment of tree plantations around the Virunga National Park, which would provide the people with the required wood energy. This is a good strategy that deters the people from exploiting the forest through charcoal making.

Overall, the idea behind all these six REDD+ pilot projects is to reduce deforestation and forest degradation and improve the living conditions of the people in a sustainable way. In short, it is to reduce the emissions of greenhouse gases from deforestation and forest degradation that reflects the mitigation in the forestry sector and also contributes to the development of local communities which have protected the forests for many years. Development is carried out through alternative activities organised by communities which have received funds from each of the REDD+ pilot projects.

In the Eastern part of the DRC, the activities vary from those in the Western part of the country, as the National REDD Directorate tries to focus on specific needs in a region. In 2011, agreements were signed to implement projects for three years. It was projected that by 2012, the national strategy for combating deforestation would have been ratified. However, by 2012, the strategy was not finalised because the National REDD Directorate had planned to test the studies on deforestation and forest degradation in the field before finalizing the national REDD strategy with these six REDD+ pilot projects. Some of these projects began in 2012 and Eco-Makala was initiated in 2013.

The projects kicked off with several challenges, and even though there is progress, it is supposed that by December 2016, most of the projects would have been finalised and the DRC government would have got a hang on the design of the National REDD strategy. It is the task of the Ministry of Environment and Nature Conservation to synthesise all projects in 2016 to see how things have developed. As the year 2016 is ongoing, activities in the form of workshops need to be organised to evaluate these REDD initiatives. In this regard, the National REDD Directorate plans to conduct two workshops in the eastern part and one workshop in the western part of the DRC. A synthesis of these activities will culminate in a major forum in Kinshasa. Prior to the start of the workshops, the National REDD Directorate plans to conduct meetings and dialogues with stakeholders and all projects in the Eastern Province, Goma, South Kivu, Maniema, and other areas. Subsequently, all the project organisations in the western part will gather in Luki to issue a policy document that will outline the national strategy. The harmonised strategy will reflect a national perspective of the geographically integrated projects.

However, various challenges have come up in the implementation of the different projects, and the coordination unit in collaboration with other international organisations such as the World Bank try to proffer solutions to the problems. Funds from donors do not come automatically, as there are often conditions attached. A whole range of criteria is defined by the World Bank that helps the DRC government to measure the success of the preparation phase. One of the criteria is that all questions relating to environmental protection must be clear. Furthermore, community involvement in the projects is important, as well as setting up an online registration procedure for the REDD project. This entails an online data technology or data processing package that helps to register REDD projects and participants.

Regarding the phase of investment which can be illustrated by the current project on GHG emissions reduction in the Maindombe Province, the World Bank pledged a USD 60 million grant towards this project. It aims to grow tree plantations that would cover 12 million hectares of land, and involve the people residing in the project zone. The project will also install a device for carbon stock monitoring. The carbon credit will be generated if activities are properly monitored, and since it is a government project, the World Bank has undertaken to pay all credits generated with a total of USD 60 million. This money will be redistributed to stakeholders who are actively involved in the project. If the project is ratified by the World Bank, it should be implemented

within five years (from 2016 to 2020), and in the Bandundu region especially in the Maindombe Province.

Besides these DRC REDD+ projects, there is also the FIF (Forest Investment Fund), which is expected in the second phase to support projects that contribute to the reduction of deforestation. The FIF has a national coordinator and has access to U\$D 60 million - U\$D 30 million donated by the World Bank and U\$D 30 million by the African Development Bank (BAD). As the country is rather vast, accurate zones will be identified for the project. It is in the implementation phase (third phase) that the people can begin to be paid the carbon credit. A guide of the carbon credit payment was given from the COP 20 in Peru, and for the National REDD Directorate, the COP 21 in Paris was a decisive point.

The DRC has produced a third version of the document which outlines the progress of the REDD+ process in the DRC. The document is not the final strategy, but a draft that is directed at the launch of the investment phase by keeping the dialogue going thus:

- Within the government – the focus is on the definition of priorities and the goal of maintaining the process, the integration of the REDD+ in the sector policies and its place in the national development strategy by 2035;
- Between development partners – the goal is to sensitise them to their roles in diverse interventions that would contribute to REDD+ objectives in a manner that would steer the DRC towards a green economy;
- Between the government and its partners in development – presenting and discussing the relevance of the DRC propositions about the concrete implementation of REDD+; at the end of 2012 and especially in 2013, these propositions have been at the core of dialogues geared towards increasing REDD+ investments in the DRC.

The contributions of the National Ministry of Environment are important in the context of climate change mitigation strategies reflected in its involvement in the project by National Appropriate Mitigation Actions (NAMA). The process was launched in the DRC in September 2012 to integrate the issue of climate and environmental threats in policies and programmes about development in all sectors.

The support from the UNDP national office has helped the DRC to maintain its place among the 25 countries in the world (eight of which are in Africa) in the first global initiative NAMA. The

DRC secured the ranking because of its significant efforts in reducing the emissions from deforestation and forest degradation (REDD+) which results in up to 80% of emissions reductions especially from deforestation (firewood) and agriculture. In the same way, the UNDP helps the DRC to identify its priorities and formulate a national programme which integrates both the REDD+ and NAMAs in a global strategy entitled capacity building in low emissions programmes (LECB).

Since 2011, the EU and the UNDP have worked together on the capacity building in low emissions (LECB). Within a short period, this programme got support from many donors especially from Germany (BMU) and Australia (AusAID). The initiative has now spread to more than 25 countries in different parts of the world including the DRC. The LECB programmes are based on dialogue and interactions between different ministries (Agriculture, Rural Development, Environment, Hydraulic Resources, Electricity, Small Industries, Interior, etc.) in the definition of policies and adequate strategies for the mitigation of climate change impacts. There should be the reinforcement of synergies between decision makers at the national and local levels to integrate the interconnection between the components and goals. Therefore, the UNDP is collaborating with the DRC government in this process. The objective of the NAMA initiative is to mitigate the GHG emissions and promote sustainable development.

The question is why are the NAMA initiatives useful for the DRC? In the DRC and in other countries, the NAMAs objectives, which are voluntary and appropriate national measures for mitigation, are twofold: a) to ensure the mitigation of GHG emissions, and b) to generate environmental and socioeconomic co-benefits. The primary task of the NAMA is to reduce GHG emissions. The reduction of emissions has direct and indirect consequences on the environment, economy and the people's social life. The direct impacts are those related to the emissions reduction and especially the temperature and climate stabilisation. If it does not cover this *sine qua non* condition, the measure is not regarded as a NAMA initiative. On the other hand, a NAMA initiative should produce transformational impacts by reducing the ecological and climatic footprints for each citizen.

The second characteristic of a NAMA initiative is to produce environmental and socioeconomic advantages called co-benefits. Indeed, a NAMA project must have positive impacts on the environment – protection of biodiversity, improvement of the water quality, reduction of air pollution, ensuring eco-systemic services, etc. On the social level, it is to promote cultural, family

and individual wellbeing; while on the economic level it is to create jobs and to increase the purchasing power, etc.

In 2012, the commitment in the area of mitigation became a reality with the creation of the NAMA project which focuses on emissions from the four key categories recognised by the UNFCCC namely energy, agriculture, wastes and industrial processes. Emissions from the forest form the fifth key category but it is covered by the REDD+ project, which is also a national appropriate measure of emissions mitigation.

The DRC's NAMA project, which was launched in July 2012, is funded by the EU, Germany and Australia with USD 642 000 for a period of 36 months. It also receives technical support from the UNDP in the form of a capacity building world programme. This programme, which is initiated by developed countries for developing countries, targets the improvement of the capacities of participants from the public and private sectors in the following five activities: (a) the improvement of the GHGs inventory systems (I-GES); (b) the formulation of the national appropriate mitigation measures actions (NAMAs); (c) the conception of systems of measuring, reporting and verification (MRV); (d) the elaboration of low emissions development strategies (LEDS); and (e) the encouragement of the private sector to invest in appropriate technologies for the implementation of the NAMA initiatives. Firstly, the DRC has been selected according to its priorities to develop only three of the activities, that is, the conception of an improved system of GHGs inventory, the identification process, the formulation and justification of NAMAs and the conception of a monitoring system (MRV).

In 2014, an additional funding of USD 321 000 from Germany helped the DRC to add to the LECB programme the formulation of an efficient development strategy in carbon (LEDS). However, the DRC is yet to secure funding for the fifth and the last component - the support of the private sector to invest in appropriate technologies for the NAMAs. The NAMA project aims to provide all the key stakeholders of sectors that emit the GHGs with the capacities, knowledge and tools which will help them to search for funds and design projects that will contribute to the mitigation of emissions. The results from the NAMA initiatives process and the progress achieved by the DRC in its efforts towards mitigation and adaptation was presented to the United Nations during the last Paris world session in favour of climate change in December 2015. The ultimate goal of the NAMA project is to turn the DRC into a green economy and this would in

turn improve social wellbeing and social equity as the environmental risks and resource scarcity also reduce significantly.

The National Ministry of Environment plays an important role in the climate change mitigation strategy of the DRC. It is involved in the project by National Appropriate Measures Mitigation Actions (NAMA), Low Emissions Development Strategies (LEDS), and green growth in collaboration with the UNDP and other partners. Since the beginning of the inventory process in 1997, two arms have been put in place for data exchange. The first concerns the emissions from the forestry and agricultural sectors while the other structure deals with emissions from other sectors. The ministry works on this through its climate change department of sustainable development. The two arms bring together experts from different international institutions and organisations that handle data collection and statistics. The improvement of data collection is necessary because the previous two national consultations relied on records that were based on the IPCC guidelines, but the data presented were surrounded with uncertainty. Therefore, it is important to revise the data collection procedures and the choice of sources in order to establish a relevant and standard database. It is the guideline of the American Agency for the Environment that is used in the LECB programme to improve the inventory system in terms of reliability and transparency.

In brief, all these activities help to put in place a final draft of the national strategy for fighting the drivers of deforestation.

4.4 National REDD+ programme and contributions of other organisations to climate change mitigation in the DRC

Question 2: How is the national REDD project unfolding and how does REDD with other organisations contribute to climate change mitigation in the DRC? (Question 2 Appendix A)

The REDD projects and other organisations make various contributions to climate change in the DRC by reducing emissions from deforestation and forest degradation as indicated in Table 7 below.

Table 7: Contributions of National REDD Programmes and of other Organisations to Climate Change Mitigation in the DRC

N°	Organisation	Contributions of national REDD programmes and organisations to climate change in the DRC
ORGANISATIONS FROM THE NORTH KIVU PROVINCE		
1	Réseau CREF (CREF Network) (Works to reduce deforestation)	The CREF Network is involved in REDD at two levels: <ul style="list-style-type: none"> ✓ conservation and sustainable management of forests; and ✓ The follow up of rights of communities and indigenous people during the implementation of REDD+ projects in the DRC.
2	YME Great Lakes Beni (Forestry)	<ul style="list-style-type: none"> - As the REDD project aims to mitigate the effects of global warming, YME Great Lakes fights deforestation by reducing the cutting of trees in order to mitigate climate change impacts such as drought which had become rampant in its intervention zone. - The YME began to plant trees and to calculate the carbon stock related to those trees.
3	Research Centre for Environmental Planning (Supports reduction of deforestation)	<ul style="list-style-type: none"> - The centre was involved in the Tayna REDD+ project. It contributed to the REDD project in the area of the cartography in order to reduce deforestation. - The fact that the research centre talks about projects of tree planting coupled with the biogas kit shows that it is already a climate change mitigation path because it reduces emissions from the energy and forestry sectors.
4	WCS North Kivu (Conservation and REDD programme)	The WCS respondent was unable to provide information because the organisation is still waiting for funds. However, it was noted that it is the WCS Forestry in Mambasa that handles REDD activities.
5	Jan Goodall Institute	<ul style="list-style-type: none"> - The goal of Jan Goodall Institute is to advertise REDD projects in most of community meetings and promote capacity building in collaboration with universities. However, the organisation is not involved in the calculation of carbon stock. - It has organised workshops to promote REDD projects and climate change for teachers. These workshops are organised to educate people on the basic importance of REDD and its objectives.
6	WWF North Kivu (Eco-Makala REDD+ Pilot Project)	<ul style="list-style-type: none"> - In collaboration with the WWF Goma, the Université Catholique de Louvain (UCL) has produced maps of forest and non-forest areas as well as the map of biomass and soil occupation. - The WWF also cultivates tree plantations for charcoal making in order to protect the Virunga National Park in a REDD pilot project called Eco-Makala+. However, the carbon stock has not yet been calculated.
7	North Kivu Ministry of Environment	<ul style="list-style-type: none"> - The provincial government is involved in the REDD project because the focus of the provincial REDD+ is already integrated in the agenda of the provincial office - one of its officials attends all meetings about the strategies of reducing deforestation and forest degradation. - Thus, the provincial Ministry of Environment has integrated the REDD national policy into the activities of the provincial government.
8	UGADEC Goma	- UGADEC was involved in the Tayna REDD+ project after its officials

	(Association' unions for Gorilla conservation and community development in the eastern DRC)	<p>were trained by the Cirrus Group from South Africa. The training was compulsory because it was a new field of research;</p> <ul style="list-style-type: none"> - UGADEC has trained representatives of some communities who also went back to educate their respective communities on the importance of REDD+; - UGADEC officials were also selected to collect the biomass data from the field in the Tayna REDD+ project; - The carbon stock per hectare per annum for the project was 61,78 tons; - Unfortunately, this project was interrupted before the production of the PDD, which means before the first phase of preparation ended due to management problems. Meanwhile, the community continues to wait for the activities to resume.
9	North Kivu Provincial Directorate of Environment	The North Kivu Directorate only engaged in the publicity of the REDD+ through workshops when it collaborated with the REDD in the North Kivu Province.
10	ICCN North Kivu	<ul style="list-style-type: none"> - The ICCN is involved in REDD+ activities in North Kivu in the area of conserving surfaces and forestlands which contribute to carbon sequestration. The main objective at the national and provincial levels is to reach 17% of the national territory in the implementation of protected areas; - The ICCN works with communities by implementing a programme called CBNRM (Management of Natural Resources through Local Communities). This programme develops areas of interests for conservation in decentralised territorial entities around the Virunga National Park, the Maiko Park and Kahuzi Biega Park to ensure the protection of forestlands which are in direct contact with protected areas in order to contribute to carbon sequestration. - However, the ICCN North Kivu is not developing any REDD+ project. The Tayna and Kisimba Ikobo REDD projects were developed by Conservation International (CI), and the ICCN North Kivu was not involved in their implementation.
ORGANISATIONS FROM THE SOUTH KIVU PROVINCE		
11	CERD (Renewable Energy Centre for Development)	The CERD is interested in the REDD project in the area of reducing the pressure on the forest
12	WCS South Kivu	The WCS South Kivu is not aware of the REDD. However, it has installed a meteorological station in the Kahuzi Biega Park especially in the Bulugumiza Mountain to collect data related to climate change.
13	ICCN South Kivu	<ul style="list-style-type: none"> - The REDD programme in the South Kivu Province is not well developed because the first agent of the REDD was inactive for a long time and he has abandoned the project because he has gone into politics. - The coordinator of the REDD at the provincial level is unidentified,

		and the ICCN is involved only in creating public awareness on reducing deforestation among the people living around the forest.
14	South Kivu Provincial Directorate of Environment and Sustainable Development	At present, there is no REDD project in the South Kivu Province. Even though its proposal was approved, it is not functional because of politics.
ORGANISATIONS FROM THE EASTERN PROVINCE		
15	OCEAN Geographically Integrated REDD+ Pilot Project in Isangi	<ul style="list-style-type: none"> - The University of Kisangani (UNIKIS) is working on the carbon stock in the Isangi project and has already installed different parcels both in the primary and in the secondary forests. The project already has 300 parcels within a defined boundary for which the university is calculating allometric equations; - The UNIKIS works on the ecological monitoring, socio-economic and reference data and - The carbon stock has been calculated at (195-210) tons per hectare per annum respectively on the right and left sides of the Congo River.
16	Mambasa commission of Agriculture	<ul style="list-style-type: none"> - Staff members of the Mambasa Department of Agriculture were trained by institutions which are in charge of REDD and were involved in surveys on REDD in different villages; - The commission is involved in REDD through WCS Mambasa which supplies cocoa seeds to the commission to distribute to the people for planting. It is part of the alternative activities of the REDD project; - The department operates the cocoa nurseries and assist all farmers to respect the regulations regarding the cocoa planting season. In addition, the department organises media programmes on emissions to educate farmers on how to nurture the cocoa. The follow up of the cocoa planting which is called biological agriculture is important as the protection of the plant is also considered; - The department encourages beneficiaries not to cut all available trees on the farm but to leave 40% to agro-forestry development. In this case, the 40% of trees and the cocoa contribute to carbon sequestration. - 4464 ha of cocoa have been planted resulting in a production of 1055 tons of cocoa according to ESCO which pays for the products.
17	WCS Mambasa Forestry REDD+ pilot project	<ul style="list-style-type: none"> - The WCS REDD+ project took off in 2011, and began fieldwork in 2012 with financial support from the African Development Bank; - The University of Kisangani as a consultant has already set up 149 parcels which are expected to reach 200. Presently the monitoring of socio-economic parameters and the carbon stock have been carried out; - It is expected that 230 tons of carbon stock per hectare across 50 hectares of the 200 parcels are to be implemented per annum; - The project supplies improved seeds to communities as well as agriculture material such as the new variety of cassava, bean, peanuts and maize seeds. - The intervention zone for the CARPE is 40 000 km² and 9 000 km² for

		<p>the WCS intervention zone;</p> <ul style="list-style-type: none"> - The WCS also established a community reserve in the eastern part of the country. The project was designed at the phase of preparation, and the WCS is planning to enter to the second phase in order to have the carbon market and - In terms of methodology, plots or parcels are used to estimate the carbon stock in parcels of 50m x 50m.
18	Eastern Province Directorate of Environment	<ul style="list-style-type: none"> - The Directorate is engaged with the two REDD+ projects in Isangi and Mambasa and is represented at their meetings in order to report to the General Secretary in Kinshasa. - The Directorate also engages in follow up and offer consultations to the project management.
ORGANISATIONS FROM THE TOWN AND KINSHASA PROVINCE		
19	WWF National Office	<ul style="list-style-type: none"> - The WWF in the DRC manages two REDD+ pilot projects. They are the geographically integrated REDD+ pilot project around the Luki Reserve Biosphere in the Bas Congo Province, and the Eco-Makala+Virunga project in the North Kivu Province. - The WWF also has another REDD preparation project on nature conservation located in Bandundu as well as carbon mapping model projects that could help the WWF to produce the carbon map of the DRC by using a tool named Light Detection and Ranging (Lidar). Lidar is a new technology that enables one aircraft to fly above the forest cover and obtain accurate data on the rate of deforestation and the carbon sequestrated by different types of trees.
20	GTCR (REDD Climate Working Group) of the National Office of the Civil Society	<p>The idea of the GTCR is to investigate a link between the GHG emissions reduction and poverty reduction. The reduction of poverty has direct impact on forest protection in the sense that there is a reduction in the need for cutting trees while enhancing the carbon stock and climate change mitigation.</p>
21	UNDP National Office	<ul style="list-style-type: none"> - The UNDP office belongs to the UN-REDD+ which is a consortium of FAO, UNDP and UNEP. - The UNDP has helped the DRC to maintain its place among the 25 countries in the world (eight of which are in Africa) in the first global initiative of the NAMA because of its significant strides in emissions reduction from deforestation and forest degradation (REDD+). The country's reduction of emissions which come essentially from deforestation (wood energy) and agriculture will reach 80%.
22	National Ministry of Environment	<ul style="list-style-type: none"> - The role and contribution of the ministry lie in the development of the national strategy and the coordination system. - It has six pilot projects in the DRC and has planned to have in 2013 through a council of ministers a REDD+ national strategy on which the DRC project builds its development programmes.

ORGANISATION FROM THE BAS CONGO PROVINCE		
23	Geographically Integrated REDD+ pilot project around the Luki Reserve Biosphere	<ul style="list-style-type: none"> - The Luki project is a voluntary market and its standards are set by the International Forests' National Office (ONFI) which helps to realise the project design document (PDD), and promote the capacity building in Measuring, Reporting and Verification (MRV). - The carbon stock is 16 000 tons of CO₂e per annum. - The project is already at the beginning of the third phase after the phases of preparation and investment. The third phase entails putting in place 1 000 ha of trees in the savannah as well as 5 000 ha of anthropic savannah so that people who refrain from bush burning will be paid USD 5 per hectare per annum. This is a way of increasing the forest cover; - At the end of the project, the carbon credit will be given to the local steering committee (CLP) and each beneficiary; - Besides the 1 000 ha and the 5 000 ha of tree planting in the savannah, the project has selected 30 model pilot farmers to increase the income of communities living around the Luki Reserve. It also produced 20 maps of village territory to help the locals manage their lands by causing some part to lie fallow and protecting the savannah by not burning it. These encourage the people to decrease the pressure on the forest; - The project also ensures the protection of 30 000 ha of the Luki Reserve with the services of 60 eco-guards.
ORGANISATION FROM THE BANDUNDU PROVINCE		
24	NSK (NOVACEL REDD+ pilot project of agroforestry in South Kwamouth)	<ul style="list-style-type: none"> - The NSK is one of the six official REDD+ pilot projects in the DRC; it is located in the South Kwamouth; - It has a target of carbon stock of more than 60 000 tons which continues to grow with eight tons of CO₂/hectare/year; - It adopts a management system based on the rotation of trees that complete their growth in seven years for the carbon stock. Then the trees are cut after seven years because from the seventh year the capacity of trees to produce carbon stock begins to decrease. Trees are cut and used to make charcoal and firewood that communities sell in rural areas. At the same time, trees are being renewed; - The NSK also adopts alternative activities such as the agriculture of cassava with agro-forestry and transformation of cassava into flour to be sold in Ibi village and Kinshasa town. The income of the local communities increases and the forest is protected accordingly. - The project management is carried out with other international partners who are involved in the REDD initiatives and carbon stock sale based on all standard requirements. The NOVACEL REDD+ pilot project is now approaching the third phase of implementation and it has become a model project in the DRC.

ORGANISATION FROM THE EQUATORIAL PROVINCE		
25	Equatorial Province REDD+ pilot project	<ul style="list-style-type: none"> - This project works on the level of the community by constructing a unit of a REDD project on a high scale, especially on the community scale and soliciting for funds for the advancement of conservation activities; - The project is also working on the link between cassava production and marketing it to increase community income while protecting the forest cover. - The project aims at organising all sectors and supplies animals to the people for cattle farming. However, the issue is the transmission of zoonoses between animals and human beings. The breeding of rabbits and pigs is also in the pipeline. The Equatorial project can only measure the carbon in the soil but it does not focus on the carbon stock as other REDD+ projects do. A project on apiculture is also envisaged.

4.4.1 Analysis of the contribution of the REDD and other organisations to climate change mitigation in the DRC

4.4.1.1 Introduction

The REDD project is involved in the mitigation of climate change through activities that reduce emissions from deforestation and forest degradation. The operation of REDD is made possible through the conservation of nature and sustainable management of forests which constitute the contribution of the organisations and NGOs in climate change mitigation. Forests are resources but also give to human beings what they need from the environment such as oxygen. They also provide ecosystem services and help the reconstitution of the soil.

On the socio-economic level, the organisation collates data on the lifestyle and the living conditions of the communities targeted by REDD+ projects, their demography and their economic development. In the process, the reference scenario, which is a document that takes into account the socio-economic data, data of carbon stock, the monitoring of the forest cover and everything that is related to the rate of deforestation, is also developed. All these biological and socio-economic data are put in place to develop models of projection called medullisation, which shows the current situation and predicts possible outcomes for the future. If there is deforestation and forest degradation, there is a decrease in carbon stock. It is important to look into factors that

influence all these which could be increase in population, economic growth among other things, but all these parameters have to be put together.

Countries have to follow certain directives or rules in their REDD projects. For example, they need to put in place an MRV system of GHG emissions. In this regard, the DRC has set up a team that has worked on an accepted methodology for operating the MRV system. This methodology recommends the use of sample plots of 50m x 50m in which all trees with a diameter of 10cm or more are measured. A sample is taken for each type of forest to check the carbon stock. Measurements are taken in the field and are based on the height and types of trees. Once of the various data are obtained, the allometric models prepared and recognised internationally are used to estimate the basic measurements from the field and the estimation of the biomass. The biomass is estimated per plot or parcel. The forestry biomass is composed at 50% of the carbon (dry biomass). Once the biomass is found, it is divided by two to obtain the carbon stock. This is the methodology used so far in the DRC REDD+ project.

There are programmes also related to the REDD+ project such as the alternative activities organised by the project. If the project can run with a certain number of activities, it can contribute to the reduction of deforestation. This means that it is possible with alternative activities to stabilise the carbon stock and deforestation. The project can even contribute to the increase of the forest cover which means that activities such as reforestation, afforestation, and others are important. All these are aimed at making projections and producing a document called reference scenario. This document will be used by the government to maintain the REDD national strategy in order to increase the carbon stock or to decrease the threats against the forest.

One of the criteria for the project is accessibility. Plots should be in an accessible place where people can locate easily. It is based on the criteria that plots are located in the forest. They are permanent plots and made conspicuous, and the trees are marked which means signs are put on them. This helps to carry out the monitoring periodically. The concept of partnership in project design and implementation and supporting activities is clearly seen in almost all the projects and among organisations under the REDD+.

The concept of coordination has been established through various coordinating units at the National REDD Directorate Office, at the national Ministry of Environment, and at the provincial levels. Each unit is supposed to have a focal point that aligns with the REDD+ projects. The national Ministry of Environment is considered to be the coordinating organ of all the REDD+

pilot projects in the DRC. It has adopted through a board of directors in 2013 a REDD+ national strategy on which the DRC projects build their development programmes. The provincial Ministry of Environment has integrated the REDD national policy in the programmes of the provincial government. The Directorate does the follow up and advises those in charge of project management.

The representative of the Directorate in the province attends meetings of the REDD+ projects and sends the report to the General Secretary in Kinshasa. These projects are important because they promote development in the provinces and improve the living conditions of the beneficiaries.

The NAMA project is a national initiative in the DRC that is supported by the UNDP and helps the country to maintain its rank among the top 25 countries in the world (eight of which are in Africa). It is an important initiative with respect to emissions reduction from deforestation and forest degradation (REDD+).

The concept of drawing the scope of the project as well as the boundaries of the reserves was necessary because the intervention zones for the projects should be known. This would help carbon stock calculation within the scope of the project and facilitate project management. Accordingly, different programmes, reserves and maps were authorised by the project and local communities at different meetings. The maps would clearly explain to local communities in the local language the various features of the intervention zones in terms of land, hills and rivers. The validation process produced valid maps drawn by the office and accepted by the community after validation.

All REDD projects at the international level have to pass through the state and funds are disbursed through the state. The funds are not private but government funds; hence, government officials from the different regions are involved in all activities including the validation.

The Ministry of Environment has demonstrated that at the national level, there is a strategic national framework and there are six pilot projects that are experimenting with different approaches to continue that strategic framework. At the national level, people work with different standards and on questions about land planning and reform in line with the strategic national framework. Some REDD pilot projects work simultaneously with the UN habitat on these different aspects to produce documents on land security.

At the national level, REDD pilot projects are in transition between the experimentation and the investment phases. How much would a pilot project cost? There are several possible answers to

this question, hence the need for experimentation. All the pilot projects are considered experiments and their findings are forwarded to the national level. The DRC is at the experimentation phase but significant progress is being made to attain the phase of investment. Before the implementation of these projects, studies were carried out to determine the rate of deforestation at the national level. The result showed that the rate was less than the global average rate of deforestation. It should be noted that carbon credits could be generated by pilot projects that would end by December 2016.

The main goal of the nature conservation strategy is that on the national and provincial levels nature reserves would reach 17% of the national territory in the implementation of protected areas. In addition to information provided in table 7, the following organisations show in details their different ways of contributing to climate change mitigation.

4.4.1.2 Contribution of CREF Network to climate change mitigation (Number 1 in Table 7)

On the link between the CREF Network and the REDD project noted above, CREF Network is involved in the sustainable management of forests through the community forests in different parts of the North Kivu Province. The Network educates communities about the different roles of the forests and encourages the communities to adopt tree-planting culture. The CREF network contributes to climate change mitigation because trees that are planted sequester carbon. The Network is also active in the process of ecological development and sustainable agriculture so that the carbon sequestered would be conserved.

As REDD projects generate carbon credits with the participation of the people and with the hope of getting benefits at the end, the CREF network follows up the situation so that the rights of people are respected. Its task is in the area of monitoring to ensure that the communities receive their dues in all REDD+ projects implemented in the North Kivu Province.

The CREF network is involved actively in the REDD project through public awareness programmes that would enlighten the communities about their different rights and benefits vis-à-vis REDD projects. However, the organisation of the community forestry programme is carried out in Walikale, Beni and Lubero, and the Ministry of Environment especially the Department of Sustainable Development is looking into how the CREF network contributes to climate change mitigation through community forestry and reforestation.

4.4.1.3 Yme Great Lakes Beni (Number 2 in Table 7)

Yme Great Lakes Beni project runs a campaign against tree cutting in order to reduce deforestation, drought conditions and contribute to mitigation of the effects of global warming. Since Yme began to plant trees, it is seeing how to calculate the carbon stock related to those trees.

4.4.1.4 Research Centre for Environmental Planning (Number 3 in Table 7)

According to the Research Centre for Environmental Planning, the Tayna REDD project stimulated or inspired the DRC to establish the national REDD initiative, as the national REDD Directorate did not exist before the Tayna project. In the Tayna project, the centre was involved in the measurement of different parameters related to GHGs inventory such as the height of the tree, the DBH, and the weight of the humus in the soil. Standard sampling procedures are followed.

The Tayna project adhered strictly to established international standards. The project had regional partners and all their results were usually sent to the Cirrus group in South Africa for final calculations. The advantage of this project is that researchers benefited much from the training by the Cirrus group based in Cape Town especially in the area of expertise which is relevant to the DRC's climate change mitigation strategy. The Tayna project also educated the local people about the importance of the REDD project, and inspired the DRC to get into the REDD process as it is considered the second largest forest in the world in terms of carbon sequestration. On the scientific level, all the requirements by the Conservation International were already met by the technicians. However, communication needs improvement in this project. The project design document (PDD) needs to be finalised so that the project could complete the first phase. The project may be renewed every 30 years for a total of 90 years. The financial support which amounts to USD 3 000 000 - 3500 000 could be given annually, and future generations would benefit from it.

In the implementation phase, that is, the third phase, the people could begin to receive funds for the different projects implemented. A project on sustainable agriculture and animal husbandry was being planned to support the REDD project to keep beneficiaries busy and enable them make use of the generated income to reduce pressure on the forest.

The idea of the Tayna project took off in 2009 and engaged in training until February 2010. From 2010 to 2013, the project data relating to the REDD project and on biomass were collected while fieldwork was also being carried out. Subsequently, the boundaries of some of the reserves were defined in order to identify the intervention zones for the project and thereby help carbon stock calculation within the project scope and facilitate project management. Maps of reserves were validated by the project and local communities at different meetings. The maps would clearly explain to the community members in their local language various features of the intervention zones in terms of land, hills and rivers. The process of producing valid maps was conducted in the office and validated by the community after the clarifications.

Conservation International was a major role player in this project and handled the funding process. Funds were obtained from Disney which is the company that planned to implement a REDD project in the DRC, and the funds are subsequently managed at the local level by Conservation International (CI) with the help of the government.

A certain number of associations were set up to manage the reserves such as the RGT or the RECOPRIBA which managed the Kisimba Ikobo Reserve. Both UGADEC and Diane Fossey were involved at the onset because funds passed through CI, Diane Fossey and UGADEC. The research centre was also a partner because its staff members could provide the scientific skill for the implementation of the project. However, the main players were RGT or Tayna, RECOPRIBA, CI, UGADEC, Diane Fossey and the government. Every 30 years, the project could be evaluated to verify if protocols are still being observed.

4.4.1.5 Jan Goodall Institute (Number 5 in Table 7)

The task of Jan Goodall Institute which is an organisation within the REDD ambit is to educate people about the significance of the REDD at community meetings. The Jan Goodall Institute also works with universities in the area of the capacity building but it does not calculate the carbon stock. It has organised workshops about the REDD through environmental education programmes. A workshop on climate change and the basic goals of the REDD was organised for teachers by the Jan Goodall Institute.

4.4.1.6 WWF North Kivu (Number 6 in Table 7)

In North Kivu, the WWF works on a project (Eco-Makala+ project) to increase the carbon stock through reforestation, tree planting and the conservation of the soil carbon. Cultivating tree plantations to be managed for charcoal making in order to protect the Virunga National Park is a REDD pilot project called Eco-Makala+, but there is also the concern of quantifying the carbon stock. However, the WWF North Kivu also works with different universities to estimate the rate of deforestation which is one of the elements that keep the national strategy going.

4.4.1.7 North Kivu Ministry of Environment (Number 7 in Table 7)

For its part, the North Kivu Ministry of Environment engages in REDD activities by creating awareness through conferences in universities about the dangers of degrading the environment or the forest. This provincial Ministry of Environment carries out REDD programmes in collaboration with other partners. The activities of the ministry are on two levels: coming up with the cartography of the existing forests in the province, for example, of the Walikale area which is made up of a vast forest. The ministry and its partners also educate the population not to destroy the forest in the bid to meet their wood energy needs. Rather, the ministry encourages the people to use the forests for other products without causing deforestation. This line of thinking pushes the ministry to consider other programmes such as apiculture that would enable the people to use the forest without destroying it. The ministry and its partners are all involved in the REDD process.

However, in the DRC, the ministry has observed that the concept of REDD has not yet received adequate support from the international community. The main challenge is that even now those who have conserved their forests have not yet been compensated. Although the people are already aware of the issues on ground, some of them continue to degrade the forest because the development projects promised to help them have not yet been put in place. Therefore, the REDD needs to provide funds to protect the remaining forests in North Kivu.

4.4.1.8 UGADEC (Number 8 in the Table 7)

The involvement of the UGADEC in the REDD process entailed the use of different methods for data collection and the measurement of the biomass in the Tayna project. Various methods could be used but only the method of dividing the forest into plots and sub-plot was used. A radius of

15m makes up the plot, and each plot contains two sub-plots, one of 2m and the other of 5m of radius. The activities on a plot begin on the sub-plot of 2m the technicians counting all plants (small trees) in that sub-plot. After that, the number and the names of the trees (lanes) are written. In the second sub-plot, all trees with a circumference of over 2cm and less than 5cm are measured according to the DBH and the height. Once measurements of trees within the radius of 5m are complete, those within the radius of 15m are also measured. In this case, only trees with a circumference of over 10 cm are measured.

Furthermore, the tools for measuring these parameters include a tape meter to measure the circumference and the plot, the clinometers to measure the height of the tree, and the GPS. After delimiting the plot, data is obtained from its centre, called point zero, and recorded on different forms. Successive plots are systematically arranged in one kilometre long straight lines.

In addition, UGADEC educates the people on the importance of trees and things that should be avoided to reduce deforestation. For example, people who have many fields for agriculture may contribute to deforestation. The UGADEC solves this problem by encouraging sustainable cattle farming on specific plots without shifting.

The procedures for delineating and measuring the plots are the same for all forest types including the rural complex, and provide forest cover, biomass and carbon stock in all types. The project was implemented into two vast areas including the Lubero territory precisely in Bamate and Batangi. Villages where public awareness programmes were conducted include Kasuo, Basekeseke, Bunyatenge, Muhanga, Kulimba, Mbuyi, and Mbihira while others are Katondi, Butondo, Mutenda, Mpinga, Feki, Kisimba Ikobo. There are 36 villages are around the reserve.

From the GIS data, maps were produced based on dials. The dial is composed of 9 or 10 plots. The project covered two reserves that were divided into three parts - the northern, central and the southern parts. The Tayna Reserve is in the North. Therefore, the centre is the southern part of the Tayna Reserve, the northern part is Kisimba Ikobo, and the southern part is the Kisimba Reserve.

Necessary periodic evaluation of the progress of the project was often constrained by lack of funds. The project itself was in three phases. The first phase was the phase of preparation with a series of activities such as public awareness programmes, trainings, biomass data collection, study of the environmental impact, socio-economic surveys, the delimitation of the project area and estimating the cost of the project. The second phase was the phase of carbon

commercialisation. The first phase could end with the draft of a document called project design document (PDD) which could be defended at the international level in order to be considered for the carbon credit. Once this document is accepted, a carbon credit market could be allocated to the project to enable it proceed to the second phase called the investment phase. Organisers of the project have opted for the voluntary market in order to avoid the constraints imposed by the government. While the market between two organisations or enterprises is voluntary, the market between two states or two governments is regarded as constraining.

People from the two reserves, precisely 126 agents, were paid each year to work on implementing the project. Scholarships were awarded to indigent students to facilitate their access to education, and medical supplies were made to certain health institutions. Elderly people were treated in such health institutions free of charge. The project also engaged in animal husbandry as it distributed genitors of goat, sheep and pig to help the population meet its nutritional needs.

4.4.1.9 North Kivu Provincial Directorate of Environment (Number 9 in Table 7)

The North Kivu Provincial Directorate of Environment joined the REDD programme in 2013 with the establishment of a REDD representative in the North Kivu province. Before then, the project operated only in other provinces. The REDD focuses on reducing emissions from deforestation and forest degradation. The Directorate in collaboration with the REDD representative has organised many workshops to educate people on the consequences of deforestation and degradation of the environment. North Kivu is important in the sense that almost 70% of its land surface is covered by the forest. The Walikale territory alone constitutes 40% of the North Kivu Province land surface, and together with the 800 000 hectares of the Virunga National Park and parts of the Maiko National Park make up the forests in the North Kivu Province.

4.4.1.10 CERD (Number 11 in Table 7)

The CERD however, contributes to climate change mitigation indirectly through REDD activities that entail energy measurements. The organisation is fighting for the decrease of deforestation through the reduction of charcoal consumption by the promotion of the improved cook stoves. So CERD is considered as an actor in REDD activities.

4.4.1.11 WCS South Kivu (Number 12 in Table 7)

The WCS South Kivu has installed a meteorological station in the Kahuzi Biega Park specifically in the Bulugumiza Mountain to collect data on climate change impact. The meteorological station was installed in 2013 and the WCS South Kivu engages in data collection on the sensitivity of amphibians and reptiles to climate change. The activities of the WCS help to determine whether there are positive or negative impacts on amphibians and reptiles. In other words, if there are impacts on these species, it could be a warning sign that climate change is being experienced in a given place.

4.4.1.12 OCEAN Geographically Integrated REDD+ Pilot Project (Number 15 in Table 7)

The OCEAN Geographically Integrated REDD+ Pilot Project in Isangi carries out the calculation of allometric equations with the collaboration of the University of Kisangani which facilitates the calculation of the carbon stock. All data and the inventory of species are stored in a database that is managed by the University of Kisangani. The idea of mitigating climate change impact involves a complex process. First is the experimental phase and the strategy at the national level that has to be unpacked. The national strategy cannot be maintained without the field activities. Hence, the pilot projects were created to sustain the strategic policy framework which is a document that is still being drafted even today.

At the end of the experimental phase comes the investment phase. The people who engage in the conservation of their forests are entitled to claim compensation from the international bodies. Thus at the investment phase, communities need to obtain funds and plan projects for development. In the case of the Isangi OCEAN REDD+ pilot project, the first phase is yet to end, as the project design document (PDD) still needs to be produced. A team from the UNDP in Kinshasa visited the project to discuss how it can proceed shortly to the investment phase. The project is initiated by the civil society and the DRC government, and OCEAN was just appointed to manage it.

The project combines the expertise of the University of Kisangani, the project consultant, and the technical skill available with OCEAN. The UNIKIS works on the ecological monitoring as well as the socio-economic and reference data. The UNIKIS describes all the ecological aspects of the project intervention zone which includes all the biophysical aspects of the area and the inventory

of species, and it also sets up a monitoring system for the management of REDD+. Thus, the delimitation of the plots follows standards that are required in the field of evaluating the carbon stock for each type of forest which may differ from one forest to another. Regarding the carbon stock, the MRV system and plots are put in place, and the inventory of each type of forest is made with the idea of estimating the carbon stock using methods that are more scientific.

The project is also charged with the task of collecting and analysing data on the socio-economic life of the communities. The alternative programmes organised by the project can contribute to the reduction of deforestation, increase in forest cover and stability of the carbon stock and facilitate production of the reference scenario document. In Isangi, the UNIKIS is about to finish outlining all the plots and an MRV system would be put in place. A study of the rate of deforestation in Isangi from 2002 to 2012 has been done, and the rate of deforestation per annum has been determined, but the UNIKIS is now trying to design the reference model or scenario.

The Isangi project has 300 parcels that are the equivalent of 75 ha in a pilot project. They are distributed in different types of forests based on two criteria namely representation and accessibility. Good representation requires that plots are well distributed in the project zone and are not concentrated in a corner or specific place so that information from other parts of the forest is not be lost. Accessibility implies that the plot can be located and accessed easily. The plots are also permanent plots and made visible; the trees are marked with signs that help the officials to carry out the periodic monitoring of the plots.

4.4.1.13 WCS Mambasa Forestry REDD+ pilot project (Number 17 in Table 7)

The WCS Mambasa Forestry REDD+ pilot project is a government project that was handed over to the WCS for implementation. The project has four partners at its implementation stage namely the WCS which is the manager of the project, and three other national organisations including the University of Kisangani which handles the aspect of ecological monitoring especially the estimation of the carbon stock and the flux of the carbon in the landscape. The other two are the NGO OSAPI which handles the micro-zoning at the community level by reinforcing their capacities in the community forestry, and the Council for the Defence of Community Rights and Environmental Protection (CDBE) which organises publicity and the mobilisation of communities for the REDD project.

The first report on the carbon stock in each type of forests within the landscape has been produced. Other reports focus on the people's means of subsistence and economic development and the activities involving the communities. Therefore, operation of the WCS covers agriculture, fishery and animal husbandry to make available supervisors of agriculture on the field. The WCS has 15 agricultural monitors of households in a permanent way. The association of breeders seem to be the more productive because it supplies animal feeds to different initiatives such as poultry and fish farming and it has a veterinary pharmacy that helps in the vaccination of chickens in the city of Mambasa.

The WCS targets two aspects of the environment. It conducts a base study that can reduce deforestation and improve practices relating to forest use, and it promotes alternatives that can help reduce pressure on the forest which is considered a vegetal cover. It should be noted that these objectives are associated with REDD and the forest cover. The second important goal of the WCS is to promote biodiversity conservation (fauna and flora). The focus is on the Okapi Fauna Reserve (RFO) and on the conservation of the biodiversity in the rural area on a general scale. The WCS also works with communities to establish a community reserve in the Northeastern region between RNK and the main road of Nduhi going to Mungwalo after a study shows that this region has many chimpanzees. However, there is also a community objective which aims at improving the living conditions of the members. This will help to increase the people's income and could contribute directly to the two first objectives.

As mentioned in Table 7, the WCS Mambasa REDD+ forestry project is in its first phase of preparation but it is preparing to move to the second phase. Although the project can easily generate carbon credit, for now the voluntary market of the Clean Development Mechanism (CDM) has been discontinued which is discouraging to the people. The WCS Mambasa officials reason that, with the 21st COP, agreements could be signed on the international level to enable the project take advantage of the available carbon stock by progressing towards a carbon market and by evaluating the carbon credit that can be generated by the project using estimation methods. The plan is supposed to extend to the whole Ituri District, which is a proposed province, or to other provinces such as the North Kivu.

The UNIKIS first went to the field to carry out the stratification which helped to identify the types of forests in the zone. In the project zone, we have the primary and secondary forests, the swampy forest and the dry forestland with different levels of carbon stock. A sample is taken of

each type of forest to measure the carbon stock means. Other measures are taken in the field and are based on the height and types of trees. Once of the various data are obtained, the technicians use the allometric models that were prepared and recognised internationally to estimate the basic measurements of the biomass obtained from the field. The biomass is estimated per each plot or parcel. The forestry biomass is composed at 50% by the carbon (dry biomass). Once the biomass is found, it is divided by two to derive the carbon stock.

The methodology used for the OCEAN Isangi REDD+ project is the same as that used in the WCS Mambasa project. However, in Mambasa, 200 plots of 50m x 50m have to be mapped, that is, the equivalent of 50 hectares.

4.4.1.14 WWF national office (Number 19 in Table 7)

The WWF national office is one of the organisations or NGOs that manages two REDD+ pilot projects in the DRC which include the geographically integrated REDD+ pilot project around the Luki Reserve Biosphere. The WWF has supported the development of tools for the preparation and the investment phases.

4.4.1.15 REDD Climate Working Group (GTCR) (Number 20 in Table 7)

The REDD Climate Working Group (GTCR) focuses on poverty reduction. Since the poor indigenous people depend on the forest, reduction of poverty means that the forests will be protected through programmes on greenhouse gases emissions reduction. The implication of this for people living around the forests and the entire Congolese citizenry is if the programme on GHG emission reduction is accepted, the benefits that would accrue will help in poverty reduction. The GTCR is presently working on the technical issues to help the DRC with the security of the stakeholders. This means that the government has to ensure that the project has adequate security included communities. This is what the GTCR is working on at the national and international levels. Thus, the GTCR is a stakeholder in the DRC's REDD programme and it assists the government with important information about the different needs of the REDD.

4.4.1.16 UNDP national office (Number 21 in Table 7)

In the same fashion, the UNDP contributes to REDD+ through its partnership with the NAMA initiative to reduce emissions from deforestation and forest degradation at the national level and the REDD+ project level.

4.4.1.17 National Ministry of Environment (Number 22 in Table 7)

The role of the National Ministry of Environment in the REDD+ project is to support the national REDD+ strategy and coordinate the different programmes.

4.4.1.18 Geographically integrated REDD+ Luki pilot project (Number 23 in Table 7)

The geographically integrated REDD+ pilot project around the Luki Reserve Biosphere is also advancing in terms of activities that focus on the protection of nature reserves. The project carries out the selection and identification of beneficiaries. As a geographical integrated project, it needs to revamp some areas of the savannah which also require new beneficiaries such as nurserymen and people who are tree planters. The training of 30 pilot model farmers was done in the first year but tree planting is an activity that will continue to the end of the project.

As noted in Table 7, the need for the protection of the savannah against fire (*mise en défens* in French) is not easily understood by community members. Thus, it is important to enlighten them first before they introduced to contract agreement, which they are not obliged to sign. In brief, the different phases that the project has undergone are outlined below.

Preparation: activities during this phase include the survey on the field, drawing the reference scenario to show that without the intervention of the project, the forest cover will not be improved. This will be compared with what the situation would look like in the future, and help to evaluate the type of pressure on the natural forest as well as the rate of deforestation. Once the project has been implemented, it is important to appraise the situation and the changes. To attain the recovery of the forest surface loss, people need to stop degrading the forest. However, with the increase in population, people will continue to need products from the forest. Therefore, it is important in the preparation phase to evaluate the reference scenario as was done in the Luki project.

Investment: technicians on the Luki project tried to calculate the cost of the project in terms of human, material and financial resources, and to evaluate the on-going investment and the

proposed activities as well as the rate of progress made on the project. However, these phases usually overlap. At the beginning of the Luki project, there was no agro-forestry and the pressure on the natural forests was strong. With the development of agro-forestry in which the soya and peanuts are mixed with acacia trees, it was realised that the system contributed to the maintenance and the enhancement of the carbon stock in the existing natural forests especially the Luki Reserve which is being protected by the present project.

Regarding the carbon stock assessment, the WWF trained its staff to use MRV sampling and allometric equations.

4.4.1.19 NOVACEL (Number 24 in Table 7)

The NOVACEL is involved in REDD+ activities in the area of tree cutting. Certain trees are cut down at the end of a seven-year rotation period, as noted in Table 7 above. The trees are used to make charcoal and this prevents communities from ravaging the existing natural forests. Trees are also being replaced in view of the seventh year, while the people also engage in agro-forestry, combining cassava with acacia. It has been proven that acacia enriches the soil and cassava grows three times faster in the forest than in the savannah. NOVACEL transfers its expertise in the government project to improve the living conditions of indigenous people and this helps to decrease the pressure on the forest. The outcome is that the carbon stock to be sold is maintained and enhanced.

The NOVACEL project targets four areas:

- Forestry management and sustainable practices based on the rotation of trees in seven years;
- Means of subsistence and economic development (with transformation of products, improvement of living conditions, and the rehabilitation of basic infrastructure such as health institutions and schools);
- Ecological monitoring (which establishes rules) in collaboration with the National Office of International Forests (ONFI). The ONFI is the organisation which supplies NOVACEL with the spot images about the evolution of the forest cover and draws the reference scenarios. The other institution is the World Resource Institute (WRI) which issues regulations on land and reconciles the customary and government laws.

- Project management is carried out by the team that is in charge of opening markets to institutions that can implement a specific activity in the project.

Furthermore, the rehabilitation of infrastructure such as schools and health institutions are part of the second component because they constitute the positive impacts of the REDD+ project implementation. It is a way of supporting REDD by helping the communities to live and satisfy their needs through alternative activities before they receive the credits. The sub-activities on the level of subsistence and economic development include establishment maintenance of infrastructure such as workers' accommodation, infirmaries or health institutions, and mills for cassava flour production. In the same breath, main roads to farms and lands are rehabilitated; hence, the NOVACEL budget makes provision to pay for trucks to transport products from farms to the market.

Under the second component of the project also, beneficiaries form cooperatives to strengthen themselves economically. Carbon stock is estimated by using plots. Once estimated with the help of a type of simulation software, the results are forwarded to the World Bank expert in Paris. After the results have been verified, the experts send the feedback so that NOVACEL can proceed to claim the credits from the World Bank. NOVACEL's operation covers about 2 300 hectares of land which is projected to reach 5 000 hectares. The project is making progress and it could spur the DRC government to further action on climate change mitigation.

4.4.1.20 Equatorial REDD+ pilot project (Number 25 in Table 7)

Although the Equatorial REDD+ pilot project contributes to climate change mitigation, it has no REDD project. Rather, it assists communities to locate local factories that can buy their cassava products. The project plans to introduce other improved species of cassava that can resist diseases such as mosaic, as well as beans for protein. Therefore, the project is at an experimental phase that aims to show that people can increase their income with fruit trees, trees with caterpillars and palm oil.

The Equatorial project has been around for three years but it has difficulties in obtaining funding. The lack of funds is one of the reasons for the delay in the project implementation. Another issue is how to increase the capacities and commitment of the local associations. The project tried to develop a new approach and to analyse the causes of deforestation and the development needs of the community. It adopted a participative planning approach towards the community so that the

project can easily identify the REDD activities that should be introduced. The method for carrying out the socio-environmental impact monitoring has been put in place, and the results would be coupled with the analysis of the causes of deforestation and suggested activities. However, the project is yet to determine the method that stakeholders would use for carbon assessment in the forest.

4.5 Roles of the civil society, local communities and indigenous people in climate change mitigation activities

Question 3: How does your organisation involve the civil society/local communities/indigenous people in climate change mitigation strategies activities through REDD or other programmes in the DRC? (Appendix A)

Table 8: Roles of the Civil Society/Local Communities and Indigenous People in Climate Change Mitigation Strategies through REDD and Other Programmes

N ^o	Organisation	Roles of the civil society/ local communities and indigenous people in climate change mitigation strategies
ORGANISATIONS FROM THE NORTH KIVU PROVINCE		
1	Gorilla Organisation	<ul style="list-style-type: none"> - Most of the activities of the Gorilla Organisation involve conservation, research and development which are implemented through local organisations. The Gorilla has implemented a project on solar energy for the benefit of communities which have taken steps to decrease the pressure on the forest and protect it; - The target of this project is composed of people living around the Kahuzi Biega National Park and who are able to protect the park; - The communities are involved in Gorilla activities through the use of improved cook stoves, - Gorilla acts through Kivu Aid and engages with local NGOs and developmental agencies that submit projects to Gorilla for funding. The People's Foundation project on reforestation around the Kahuzi Biega Park is an example. Other projects are submitted by women organisations such as the one headed by Germaine Mubalama or Strong Roots which is a civil organisation. - The Gorilla has also organised a revolving fund called Tujitegemeye (which means self-reliance) through which funds were donated to poor people to renew their capital base which was depleted during the difficult period of war and insecurity.

2	CREF Network	<ul style="list-style-type: none"> - CREF Network works in close collaboration with communities. It employs a participative approach that promotes communal ideas because it works with community based organisations; - Any general assembly cannot be organised without the auto evaluation of the CREF Network by beneficiaries; - CREF Network therefore promotes the application of the communities' consent in all projects because it defends their rights. Communities should give their consent in all projects that affect them, and they have to be contacted before the implementation of the project; - CREF Networks rallies communities in order to identify their problems and set priorities by identifying some micro projects together with the help of community members; - Community members work on nurseries by making available materials needed to prepare trees for plantations.
3	YME Great Lakes Beni	<p>The YME Great Lakes sets up nurseries in schools around Malio, Buliki and Isale Bulambo areas which are close to the Virunga National Park so that the youths can learn to engage in tree planting activities.</p>
4	Research Centre for Environmental Planning	<ul style="list-style-type: none"> - The primary vision of the Centre is to work with churches. The Centre consulted with priests from the Catholic and Protestant churches and successfully persuaded them about the need to adopt tree planting culture and the use of biogas. - The task of the church is to encourage and remind members of each household to plant trees on special occasions and for all age groups, and to nurture the trees.
5	WCS North Kivu	<ul style="list-style-type: none"> - The WCS North Kivu engages in public awareness programmes and it also collects and analyses data on the progress of the Eduard Lake project. Communities understand the importance of conservation of the lake and the park; - The WCS also supports the population in the southern area through activities relating to agro-forestry so that it does not put pressure on the park; - The WCS was donated 5 000 plants to each co-operative union in the community, and each co-operative could manage the resources as advised; - In addition, the WCS facilitates credits as revolving loans to be reimbursed without interest by members and with limited interest by non-members; - The WCS also helps the community members to market their products and earn income from selling their farm products.

6	Jane Goodall Institute	The Jane Goodall Institute (JGI) collaborates with the local people and UGADEC, and directly with local associations to coordinate the action plan of ensuring the conservation of baboons and gorillas. The JGI provides administrative skill. All the JGI projects focus on the civil society and all activities involve them. The JGI works together with local and health authorities on the field.
7	FFN (National Forestry Fund) North Kivu	The FFN works with local associations (the majority of which are forest exploiters and NGOs). The synergy between all these actors is not well defined. The FFN needs to organise the local associations to consolidate their efforts in climate change mitigation and in collaboration with the local communities.
8	WWF North-Kivu (Eco-Makala REDD+ Pilot project)	<ul style="list-style-type: none"> - Implementation of projects is carried out by the organisations or structures of the civil society in collaboration with the WWF; - The WWF North-Kivu has also put in place a plan of communicating with the people to help them understand the programmes and to know the structures which promote the activities; - All the programmes of the WWF are conducted in collaboration with the civil society; and - The agents of the civil society in the intervention zones know the beneficiaries more than the WWF does.
9	UGADEC Goma	<ul style="list-style-type: none"> - The UGADEC Goma and Tayna REDD+ project focus on the forests in the area which are natural, and UGADEC urge the people not to cut trees illegally or engage in farming in an uncontrolled way. This will help to contribute to the mitigation of climate change; - The implementation of the REDD+ project requires the mobilisation and involvement of all the people. If all stakeholders are involved, it would be easy to achieve the objectives; - Officers in charge of these forests were consulted before the Tayna REDD+ project implementation. All principal landowners were registered at the level of clans to represent all the members. - UGADEC worked in collaboration with communities taking into account the issue of gender even in data collection. A committee was also created to represent all communities in the Tayna REDD+ project. Members of this committee attended all the meetings.
10	North Kivu Provincial Directorate of Environment	- The North Kivu Provincial Directorate engaged in a participative plantation. For example, in Luofu, the Directorate and the Ministry of Environment work with the local associations and civil society. Members of the local associations such as women, pupils, students from the university, and ISEAVF Kasando monitor the plants in the nurseries and plantations. No activity is carried out without consultation with local

		<p>leaders and other people.</p> <ul style="list-style-type: none"> - The Directorate procures state lands for tree plantations; the project focuses on state-owned tree plantations and main roads. However, the project also operates on private lands when there is a specific request.
11	ICCN North Kivu	<ul style="list-style-type: none"> - Populations and indigenous people are actively involved in ICCN efforts to combat climate change through an environmental programme around the Virunga National Park funded by the WWF; - Populations and indigenous people form local associations to implement public awareness programmes about environmental issues such as tree planting and the use of the improved cook stoves; - A community conservation approach is also implemented by the ICCN in villages around the Virunga National Park. Community conservation committees are set up to monitor the sustainable use and management of forestry products.
ORGANISATIONS FROM THE SOUTH KIVU PROVINCE		
12	CERD (Centre for Renewable Energy Development)	<ul style="list-style-type: none"> - The Centre for Renewable Energy Development (CERD) is a Congolese organisation that was founded by GIZ. The Centre was transferred to Biobass, a civil society organisation. - The GIZ sees to the running of the centre. It chose not to build dams but to involve all local communities in the firewood project for their benefit; - CERD organises the training for stove makers, all of whom are from Bukavu and Kalehe. The centre has already trained 32 stove makers including people living with disabilities. CERD conducted the training for some months and then tried to involve the community members in different ways; - The CERD aims to put in place a large network of role players who can work together.
13	WWF South Kivu	<p>The WWF uses a participative approach, contacts communities or indigenous people and invites them to participate in the project. The WWF also issues cards and logos to all partners including the civil society.</p>
14	WCS South Kivu	<ul style="list-style-type: none"> - The WCS focuses more on forestry research in which the local communities are involved. - Before entering the forest, the WCS contacts the local authorities and traditional leaders who rally the people to persuade them to implement the WCS forestry programmes. The WCS works more with field assistants, carriers and others who know their way around the forest and could guide the researchers.

15	ICCN South Kivu	<ul style="list-style-type: none"> - The ICCN collaborates with the civil society to organise public awareness programmes on environmental issues; - Topical issues about the environment are addressed in collaboration with the civil society; - In case of conflicts between the park managers and the people of South Kivu, the civil society intervenes by advising the people and helping to settle conflicts. - The ICCN and the civil society educate the cattle farmers that the conservation of parks is the duty of all.
16	South Kivu Provincial Directorate of Environment and Sustainable Development	<ul style="list-style-type: none"> - In the project on wood and energy, local people are actively involved in all the aspects including working in nurseries. The Directorate only supports them; - The people also participate in the rehabilitation and protection of the Businga Forest; - The project covers five villages namely Kamina, Guvumbano, Nyamurange, Ibangiro and Shuta. At the beginning these activities were not taken seriously by the people of Businga, but with time they began to get involved when they see that the project is relevant to them. - However, the provincial Directorate in partnership with GIZ has declared that the people will manage the whole project after its implementation.
ORGANISATIONS FROM THE EASTERN PROVINCE		
17	OCEAN Geographically Integrated REDD pilot project in Isangi	<ul style="list-style-type: none"> - The OCEAN Geographically Integrated REDD project in Isangi has been implemented with the participation of the direct beneficiaries in partnership with the Rural Agricultural Management Council (CARG). The Council is considered as the main pillar of the project, and it is represented in all layers of the community; - The communities or beneficiaries carry out the petty tasks on the farms; - There is an NGO that is in charge of publicity and the project helps the community to get their own products from their own lands under the guidance of the traditional leaders.
18	Mambasa commission of Agriculture	<ul style="list-style-type: none"> - The Mambasa commission of Agriculture organises media campaigns on emissions and sensitises people to the importance of protecting the environment, the forest and some species of animals; - The commission demonstrates the importance of protecting the forest and trees, whether individual trees in the field or trees in the city and compounds through the media. Such information is always broadcast or transmitted through the mass media.

19	WCS Mambasa Forestry REDD+ pilot project	<ul style="list-style-type: none"> - The WCS Mambasa Forestry REDD+ Pilot works with peasants to reduce deforestation caused by bush burning which is common in the DRC; - The first partners in the project are the households, but the WCS also works with the state services; - For example, before the beginning of the project, the WCS tried to establish contact with the people especially those involved in the CARG, agriculture services, fishery and animal husbandry, and the authorities of the Mambasa territory; - The WCS contacts all traditional leaders in the project zone and all other actors (the people who log the forest and enterprises such as ESCO Kivu), and the WCS selects villages and households in the project intervention zones. The project also supports nine civil society associations (two cooperatives, two reforestation agencies and five associations of breeders).
20	Eastern Province Directorate of environment	<ul style="list-style-type: none"> - The Eastern Province Directorate of Environment has an office that deals with environmental and social studies. It educates people on the benefits that accrue to them if they protect the forest, which can also guarantee the economic welfare of the present and future generations; - The Directorate attempts to raise the awareness that engaging in forest destruction is a big deception that can affect the future generation. Many species could disappear which could be a huge economic loss to the community; - Thus, the Directorate approaches the people, educates them and involves them in its activities. The directorate is always available to help the people to understand the benefits, how to share these benefits, and how the benefits can be of use now and in the future; - Even when logging is permitted, the Directorate has to ensure that the advantages and disadvantages of the loggers' concessions and the benefits to people are understood. This is called the social clause.
21	ICCN Eastern Province	<ul style="list-style-type: none"> - The ICCN adopted a new approach which involves the local people and communities living around the nature reserve in the management of the reserve. The communities participate in the management in collaboration with the conservators; and - They work together to protect the reserve by denouncing those who contribute to its destruction. There are three national parks or nature reserves in the Eastern Province namely the Garamba, Maiko and Lomami Lualaba (New Park). Besides these, there are many other hunting areas.

ORGANISATIONS FROM THE TOWN AND KINSHASA PROVINCE		
22	FAO National office	<ul style="list-style-type: none"> - The FAO understands the importance of publicity and therefore supports the efforts of DIAF in this regard; the DIAF and not the FAO then works with communities directly; - Through a regional project named COMIFAC, the FAO in 2014 funded the publicity aspect of the project with USD 30 000; the public awareness campaign was carried out in the Katanga and Eastern Provinces; - The project took off with the training of DIAF officials on the objectives of the project and taking inventory. This was to enable them to educate the people on the idea of inventory taking and convince them that they are not in their area to mine diamond, gold or Coltan or to hunt for animals and exploit the forest. - The FAO has involved communities in all activities related to forest protection, and it also created awareness about the project through various media such as Okapi Radio and the community's media houses.
23	WWF National Office	<ul style="list-style-type: none"> - The WWF National Office assists communities to develop strategies as well as concepts that clarify community involvement at the national, local and international levels. - The WWF and the National REDD Directorate work in partnership to enhance community involvement, and to show people how to do the follow up of their forest cover using computerised tools, GPS, and other needed tools, and to show them how to use the data obtained from the field. The WWF also collaborates with communities in various other ways.
24	GTCR (REDD climate) Working Group in the national office of the civil society	The Civil Society National Office REDD Climate Working Group (GTCR) organises communities and helps them with capacity building for the participative cartography.
ORGANISATION FROM THE BAS CONGO PROVINCE		
25	The Geographically Integrated REDD pilot project around the Luki Biosphere	<ul style="list-style-type: none"> - The Geographically Integrated REDD pilot project in the Luki Reserve involves people in a local system of administration; - The 60 eco-guards employed to protect the Luki Reserve are from the local community; - The 30 model farmers are also involved in activities to improve agriculture;

		<ul style="list-style-type: none"> - The project supplies seeds, funds and crops to the community members. The funds help the beneficiary to prepare the land for farming; - The model farmers are selected by the local steering committee (CLP), which are structures already installed by the WWF for selecting beneficiaries. Each model farmer beneficiary signs an agreement of commitment with his Local Development Committee (CLD). Each project is assessed in time and space, and each beneficiary is expected to train five other beneficiaries; - The WWF does not distribute lands to the people; the land belongs to the beneficiaries, as one of the criteria for selecting beneficiaries is that they must be landowners in addition to being active farmers. The minimum area of land for each farmer is five hectares because they have to increase their harvest; - The CLP (local steering committee) is tasked with the management of the Luki Reserve, the CLP handles the CBFF fund to save and protect the 20 000 ha with the help of the eco-guards; - The CLD also deals with the local administration and sees to the selection of model farmers; while the WWF relies on the structure of the CLD which oversees the activities of the local communities. - Therefore, the CLP and the CLD contribute to the sustainability of the project.
ORGANISATION FROM THE BANDUNDU PROVINCE		
26	NSK (NOVACEL REDD+ pilot project on agro- forestry in South Kwamouth	<ul style="list-style-type: none"> - Local communities are involved in all activities that contribute to the reduction of tree cutting with local labour; - The activities take place in plantation blocks for charcoal production which are managed by the local people on a seven-year rotation basis; - Tree cutting and restoration activities are restricted to the plantations to protect the natural forests and enhance natural regeneration; - The indigenous people are the direct beneficiaries, and they share the charcoal and other products from the plantation; - Cassava is grown within plantations by households. Hence, cassava protection implies an increase in plantation protection; the land use and harvests also increase; - One of the achievements of the project is the noticeable development in the lives of the beneficiaries. The community cooperatives established in seven villages under the supervision of traditional village chiefs who offer village land to the cooperatives ensure that all the processes would be sustained. Presently, 20 000 hectares of land are leased out to the cooperatives;

		<ul style="list-style-type: none"> - The communities understand that the benefits are obtained through participation in the different activities and that the natural resources must be protected. - On the legal aspect, there are rules in place to guarantee order especially in the way project managers interact with traditional leaders. A committee monitors the situation to ensure that the project is making necessary progress.
ORGANISATION FROM THE EQUATORIAL PROVINCE		
27	The Equatorial Province REDD+ pilot project	<ul style="list-style-type: none"> - The Equatorial REDD pilot project engages in research and works with local partners or local organisations to implement its activities. The aim is to reinforce the capacities of the local people in order to establish all REDD related projects; - When donors give money, the project has to select stakeholders, even from households, so that all the people would have the opportunity to air their views; - As the people begin to understand the objectives of the project, the managers try to increase the level of trust between community members and associations, and make effort to improve the project management; - Managers also help to resolve conflicts between community members and ensure that the beneficiaries get equal benefits from the project. The project tries to restore trust among community members through a transparency approach. - Before the outset of the project, feasibility studies of the socio-economic conditions of the project environment were carried out. Studies of the local politics were also conducted in order to understand the leadership structures of the communities and their heads such as the traditional leaders and administrative chiefs.

4.5.1 Collaboration between NGOs and local associations on climate change mitigation strategies

In the DRC, the main cause of deforestation is the practice of bush burning used on farm by the villagers or peasants in the rural zones. It is therefore practical that projects involve rural communities in the process of reducing deforestation and the mechanism of climate change mitigation.

Many of the NGOs and organisations that are involved in the reduction of emissions implement their activities in collaboration with the other organisations, communities and civil society

members. At the national level, the FAO's national office, the national office of the WWF and the national REDD Directorate's office in the Ministry of Environment work in collaboration to enhance community involvement and the functions of organisations at provincial levels. The National Office of Civil Society REDD Climate Working Group (GTCR) takes the initiative to organise communities and do the capacity building for them in the participative cartography. The formation of civil society groups such as cooperatives, associations for reforestation and associations of breeders proved to be useful in carrying out projects that require collaboration between organisations and communities.

The concept of collaborative management that accommodates both the local communities and the civil organisations is becoming popular in natural resources management. The practical application is done by the ICCN in South Kivu and Eastern provinces and by the WWF in South Kivu where the conservation is carried out by the community. When there are conflicts between the park managers and people, the civil society intervenes to resolve the conflict. The collaboration helped the YME Great Lakes Beni to conduct activities of tree planting around the Virunga National Park through schools and local communities.

The organisations planned their activities to provide material for public awareness in communities to increase their involvement. Some NGOs and organisations may obtain their funds from funding agencies including the National Forest Fund in North Kivu which supports the local organisations in the province. The organisations use the funds to community support projects on climate change mitigation. The development of projects resulted in the establishment of village cooperatives and involvement of traditional leadership in order that activities of the local communities and indigenous people could result in successful contribution to climate change mitigations. In details, the following text shows how organisations involve communities in activities of climate change mitigation.

4.5.1.1 Gorilla Organisation (Number 1 in Table 8)

Regarding the involvement of the civil society in Gorilla's climate change mitigation activities, Gorilla works with local people and with different civil society organisations through a win-win approach. Its public awareness programmes cause the Gorilla Organisation to be visible in its intervention zone and in its contact with the target communities while in the field. The Gorilla

Organisation always works in collaboration with local associations such as the People Foundation.

Gorilla also gives micro credits in revolving loans to people to renew their capital turnover during crisis. Many beneficiaries eventually became financially independent and they have repaid the loans. This was advantageous as it meant fewer people relied only on Gorilla. These activities were carried out through the Local Development Initiatives (ILD) as also a way of involving the civil society in Gorilla's activities on climate change mitigation.

4.5.1.2 CREF Network (Number 2 in Table 8)

The initiatives of the CREF Network, on the other hand, help the community to appreciate the sustainable management of forests with some projects that can generate money such as the animal husbandry. The agricultural projects also include pig and cattle breeding. The Network also enlightens the communities on the importance and effects of using the improved cook stoves in their homes.

4.5.1.3 WWF North-Kivu (Number 8 in Table 8)

The WWF North-Kivu which collaborates with civil society structures has also put in place a plan of communication with the people to educate them on the programmes and the structures which publicise the activities. The on-going discussions with the civil society reflect on the sharing of incomes and the management of the natural resources. The WWF has observed that there are high expectations. On the international level, the tempo of the debate is high, and on the community level, people continue to ask themselves questions. This plan of communication helps to clarify basic elements about what the REDD is all about and deforestation; as well as what practices need to be changed to have an impact on the global level. The plan of communication has already been produced, and the next step is the publicity through the mass media.

4.5.1.4 CERD (Number 12 in Table 8)

CERD has trained 32 improved cook stove makers according to means that were available. They received training on the latest technology and marketing in order to sell their product and to continue to produce more stoves. The training aimed to promote the improvement of the stoves. The centre raises the awareness of the stove makers and the community about the environmental

and ecological impacts of these stoves. Thus, beneficiaries were urged to participate in the training to appreciate basic notions about the environment and their role in protecting the environment.

4.5.1.5 WWF South Kivu (Number 13 in Table 8)

The WWF South Kivu engages with the civil society, as community based organisations make up the core of its structure. The organisations belong to the members of the local communities and the indigenous people. When the WWF organises activities, they also unite to air their points of view. The existing community approach is adopted not only by the WWF but also by the ICCN. In the case of WWF South Kivu, the conservation is done by the community members who are more acquainted with the area. Moreover, the community is not ignorant of conservation issues because it has traditional laws which relate to deforestation and to the ideals of REDD. People are urged to return to what their forebears practiced such as prohibitions contained in and enforcement of traditional laws of conservation. All these can be put to use in the fight against GHG emissions.

For example, in the past, it was prohibited for one to cut trees anyhow, as there was a period the land was to lie fallow which was respected by custom; even cutting the primary forest was purposeful; the people knew why it was cut. Thus, such laws should be reintegrated into the society even though many people think that they are now enlightened and they can shun their responsibilities.

All forests belong to the community. The fact that a forest appears big does not imply that it has no owner. It belongs to the community, and the community knows to whom a given area of the forest belongs. Communities had established laws which kept the biodiversity intact even though hunting, fruit picking and farming took place in the forests. If communities would return to their traditions, they would be able to engage again in conservation of nature. The negligence of traditional laws does not promote environmental protection and this should have some consequences. Both traditional and Congolese laws should be applied, and offenders should be punished while managers of the environment should encourage individuals and organisations that fight for the conservation of resources. In this sense, much can still be done.

4.5.1.6 ICCN South Kivu (Number 15 in Table 8)

The ICCN South Kivu involves the civil society in its activities, as shown in Table 8, but the conflict between the cattle farmers and the park managers remains. Cattle farmers continue to occupy the Kahuzi Biega Park especially the middle part called the Ninja Corridor. These farmers do not allow park animals to move freely within the park, and if they continue to stay in that area, there will be a problem of consanguinity among the animals. However, the ICCN has done its best to involve the provincial authorities. The ICCN has initiated several dialogues with the provincial land planning office and cattle farmers and the search for solutions continue. A national forum has been established to come up with strategies for resolving recurring conflicts in the protected area especially in the Kahuzi Biega National Park. The forum will take place in South Kivu Province at Chivanga in the Kahuzi Park.

The civil society also helps to educate associations that work in the field of environment. They urge people to avoid cutting trees and to consider planting other trees when dead woods are removed. This is to recover the area that is already destroyed and is without the green cover. The civil society plays a major role in creating public awareness and in fighting deforestation.

4.5.1.7 Geographically Integrated REDD+ pilot project around the Luki Biosphere (Number 25 in Table 8)

The CLDs (Local Development Committees) have also signed some agreement with the Geographically Integrated REDD pilot project around the Luki Biosphere because it has sufficient means to handle the operation. Bicycles were given to the CLD agents to enable them move freely, but the CLDs also received stationery. There are 75 CLDs and the REDD project supports 50 of them. The WWF helps to monitor the activities of the CLDs. If things do not go well for a beneficiary from a CLD, it would appear as if it is the CLD which failed because it selected someone who does not deserve support. Thus, the CLD has to do the follow up because if things failed to work out the support from the CLD would be discontinued. The point is not to punish them, but to make them accountable for their actions. Therefore, each CLD has a steering committee composed of 13 members who are charged with the task of monitoring the activities of the beneficiaries. When the CLD fails, the whole village is affected by the problem.

Beneficiaries harvest many products from their farms, and the WWF makes trucks available to the community to transport its products through the CLD. Community members operate through

various cooperatives which handle their benefits. The CLD has USD20 000 in the bank and the communities help to manage the account. The system is sustainable and it helps to contribute to the REDD management.

4.5.1.8 NOVACEL REDD+ pilot project (Number 26 in Table 8)

In the NOVACEL REDD+ pilot project, the indigenous people are involved in all activities that contribute to the reduction of illegal logging. NOVACEL's activities take place in plantation blocks managed by the indigenous people on a seven-year rotation basis and include charcoal production and sustainable management. The indigenous people are the direct beneficiaries, as they share the charcoal and other products from the plantation and plant cassava on the plantation.

The project achieved more success in the area of the welfare of beneficiaries, as it set up community cooperatives in seven villages under the supervision of traditional village chiefs who allocate village land to the cooperatives. The system is supported by a legal framework. The communities understand that benefits are attained through participation in the different activities and that the natural resources are protected.

4.6 Energy sources used in the DRC and potential energy envisaged by the government and other organisations in climate change mitigation

Question 4: What are the energy sources used in the DRC and what other energy sources are envisaged by the government and other organisations for mitigating climate change? (Appendix A)

Table 9: Energy Sources Used or Envisaged by the Government or Other Organisations to Mitigate Climate Change in the DRC

N°	Organisation	Energy sources currently used in the DRC and others envisaged by the government and other organisations
ORGANISATIONS FROM THE NORTH KIVU PROVINCE		
1	Gorilla Organisation	- Gorilla has a project on solar energy in five villages namely Kitolu, Burusi, Rusayo, Kalehe and Ngwenda. This project has decreased the pressure on the forest and it is expected to contribute to the reduction of deforestation. Gorilla employs some strategies such as the launching of new technologies especially the promotion of improved cook stoves to

		<p>combat deforestation. This is an interim solution because it will take some time for regular electricity supply to become a reality in the DRC. Improved cook stoves therefore help to decrease the consumption of charcoal;</p> <ul style="list-style-type: none"> - Gorilla has distributed five hundred solar panels to households, and plans to distribute additional 1500 solar panels. Selected villages are added to those selected previously by government and other organisations. - Gorilla also promotes the use of briquettes and introduction of biomass kit.
2	CREF Network	<ul style="list-style-type: none"> - CREF Network promotes the use of improved cook stoves because they have an impact on the local economy; - CREF Network advises the DRC government on the use of hydropower from the main rivers and the geothermic energy in volcanic zones as well as the methane gas in the Kivu Lake; - The Network also plans to try out solar energy; and - It advises the people on prudent use of charcoal while using electricity in Kisangani. However, this could also pose a cultural problem as women might argue that cassava leaves cooked with charcoal taste better than when cooked with electric stoves.
3	North Kivu Provincial Department of Energy	<p>In North Kivu Province, private production of electricity from dams is becoming common. There are small privately owned dams such as Mondo Gusto and Beni on the River Muhila. The ICCN helps in constructing dams and different sites are ready to produce electricity such as in Beni on a river with 2 MW capacity power station, Kisalala with 7.5 MW, Biautu 100 Kw, Luholu 6 MW and the Londi site with 7.8 MW. In Lubero, there are also different sites such as Bukono 4.0 MW, Vutovo 4.0 MM, Talihia South 7.0 MW, Lowa 3.9 MW, Mutiri 50 Kw and Luvira 100 Kw. When the construction of these sites is complete, they will provide energy and help to protect the forest with the use of less firewood. In Masisi territory, the UNDP is planning to build a dam on the site of Wau with a 50 Kw generating capacity.</p>
4	YME Great Lakes Beni	<p>YME Great Lakes Beni is collaborating with the WWF to make women more independent through the use of the improved cook stoves which can also contribute to the economy of energy use. The YME Great Lakes collaborates with women who make and sell the improved cook stoves to increase their income. For this purpose, 61 women who live in different areas of Beni town were trained.</p>
5	Research Centre for	<ul style="list-style-type: none"> - The centre focuses on the promotion of wind and solar energies. It organises conferences to raise people's awareness about the importance

	Environmental Planning	<p>of solar energy as a clean mechanism. The centre managers suggest to administrative authorities that the idea of encouraging people who use non-pollutant energy sources by lowering their taxes so that they pay less tax than those who use methods that result in higher emissions;</p> <ul style="list-style-type: none"> - The strategy of reducing tax on solar panels can encourage more people to use clean energy, and encouraging the use of hydropower is a kind of advocacy for people to increase clean energy production and use.
6	Jane Goodall Institute	<p>The main function of Jane Goodall Institute in connection with energy is in the area of organising and implementing training programmes on the improved cook stoves. The institute collaborates with many organisations that are concerned with development in this field.</p>
7	WWF North Kivu (Eco-Makala REDD+ pilot project)	<ul style="list-style-type: none"> - The WWF North Kivu is currently trying to put in place a strategy for reforestation (tree planting) in relation to wood energy and the use of improved cook stoves. The project is working on the study of alternative energy; - The WWF also augments the efforts of the government and other role players in environmental protection to maintain a good energy budget and consider alternatives energy that could meet the needs of the growing population; - The WWF is awaiting the findings from the studies that would enable it to suggest alternative energy sources for wood that include gas. - If actors in the environmental protection would like to have economic and positive environmental impact, they have to focus on poverty reduction and help the poor people who ravage the park in search of wood energy.
8	UGADEC Goma	<ul style="list-style-type: none"> - UGADEC's conservation effort is in collaboration with other organisations such as Jane Goodall Institute, and it engages in community development projects. In Kasuo, it has built a small dam to supply electricity to the city. The small dam helps people to decrease the pressure on the existing forest. - People were also urged to plant eucalyptus trees outside the village to provide wood energy, and JDI has supplied the people with improved cook stoves. The improved cook stoves were distributed at Walikale to decrease the consumption of charcoal and wood energy.
9	North Kivu Provincial Directorate of Environment	<ul style="list-style-type: none"> - The ICCN in collaboration with the Directorate has put up a dam in Mutwanga, and another has been built at Matebe in the Rutsuru. - The Directorate has partners who appreciate the importance of using gas from the Kivu Lake and expect the Directorate to intervene in this regard.

10	ICCN North Kivu	The energy sources envisaged by the ICCN North Kivu involve the construction of micro dams that can provide energy to all villages, cities, commercial centres and towns along the Virunga National Park. One micro dam has already been built on the Rutsuru River. A bigger dam project has begun on the Talihya River to provide electricity to several towns including Beni, Butembo and Goma. Sustainable energy production has been planned for different locations. Butahu River in Mutwanga with a micro dam of 0.4 MW is to provide electricity for 5 000 people, and the Vulcano River/Lubero is projected to produce 1.1 MW for 50 000 people. The Rutsuru River/Rutshuru is also projected to produce 12.6 MW for 140 000 people and other different sites will produce 80 MW for 840 000 people.
ORGANISATIONS FROM THE SOUTH KIVU PROVINCE		
11	CERD (Renewable Energy Centre for Development)	<ul style="list-style-type: none"> - The CERD envisages increase in the biomass through improved cook stoves and briquettes; and - The CERD is working on a stove called Bukavu because the names of stoves come from their place of origin.
12	WWF South Kivu	<ul style="list-style-type: none"> - In the Itombwe Nature Reserve, which is in the WWF intervention zone, wood that is illegally obtained from the reserve is used for various purposes. However, Itombwe is in the equatorial territory where the abundant sun energy can be tapped easily for local energy use; - Many rivers also pass through Itombwe including Holindi, Elila, Simonambi, and others which cross the forest, characterised by high flow of water and many waterfalls; - The WWF plans to utilise these resources for solar energy and hydropower generation to reduce the consumption of wood energy; - Itombwe is on a high altitude at low temperature therefore wood is not only used for cooking but also for heating; - The WWF is seeking partners to produce and supply solar panels, and which can also build micro dams to decrease the consumption of wood. The use of improved cook stoves represent an important phase before hydropower and solar panels can be widely used.
13	ICCN South Kivu	<ul style="list-style-type: none"> - Initially, the ICCN South Kivu sensitised the people to the advantages of using the improved cook stoves with the aim of comparing the different models and promoting the use of the efficient ones; - The large type of stoves with metal sheet is no longer being used because it is characterised by high loss of wood and poor efficiency.

		- Households now understand that the use of improved cook stoves help to reduce poverty in the sense that it helps them to save money.
14	South Kivu Provincial Directorate of Environment and Sustainable Development	<p>- South Kivu Provincial Directorate appreciates the importance of solar energy and it is creating awareness about this among the people of South Kivu;</p> <p>- Until recently, the Directorate could not come up with alternative energy sources but with the GIZ and the UEA (Evangelical University of Africa), there is already a centre for energy that creates public awareness of other forms of energy that can be used and could replace the use of charcoal or wood energy.</p> <p>- The energy centre is a result of the collaboration between the Directorate of Environment, GIZ and the UEA. The Ministry of Energy is also planning to install a solar centre in Katana which will be implemented by the Chinese.</p>
15	South Kivu Provincial Department of Energy	<p>- The South Kivu Province has a potentiality of 3 000 Megawatts to be associated with the many rivers including the Elila and Ulindi Rivers. Only less than 3% of the potential is exploited, and this is why there is a low rate of access to electricity in the area;</p> <p>- The Ruzizi River has a substantial potential for hydropower energy and already has two dams which are being explored. The implementation of the third dam and the feasibility of the fourth are on the agenda;</p> <p>- In January 2012, there was a workshop to validate the environmental and social impact of the project of building a dam on the Ruzizi III that could generate up to 147 MW of electricity;</p> <p>- In December 2013, a workshop was organised in Kinshasa funded by the UNDP and the Climate Corporation to create public awareness about the improved cook stoves.</p> <p>- From a meeting of the department with other organisations in 2012, the following action points were suggested: to produce biogas from biodegradable waste; promote the use of improved cook stoves and improve the techniques for carbonisation. Others include promoting tree planting with fast growing species to produce wood energy and charcoal, extracting and making available methane gas from the Kivu Lake, developing infrastructure for production, and electrification of rural areas with photovoltaic and wind energies.</p>
ORGANISATION FROM THE EASTERN PROVINCE		
16	OCEAN Geographically Integrated REDD	-The main cause of deforestation is the use of wood energy, hence, OCEAN proposes the use of fast growing trees that communities can plant in their farms for agro-forestry;

	pilot project in Isangi	<ul style="list-style-type: none"> - The management policy is that communities cut branches of trees and use them for firewood; - The project also advocates the use of improved cook stoves which would result in wood saving. - At the stage of planning its programmes, the project discussed the idea of using hydropower. Those who participated in the planning considered building some small dams within the project's intervention zone. In Yangambi, a river with a high potential for hydropower has been identified, but OCEAN needs to have a donor to implement the idea of constructing a dam there.
17	Mambasa commission of Agriculture	<ul style="list-style-type: none"> - People living in villages and close to forests are advised to use dead woods for wood energy instead of cutting growing trees so that they can protect the existing forest stock. - The production of electricity from hydropower is encouraged because of the high potential.
18	WCS Mambasa Forestry REDD+ pilot project	<ul style="list-style-type: none"> - The WCS project did the first evaluation of wood energy exploitation in 2009 and 2010, followed by intensive research to estimate the quantity of charcoal and wood energy coming from the countryside into cities such as Bunia, Beni and Butembo and to determine the impact of these activities on the environment; - At the same time, the WCS is promoting the use of improved cook stoves to reduce the consumption of wood energy. It is an activity that WCS has engaged in for a long time; - There is a local structure specialised in the design of the improved cook stoves in Mambasa. The WCS has conducted an evaluation of the rate of adoption of these improved cook stoves in the city of Mambasa; - Data is saved and used for study of the efficiency of the improved cook stoves and reduction of charcoal consumption and cost. The survey was about the number of people who have adopted the use of the improved cook stoves; - The policy of the WCS REDD project is to consider micro dam and electricity power use for cooking. The project is now focusing on educating the people of Kisangani to use electric cookers as alternative to charcoal because electricity is available. - Several rivers flow through the project zone and micro dams construction is possible and encouraged by the government.
19	Eastern Province Directorate of Environment	<p>The Directorate in the Eastern Province tries to demonstrate to the government the advantages of alternatives to wood energy in order to reduce the pressure on the forest. Workshops are organised to encourage the Directorate to implement projects on micro dam which facilitate the</p>

		decrease of the pressure on the forest and grants more people access to electricity. The Directorate has also envisaged the use of solar panels.
20	ICCN Eastern Province	<ul style="list-style-type: none"> - The WWF made inroad into the Eastern Province to sensitise the people and train them about other energy sources so they would desist from destroying the forests and nature reserves. - The WWF therefore created public awareness about the importance of improved cook stoves and trained the people to use them. The aim is to help the ICCN to protect its reserves.
21	Eastern Province Department of Energy	<ul style="list-style-type: none"> - It is true that people put pressure on forests by making charcoal in order to produce energy to cook. Thus, the office of energy has designed some projects. An office was also established in Kinshasa that deals with the electrification of rural areas. It is a way of helping rural areas to access electricity. If it is approved by the public works department, a branch of the unit for rural electrification will be established in Kisangani town in Eastern Province; - In the same vein, the Department of Energy has projects to create micro, mini and pico dams. In 2014, a special workshop was organised by the DRC's central government in collaboration with the UNDP and other state partners to address this issue. It was organised to discuss how to fund these micro, mini and pico dams. The government has set up a commission to do feasibility study of the proposed micro, pico and mini dams and seek for funds; - Participants have considered the use of hydropower which is a suitable energy source because it does not emit GHGs; - During the workshop in Kinshasa, an atlas of all rivers and their capacities in Megawatts was made available to each provincial department in the DRC. - All the rivers in the DRC are identified on the map as well as the places where dams can be constructed. The Department consults with the provincial government about the possibility of obtaining funds for some projects. Presently there are few dams in the Eastern Province. - The Department also plans to implement a solar energy project.
ORGANISATIONS FROM KINSHASA TOWN AND PROVINCE		
22	WWF National Office	<ul style="list-style-type: none"> - The target of the WWF is to make renewable energy available in villages and in the countryside, and to show the local people how they can grow their own firewood plantations and preserve the forest for the future generation; - However, these plantations can also help them to generate income when they sell the wood;

		<ul style="list-style-type: none"> - The improved cook stoves are used in the WWF North Kivu's Eco-Makala REDD+ project, and but the WWF makes briquettes with the help of the ICCN and the local associations to produce wood energy. - Tree planting for charcoal making and the use of improved cook stoves would protect the Virunga National Park from deforestation.
23	National REDD+ Directorate	<ul style="list-style-type: none"> - In the case of REDD initiatives, funds could be obtained easily part of which can be used for dam construction because the DRC has many rivers that are useful for hydropower. - If enough electricity is generated to cover the whole of the rural areas, it can help to protect the forest. The government needs to take a stance in support of alternative and viable sources of energy such as the use of improved cook stoves and renewable energies.
24	GTCR (REDD Climate Working Group)	<ul style="list-style-type: none"> - The GTCR encourages the use of improved cook stoves and renewable energies and advises the government to issue a policy that supports the construction of small dams in rural areas to generate electricity in order to protect the forests. - The GTCR plans to change or review the way charcoal is being produced. Trees such as acacia can be planted massively in the bush or around houses, for the purpose of making charcoal, but there are administrative problems involved. This issue can be presented to donors for their input.
25	National Ministry of Energy	<ul style="list-style-type: none"> - The National Ministry of Energy in collaboration with the UNDP national office has produced an atlas of renewable energy sources; - In September 2011, the DRC adhered to the United Nations initiative called Sustainable Energy for All, with the goal of distributing electricity to the whole population by 2030; - The Ministry of Hydraulic Resources and Electricity, with the support of the UNDP, has conducted studies on the distribution of potential renewable energy sources in 11 provinces, 145 territories and 76 000 villages of the DRC. - The findings from the studies were published in 2014 in an Atlas of renewable energy sources. The project was accomplished with the support of the UNDP and the SNV. Its aim is to help the country to improve access to suitable energy; - The Atlas presents to investors the renewable energy potential of the DRC. It also helps to accelerate everyone's access to energy. The DRC's UNDP national office has a national adviser in charge of Climate change energy who works in collaboration with the Ministry of Energy; - A law on electricity was promulgated in June 2014 by the President after it was approved by the parliament and the senate of the DRC. This

		<p>law decentralises the electricity production sector and electricity distribution by withdrawing the monopoly enjoyed by the National Electricity Board (SNEL);</p> <ul style="list-style-type: none"> - The new law opens the way for private companies and households to produce electricity by investing in solar energy, and in pico and mini dams. The absence of electricity in many DRC towns forces people to resort to the use of generators which cause too much pollution. The liberalisation of the electricity sector can put an end to the use of these generators.
ORGANISATION FROM THE BAS CONGO PROVINCE		
26	Geographically Integrated REDD+ pilot project around the Luki Reserve Biosphere	<ul style="list-style-type: none"> - The Luki integrated project encourages the use of carbonisation, a method that helps one to consume less wood. - The use of improved cook stoves is the focus of the Luki project which encourages those who make them to advertise them in order to reduce the consumption of charcoal. The Luki project adopts the strategy of promoting the distribution of the improved cook stoves.
ORGANISATION FROM THE BANDUNDU PROVINCE		
27	NSK (NOVACEL REDD+ pilot project of agro-forestry in South Kwamouth	<ul style="list-style-type: none"> - The NSK REDD project establishes plantations managed on seven-year rotation basis to promote a sustainable system for charcoal production and to avoid unplanned cutting of natural forests which causes deforestation. - The system is linked to agro-forestry to improve crop production and reduce the land area used for agriculture.
ORGANISATION FROM THE EQUATORIAL PROVINCE		
28	The Equatorial Province REDD+ pilot project	<ul style="list-style-type: none"> - The Equatorial REDD project has observed that the problem of illegal logging and tree cutting increases when energy supply from electricity is poor. The project advocates the use of renewable energy and its offices are fitted with solar panels. The Equatorial Province experience demonstrates that solar energy is an important alternative in the DRC; - Research has shown that hydropower generation along the Congo River is feasible if funds are made available for the project; - The project also promotes the production of charcoal from acacia which is linked to the use of improved cook stoves with the aim of reducing deforestation on a large scale; - The project is investigating the use of biogas from organic wastes. The improved cook stoves are made locally in Mbandaka, and three types are available while 15 types are being tested in different villages. Prices are based on the efficiency of each improved cook stove. The project has also trained masons or builders to make improved cook stoves with

	<p>bricks especially the fixed improved cook stoves;</p> <ul style="list-style-type: none">- The idea is distribute 1 000 improved cook stoves which would be sold on revolving loans;- The project is verifying the use of each type of improved cook stove. Preliminary studies by the project indicate that improved cook stoves reduce the consumption of charcoal by 30-40% of traditional stoves; and- The most important aspect is the social acceptance of these improved cook stoves.
--	--

In view of the table above, the DRC sees hydropower as the energy source per excellence which could also be one of the main sources of energy in the DRC that would facilitate clean energy use. A white paper was signed by 10 countries including the RSA to reinforce the hydropower potential in the DRC. An atlas of renewable sources in the DRC was published in 2014 showing that the country can generate potentially 100 000 Megawatts of electricity from hydropower. All the rivers in the DRC are captured in this atlas which contains the following main elements:

- 10 000 MW for micro, mini, and pico hydroelectricity distributed as,
- 780 sites located in 145 territories of the DRC with 500 files or project documents which cover 76 000 villages.

Almost 200 maps are distributed thus:

- 14 national maps (per type of energy);
- 11 maps of provinces;
- 145 maps of territories and
- 30 maps of thematic analysis.

National and local studies which also relied on experiences from outside include:

- One national study of GAPS analysis,
- 10 studies of provincial diagnostics,
- 10 countries visited and experiences acquired,
- Political orientations and recommendations formulated and
- Energy potential of agriculture residues envisaged.

The DRC government's Act No 14/011/2014 of 17th June 2014 seems to be a major innovation in the energy sector. Investors are now free to invest in the hydroelectric power sector. The liberalisation of the electricity sector has resulted in the construction of many dams which has multiple effects on the development of the DRC. The DRC now encourages private enterprises and electrification services through small private dams that would supply electricity with the goal of ultimately decreasing the pressure on the forests.

The DRC sees solar energy as a promising energy source, but the government has not distributed solar panels to communities. Only businesspeople import them to the DRC and this could make access to solar energy rather expensive unless subsidy policy is introduced.

On the other hand, wind energy exists in the DRC but in limited areas. However, these sources of electricity indicate that they are potential components for energy production in the DRC which can play important role in climate change mitigation approach. Currently, most of people in the DRC use generators imported by businesspeople because electricity is not widely distributed. It is recommended that different banks and corporations invest not in fossil fuels but in the renewable energies. The campaign to promote this venture was launched in early February 2014 at the international level.

Wood energy conservation is also an important aspect of climate change mitigation if a strong policy on prudent use of energy is adopted. The main concern of the organisations is to reduce deforestation through wood energy saving. Most of the activities on energy use centre on the use of improved cook stoves and renewable energy.

The DRC is also considering the possibility of producing electricity from methane gas but no progress has been recorded in that direction. The adaptation of methane gas will probably take some time but many companies already plan to exploit the possibility. The following organisations explain in details the energy sources used and envisaged by the DRC:

4.6.1 Gorilla Organisation (Number 1 in Table 9)

Regarding energy used and envisaged, the Gorilla Organisation promotes the use of improved cook stoves, which use less energy than the traditional charcoal stoves, as well as the use of briquette as alternative to charcoal. Unlike its partner, the ICCN, Gorilla did not invest in initiatives such as making the briquette and improved cook stoves. Organisations are advised to refrain from duplicating but complement the efforts of other bodies. Gorilla chose to focus on

solar energy; therefore, it funds the projects on the improved cook stoves. However, Gorilla also carries out public awareness programmes while the ICCN and the WWF do the practical work for example on the production of the biomass kit or the reuse of the charcoal waste. The Gorilla Organisation is part of a synergy of actors around the National Park of Virunga, but its key emphasis is on solar energy.

4.6.2 CREF Network (Number 2 in Table 9)

The CREF Network envisaged that the use of improved cook stoves reduces wood energy and contributes to climate change mitigation. It also understands that this has an impact on the economy and households because people would use less wood energy which reduces the rate of deforestation. The CREF also advises the government that the use of hydropower would reduce deforestation. The use of briquettes is also promising but it requires more research. The DRC has rivers that could serve as energy source for hydropower, geothermic power in volcanic zones, and methane gas in the Kivu Lake which should be tapped. Solar energy is also another alternative source of energy.

4.6.3 North Kivu Provincial Department of Energy (Number 3 in Table 9)

The North Kivu Provincial Department of Energy represents the National Minister at the provincial level, and the administrative authority at the national level called the General Secretary in charge of energy and hydrocarbon. The energy sector comprises of the electricity board with the technical service in the Ministry of Energy called SNEL (National Electricity Board) which had the monopoly of managing the hydropower in collaboration with the Regideso (which is in charge of supplying water to communities). However, the government has signed a privatisation law that liberalises the energy and by implication, the electricity sector which means anyone is free to build a dam as long as he or she is ready to invest in the electricity sector. Investors are now free to invest in the electricity sector. However, it should be noted that SNEL did not cover the rural but urban areas.

4.6.4 CERD (Number 11 in Table 9)

The GIZ came to help set up the CERD operations. In collaboration with other partners, CERD is also able to diversify its renewable energy sources. The energy source envisaged by the CERD is

biomass through improved cook stoves and briquettes. However, at present, the use of briquettes in households is not desirable unless it is improved. A few organisations worked on improving the quality of available briquettes between 2007 and 2008 but did not make much progress.

Therefore, the CERD is considering how the briquettes can be used on a massive scale in South Kivu just as charcoal and firewood are being used in towns and villages. There is an on-going study on briquettes, which should soon be finalised. The materials used in making briquettes include fine sawdust and the chaff from rice. A feasibility study is also being conducted on how to produce the briquettes in Fizi, Muresa and Uvira.

The CERD still has much to do, and it is planning a study that would determine the availability of biomass and revise the technology for producing briquettes so that people can accept them and produce the briquettes themselves. Briquettes are made by using a wood press as in the model used by the WWF. It is difficult to market this wood press because it is very expensive at a cost of USD500 per piece. Secondly, the technology causes those using it to tire easily that is why a workshop would be organised to simplify the technology. The CERD has produced few briquettes in a pilot project which aims to encourage further research on the product and to encourage more people especially communities to join in the production in order to benefit from it.

4.6.5 GTCR (REDD Climate Working Group) (Number 24 in Table 9)

One of the goals of the GTCR (REDD Climate Working Group) is to work on reducing the consumption of charcoal. Thus, the use of improved cook stoves and other alternatives such as briquettes are being advertised in order to decrease charcoal consumption. The GTCR supports these practices because the government and communities cannot afford the cost of hydroelectricity, wind energy or solar energy. It would have been helpful for each family to have access to a solar panel. Unfortunately, people are still too poor to afford solar panels.

The GTCR does not manufacture briquettes or improved cook stoves. The briquettes attempted by the GTCR in Bukavu were releasing more smoke. Therefore, the GTCR has engaged the services of another company in Kinshasa to improve the quality of the briquettes. The experimental phase is already complete, and the GTCR is looking for funds to implement the whole programme. Producing briquettes in Kinshasa that would meet the needs of more than 10 000 000 of people is not an easy task because there is a chance of being unable to meet the

demands. However, an electric compressor has been bought compared to the mechanism that was used in Bukavu.

4.7 Application of remote sensing

Question 5: Does your organisation use remote sensing? If yes, what are its advantages and disadvantages, and what other issues relate to the use of this tool? (Appendix A)

Table 10: Advantages and Disadvantages of Remote Sensing in the DRC

N°	Organisation	Advantages and disadvantages of remote sensing
ORGANISATIONS FROM THE NORTH KIVU PROVINCE		
1	Gorilla Organisation	All stakeholders in the Virunga National Park including the Gorilla Organisation are engaging in dialogue about the importance of using remote sensing. However, most of them are not interested in using remote sensing because they do not know much about it. However, Gorilla takes seriously the protection of the ecosystems that are in the park including the habitat of gorillas and ensures that the use of this tool would help the monitoring of the ecosystems without affecting them negatively.
2	CREF Network	The CREF Network does not use remote sensing but it collaborates with OSFAC and MOAPI to obtain data from satellites for the North Kivu Province. At a meeting in Kinshasa in December 2014, it was announced that images for all territories of the North Kivu Province are ready. Nevertheless, authorisation from London is needed to access these images. The CREF Network has therefore requested that the Ministry of Environment arrange for access. The access could help the CREF Network to identify the problem as well as the solution by taking strong actions and necessary measures. It is helpful to have access to the data for each territory. Remote sensing is a new technology and it should not be used alone but combined with fieldwork. For example, it was discovered through images that the centre of the Salonga Park is being destroyed by unidentified persons. This was revealed by remote sensing. After the field observation, researchers noticed that the particular area was being destroyed by elephants from the same park. Thus, data from remote sensing should be complemented with fieldwork to understand the causes. Remote sensing helps organisations and countries to estimate the rate of deforestation and shows the degree of compensation (planting trees in destroyed places). The main challenge is the identification of the forest degradation indicators.

3	Research Centre for Environmental Planning	The research centre uses remote sensing in the sense of GPS and GIS services. The centre works only on satellite images from different years and helps to map out the scenario or the medullisation.
4	Jan Goodall Institute	The respondent from the Jan Goodall Institute is an expert in remote sensing use from the USA. The JGI has partners who specialise in remote sensing in the USA. The JGI has used this tool to view the structure of the forest especially the quality of the habitat of the baboons. JGI continues to use remote sensing but it needs to improve its operation. Unfortunately, the cost of images with high resolution is rather high. The Jan Goodall Institute collaborates with institutes in the United States which have access to remote sensing equipment.
5	FFN (National Forestry Funds)	The FFN does not use remote sensing but helps institutions with information about the inaccessible places.
6	WWF North Kivu (Eco-Makala REDD+ pilot project)	<p>- The WWF North Kivu uses remote sensing and has images with a resolution of 10 x 10 meters. When the WWF does the forest and non-forest analyses, it notices that the banana field reflects the same images as the forest and the eucalyptus which creates great confusion. Therefore, the WWF complements the data from remote sensing with the fieldwork and ground samples.</p> <p>- The WWF North Kivu focuses on the REDD+ pilot projects in three territories namely Nyiragongo, Rutsuru and Masisi. The WWF plans to test a combination of activities in a geographical zone to see if the activities would have an impact on the Virunga National Park.</p>
7	North Kivu Ministry of Environment	In the North Kivu Province, the Ministry of Environment has not yet adopted remote sensing technology. However, it is important to do so because the ministry is not even able to calculate the rate of deforestation. The ministry may therefore need to consider experimenting with this technology in collaboration with other partners.
8	UGADEC Goma	In the Tayna REDD+ project, the maps that UGADEC used were satellite maps. Although some data was captured, sometimes the data from remote sensing was not applied correctly due to human error. Therefore, it was important to train technicians in fieldwork monitoring. The advantage of remote sensing is that data can be obtained from remote places in the DRC.

9	North Kivu Provincial Directorate of Environment	The Directorate does not have a partner in remote sensing usage in the Province. To determine the rate of deforestation therefore, the Directorate just relies on its annual statistics.
10	ICCN North Kivu	The ICCN uses remote sensing for the monitoring of human activities that tend to threaten the Virunga National Park.
ORGANISATIONS FROM THE SOUTH KIVU PROVINCE		
11	CERD (Centre for Renewable Energy Development)	Due to the importance of remote sensing in forest monitoring, CERD is engaging in a study that would detect the biomass and capture its images. However, CERD does not have specialists in remote sensing. It operates like a distributor; others can come to take their readings with CERD.
12	WWF South Kivu	<ul style="list-style-type: none"> - In Itombwe, it is difficult to distinguish between the primary and secondary forests if one is not familiar with the area. Thus, the forest classification had to be revised by the WWF South Kivu using remote sensing; - Studies on the pattern of deforestation in Itombwe need to be conducted. Otherwise, only long discussions without any serious action would ensue; - Remote sensing and photo interpretation are tools which help the WWF project to have precise data on deforestation and GHG emissions. These results can be achieved when good tools and trained staff are available, but there is an urgent need for training in this field. - The WWF South Kivu continues to focus on the administrative and legal aspects, land use plan, and the territory's cartography which can help in estimating the rate of deforestation.
13	WCS South Kivu	<ul style="list-style-type: none"> - The WCS South Kivu always uses remote sensing for mapping. The maps help to locate the places where the primary and secondary forests are located and help to demarcate deforestation due to agriculture. Villages inside the reserve are also identified. - With remote sensing, the WCS can identify deforestation drivers and take action before deforestation spreads. Thus, remote sensing helps the managers to preserve the forest and restore what has been destroyed. - The positive aspect is that this technology helps organisations to adopt strategies that would help to protect nature.
14	ICCN South Kivu	The ICCN South Kivu has maps in the office which show the rate of deforestation in South Kivu. The GIZ has trained students in the analysis of data from the satellite and on maps. Regarding deforestation in South

		<p>Kivu, traditional rulers were asked by the ICCN to work on their local development plan (PDL), which would sensitise the people to and show them the importance of fighting climate change. The plan covers Kabare, Kalehe and Walungu. In the case of Idjui, only a small part of the forest is yet to be covered. There is little vegetation in South Kivu except in the Kahuzi Biega National Park but two traditional rulers in Idjui are also contesting the ownership of the remaining small forest.</p>
15	<p>South Kivu Provincial Directorate of Environment and Sustainable Development</p>	<p>- South Kivu Provincial Directorate adopts cartography for example in Businga where remote sensing was used. Satellite maps are made available by the partner, GIZ. The advantages of remote sensing here is that it helped the Directorate to map out all the boundaries of the tree plantation in Businga.</p> <p>- The goal of the South Kivu Directorate is to get an update of the different lands in the state as well as the forest stock. Thus, remote sensing provides facilities such as the GPS but it also has to be applied accurately.</p>
<p>ORGANISATIONS FROM THE EASTERN PROVINCE</p>		
16	<p>OCEAN Geographically integrated REDD+ pilot project in Isangi</p>	<p>- OCEAN has some software on remote sensing such as ENVI. It also produces maps that are used in the field with the software Arc view 10.4.</p> <p>- More maps are still being produced by technicians who are familiar with the forest. The University of Kisangani which is in charge of the ecological monitoring has no access to recent maps. Only images of 2010 and 2011 were available at some point. Although the university now has images of 2012, the project has encountered difficulties in handling the remote sensing tool. It is a useful tool, but mastering it requires many sessions in capacity building. At OCEAN, there is a planning unit for cartography, but it does not have adequate remote sensing software. In terms of map production, there is no problem, as OCEAN uses the Arc view 10.4 for producing maps. For remote sensing, there is the software ENVI. OCEAN now has the images of 2013 which took a long time to produce. Even at the national level, that is, in the Ministry of Environment, the problem is the same. The main challenge is obtaining recent images which could provide a description of the current forest cover.</p> <p>- OCEAN does not run the project alone. It focuses on the management and the planning of the project while UNIKIS helps to cover all aspects related to ecological monitoring and the MRV.</p>

17	WCS Mambasa Forestry REDD+ pilot project	<ul style="list-style-type: none">- The WCS Mambasa REDD+ project operates with support from the national level. Today, remote sensing can operate with geographical information system (GIS). The GIS has become an important tool for spatial management. Technicians opt for GIS when it comes to environmental management and the management of biodiversity. Although some people have learnt to use GIS, remote sensing operates on a high level, and it has become important to activities relating to the reduction of deforestation;- The WCS obtained data on the forest cover in Ituri from 2000 to 2012. At the national level, an expert conducted his PhD research on remote sensing, and he works with a technician from Ituri to monitor the change in the forest cover. However, remote sensing should be complemented with data from the field to avoid errors in handling and interpretation;- The mean rate of deforestation was established as 0.16%. In the REDD zone located further in the Southeast and which has a high pressure, the rate of deforestation is at 0.4%;- The project has also used spot images in two studies;- The carbon stock varies according to types of forests, and the project has identified 5 types of forests. There are 2 types of primary forests with large trees which emit 280 tons of CO₂ per ha, mixed forest with 220 tons per ha, old secondary forest with 200 tons per ha, young secondary forest with 85 tons per ha, and young secondary forest set-aside with 50 tons per ha;- The UNIKIS acts as consultant on the project, while OCEAN and the WCS provide technical support respectively in Isangi and Mambasa. Consultants from UNIKIS work in areas which staff lacks the required skills. Thus, UNIKIS focuses on ecological monitoring, socio-economic and reference data;- The UNIKIS works on all biophysical aspects of the site, takes an inventory of species, and sets up a monitoring system for the management of REDD+. It has already fixed plots in line with the norms that are required in the field in which carbon stock is evaluated according to the type of forest since stock varies from one type of forest to another. To measure the carbon stock, the UNIKIS has also put in place the MRV system, and ultimately, the idea is to estimate the carbon stock by using methods that are more scientific;- The UNIKIS also evaluates the socioeconomic condition in the project zone. It gathers data on the living conditions of people in the communities, the demography, the development and the evolution of the
----	--	---

		<p>economy in the target area. In addition, UNIKIS helps to develop the reference scenario which is a document that takes into account the socio-economic data, carbon stock, monitoring of the forest cover, and other issues relating to the rate of deforestation.</p> <p>- All these data are amassed to develop the models of projection called medullisation which shows the current situation and predicts future outcomes. If deforestation or forest degradation occurs, there would be a decrease in carbon stock. Thus, the factors that trigger these would include increase in population and changes in the economy.</p>
18	Eastern Province Directorate of Environment	<p>The Directorate offers a service in cartography which determines with accuracy the biomass or forestry mass in each village, territory, community and district. This gives an idea of the conditions in existing forests and it helps also to determine the rate of deforestation which is not too high when compared with the large forest area. The GPS and GIS are used for the cartography and the Directorate does not use satellite equipment.</p>
19	ICCN Kisangani	<p>The ICCN Kisangani does not use remote sensing. Once a place is identified as a reserve, the ICCN contacts the National Geographic Institute which designs maps. The ICCN plans to train people in cartography. Francophone cartographers are trained in Cameroun and Anglophones in Tanzania.</p>
ORGANISATIONS FROM THE KINSHASA TOWN AND PROVINCE		
20	FAO National Office	<p>- The FAO is supported by the UN REDD programme, the component MRV of REDD, so that the FAO supports the national forestry or the Ministry of Environment with the satellite monitoring system and the data on GHGs. However, activities began in the national forestry in 2013, the system of monitoring with satellite in 2012, and taking inventory of the GHG in 2012. Regarding the practical aspect, the project is designed to work in collaboration with staff members of the DIAF. So all the national consultants collaborate with the DIAF to monitor the MRV;</p> <p>- In practice, the national monitoring of the forest is in the intermediary phase because the national territory is quite large. Given that there is no specific study on the whole national territory, the DIAF should be supported to conduct the preliminary inventory of the national forests with the aim of quantifying the variability of biomass in each strata, evaluating the cost of the forests inventory based on the national logistics and capacity. The preliminary inventory constitutes important data for the DRC. The data produced by the FAO field agents are sent to</p>

	<p>the DIAF team in Kinshasa for analysis and encoding;</p> <ul style="list-style-type: none">- The FAO works in partnership with other organisations such as the US Forestry Service which focuses on soil samples. Regarding the analysis of the soil, the DIAF consults with some universities such as UNILU, a laboratory in Kinshasa called CRENCA, and the FAO which works with the WWF to complement the project in the Equatorial Province where there are several initiatives on forest monitoring. The DRC is strategic at the global level and the DIAF which is the Department of Forestry Planning and Statistics collaborates with various partners.- There is a likelihood of working with the WWF which engages in the carbon mapping for the DRC through the flight Lidar which differs from the terrestrial Lidar but has a key advantage in that it can go over the DRC a few times. The disadvantage however, is that it is quite expensive and requires the validation of the data from the field. Technicians have to go to certain sites to measure trees; therefore, the agreement with the WWF is that the on-site data validation should be carried out in the Equatorial Province. In terms of logistics, the FAO relies more on the findings by the DIAF with the help of the WRI (World Resource Institute) which worked on the layers and atlas of the DRC (roads and rivers);- Regarding the satellite aspect, the DIAF works with an equipment designed only for Brazil called Terramazon. It was adapted for use in the DRC and it is called Terra Congo. With the equipment, 12 people could work at the same time on satellite images. Thus far, the group has worked on the image for 1990 to determine whether the forest has changed between 1990 and 2010, and to distinguish between the forest and non-forest zones. According to technicians, the exercise is more complicated in the case of the Miombo Forest. However, the Bas Congo Province is always covered by clouds, which requires some elaboration that is easy to do. Funds are available for the DRC to work on its national reference level.- Given that the DRC covers a vast territory, the FAO has not yet established the reference level which requires some technical support to accomplish. The FAO helps with the inventory taking and remote sensing expertise in addition to providing advice to the DRC government on certain mechanisms of monitoring. The FAO can also support in the area of logistics, but in terms of field support, the organisation retains a technical consultant in the National Ministry of Environment.- The DRC has identified various types of stratification. The first
--	--

		<p>stratification is the Yangambi type which was done in 2007. However, the forest strata are only on the biological level. Other partners identified other types of stratification in the DRC as in the key study by the Université Catholique de Louvain that focused on certification in the Southern African region, particularly in the DRC. The forest strata they worked on (about seven or eight in number) are not only terrestrial, but also aquatic. The JICA JAFTA is also an international partner from Japan, and it supports the inventory taking in Bandundu where a carbon map or MRV of sorts is being produced. The different partners now share knowledge and experiences. The stratification by the DIAF has been reviewed and discussed by other partners and is already in use.</p>
21	WWF National Office	<ul style="list-style-type: none"> - The WWF uses remote sensing and has a specialist in that field. The advantage is that it does an aerial monitoring of the national territory with satellites, taking photos to capture what is happening in the project zones of the WWF. With this method, the follow up of the forest cover during a certain period is possible, and the WWF can determine the cause of deforestation during a given period, and predict tendencies of deforestation so that strong measures can be taken to forestall it. - The use of remote sensing in the WWF project is mandatory. The WWF uses what is called Lidar remote sensing, and obtains its data through different modes of capturing images. There are radar, optic, spot, and land sat captures, but the WWF opts for the Lidar (light detection and ranging) which uses laser to obtain data; - The issue of allometric equations relates to carbon stock. The Lidar is used to estimate the carbon stock and the Lidar remote sensing is used to do the carbon mapping. The advantage is that this tool helps organisations to estimate with accuracy the carbon stock; - Each object is distinguished in function based on its height, and any object that is up to 30m can be identified at this height. The radar can go up to 25m high, but for objects that are 4m high, the Terrassa is used. However, the Lidar gives a precision of 10cm and it is more accurate. Even on images, some details can be seen with the physical eye. The advantage of the Lidar is that the rate of accuracy is very high. - Besides taking the forest inventory technically through remote sensing, the height and the diameter of trees can also be used to obtain data. The WWF uses this method on the field which helps to calibrate the Lidar data as the two approaches can be compared to evaluate the accuracy. These approaches complement each other. However, fieldwork is expensive to carry out, and if no funds are available, technicians can only rely on remote sensing data. The WWF does not have the Lidar at

		<p>Luki for the REDD+ project, but it operates with some South African partners. Individuals do not have the Lidar tool because it is owned only by organisations or companies, and it is operated on an aircraft that flies up to 700m high.</p> <p>- There are different types of Lidar including the terrestrial Lidar, the aerial Lidar, and the spatial Lidar which is located only in space. Resolutions are different for these three categories of Lidar. The spatial has less resolution than the aerial Lidar, while in the case of the terrestrial Lidar, the environments of acquisition are different. Due to the size of the DRC, the WWF has taken a Lidar sample of 2000 ha especially of the dense forests and there were 213 repartitions in the whole country. The WWF now needs to do the field numerical model; determine the carbon stock in these samples, and extrapolate based on the remaining stock. The spatial Lidar is used when the altitude is above 1 000m.</p>
22	National REDD Directorate	<p>- Remote sensing is a reality with the Directorate because it is one of the conditions for getting funds from the World Bank or the African Development Bank for the Maindombe programme; the National REDD Directorate has to determine the reference level for its project. The first step is to demonstrate that there is pressure on the forest and people exploit it through farming and other activities. Therefore, the projection must show that within five or six years, the pressure on the forest would decrease through a series of activities such as tree planting, reforestation and the use of improved cook stoves. All these activities can cause the forest to grow and the limit can also change. The six-year gap between the previous and the current condition of the forest can be accounted for in terms of funds. To accomplish all these and make the projections, the images of the previous five or ten years would have to be obtained through remote sensing. The Directorate collaborates with the WWF in taking photos of the Maindombe, and also with a French factory which provides the DRC with free images. However, it is technicians from the DIAF who operate remote sensing in the DRC. Without remote sensing, nothing can be done in all DRC's REDD+ projects because the reference scenarios are needed. This tool is also important to distinguish between the forest and non-forest zones.</p>
23	GTCR (REDD Climate Working Group)	<p>- The DIAF (Directorate of Forestry Planning and Statistics) uses remote sensing with the assistance of experts from Brazil.</p> <p>- In 2009 and 2010, a study of drivers of deforestation was done in the DRC. Fieldworks were conducted coupled with spatial data provided by</p>

		the UCL (Université Catholique de Louvain), while the UNEP provided the socio-economic data. With these, consensus was reached on the drivers of deforestation at the national level. Remote sensing is also crucial to the follow up of the forest cover, because the DRC's forest cover is rather large. However, there is a serious problem with obtaining indicators of forest degradation.
ORGANISATION FROM THE BANDUNDU PROVINCE		
24	NSK (NOVACEL) REDD+ pilot project on agro forestry in South Kwamouth	NOVACEL has begun to show interest in the use of remote sensing. Therefore, it plans to train people in remote sensing use because at present, it does not have any specialist in that area.
ORGANISATION FROM THE BAS CONGO PROVINCE		
25	Geographically Integrated REDD+ pilot project around the Luki Reserve Biosphere	<p>- The Luki project is unique because it has an assistant who employs the GIS approach. A table is produced which shows the managers of the project the location of bush fire in the savannah and the zones where bush fire is a serious problem. The project tries to operate all equipment on the ground and distinguish between the forest and non-forest zones in order to verify the eligibility of the zone before the project is sent to the ONFI. Images from remote sensing are provided by OSFAC but there is a great need to train more people in remote sensing use.</p> <p>- In the REDD approach, remote sensing is used to reinforce aspects related to the MRV, and all the forest characteristics. Remote sensing helps in obtaining information on the boundaries of the forest reserve and forests outside the reserve. The information helps the WWF to identify where to plant trees in the savannah. If trees are planted in or outside the forest, the MRV approach is used to assess the increase in the carbon stock. This is one the goals of the project which also works in partnership with OSFAC, a satellite station for monitoring forests in Central Africa. It has signed a contract with the WWF to produce data on layers or strata relating to remote sensing use.</p> <p>- The REDD project has recommended series of images which are based on the standard methodology to produce maps for the Luki project. This information helps managers to choose sites on which to plant trees. The satellite images used by the project are land sat which help to evaluate the vegetal cover. The images with weak resolution help to deduce or show deforestation in a way. In partnership with the WWF, the Lidar project does the carbon mapping model for REDD. An operational</p>

		<p>aircraft is stationed in Katanga for use in obtaining data from the project zone because the WWF LUKI is also one of the REDD pilot projects in the DRC. The Lidar information on the Bas Congo Province will eventually surface. The Lidar is connected to the aircraft and is like a scanner which takes information from a certain altitude based on three dimensions namely biomass, CO₂ and forest cover. Various parameters are calculated simultaneously with the Lidar;</p> <ul style="list-style-type: none"> - The terrestrial Lidar captures the data of biomass, and has mathematical formula that embarks the satellite. The Eco-Makala project operates in Goma, but it is the Université Libre de Bruxelles that handles the remote sensing. The calculation of the potential carbon is done by satellite, but it is not enough because other basic data such as the height of trees and the diameter is also needed. - Fieldwork is done to obtain the primary data such as the height and diameter of a tree, which is then stored in a database. Data from the field can help with the Lidar calibration. Technicians integrate the quantity of carbon stock which depends on whether the site is a natural forest or an artificial plantation. Remote sensing is an important planning tool which also helps in measuring the carbon sequestrated. As the DRC has 150 000 000 ha of forests, the use of remote sensing to monitor and evaluate the different zones is essential. - The analysis of remote sensing is either spatial or temporal. This tool helps the project to compare the levels of the forest cover during the different periods to see whether the forest cover has increased or decreased.
ORGANISATION FROM THE EQUATORIAL PROVINCE		
26	The Equatorial Province REDD+ pilot project	<ul style="list-style-type: none"> - The Equatorial Project is not as well equipped in remote sensing as in project management. Remote sensing is a new field for its managers. However, it helps the project with maps of deforestation in the Equatorial Province. It is interesting to see the follow up of deforestation on a large scale, and in large territories. Nonetheless, remote sensing has to be combined with fieldwork to obtain data accuracy which could be quite expensive. - As in the whole of the DRC, the Equatorial Province needs to train experts in the field of remote sensing, and acquire the necessary equipment. It is important first to recognise the limitations of remote sensing before seeking to overcome them. Images are taken periodically to provide data to evaluate the rate of deforestation. At the local and community levels, the situation can be assessed based on the combination of remote sensing and ground measurement.

The advantage of remote sensing is in the area of ecological monitoring and monitoring of human activities which relate to deforestation and forest cover change. Remote sensing is used more in REDD+ pilot projects to measure the response to the technical aspects. Its advantage is that it shows the rate of deforestation while taking into account the forest cover during different periods and facilitating the monitoring of the forest each year. The other advantage of remote sensing use is that large areas are covered. Remote sensing provides reliable data on these areas.

Few people in DRC are trained in the use of remote sensing, but such people and institutions that have remote sensing expertise should be listed in a database which will serve as a resource for future references. However, it is important to train more people in remote sensing use because most experts are expatriates with the FAO and UNDP. A number of universities such as the UCL (Université Catholique de Louvain) are also equipped with the technology. The REDD+ Luki project in the western part of the DRC works with the OSFAC and other international bodies. In addition, some people are already trained in the use of the GIS. The GPS helps officials from the organisations to use remote sensing and locate the different zones such as zones of protection, detention and deforestation, etc.

The task of the South Kivu Provincial Directorate of Environment is to update the data on the different parcels of land owned by the government. In the past, the state had lands which were leased out to people through some state agents such as traditional leaders. With the GPS, technicians go around the land to measure the areas in hectare based on the past and present history. They also go into the interior of the forest to evaluate the rate of deforestation, and of the illegal logging activities.

The advantages of remote sensing are highlighted by different organisations, and these can help to identify the drivers of deforestation and rectify them before deforestation intensifies. The tool also helps the managers to conserve forest and to restore areas that have been damaged. When it comes to climate change, the advantages of remote sensing are clear because it indicates how deforestation contributes to climate change and affects human beings negatively.

The positive aspect is that this technology helps organisations to adopt strategies that would help to protect the environment. Moreover, remote sensing can be used on different projects to carry out stratification of the types of existing forests and of the areas that are populated, as well as to estimate the rate of deforestation. Remote sensing also has other advantages especially in respect

of the management of natural resources. With remote sensing, it is possible to identify areas prone to natural disasters such as deforestation or fire outbreaks, especially in order to safeguard the interest of people who work in the forest. Thus, remote sensing is an important tool for the management of natural resources especially of the forest resources because it helps to anticipate the future and evaluate the present condition of the forest. At present, images are obtained from abroad, and are paid for or sponsored by donors. However, such images are quite expensive and most of the organisations cannot afford to pay for them.

Most African countries including the DRC do not have enough funds to carry out research on remote sensing use. Companies or multinationals which work on remote sensing develop them often through the military. In the DRC, remote sensing is very expensive and equipment is not readily available. The NGOs have more images than the country itself, as most images come from Belgium, France, and other developed countries. Therefore, there is a problem of image availability because of financial constraints. The common image available today is the land sat which is free, and can be downloaded online. It has a resolution of 60 x 60 m or 30 x 30 m which is not bad. Other images with high resolution of about 10 x 10 m and 2 x 2m have to be bought, but these are spot images. However, spots are images donated by France to the National REDD Directorate, which distributes them to all REDD+ projects.

In terms of sustainable REDD management, organisations need to have socio-economic themes; data for the project on the living conditions in the communities, the demographic data, and the socio-economic development of the target area in general. In addition, organisations need to develop the reference scenarios which account for the socio-economic data, carbon stock data, the monitoring of the forest cover, and other factors which relate to the rate of deforestation. All these data are used to develop the models of projection called medullisation which shows the present situation and future projections. If deforestation and forest degradation occur, there would be a decrease in carbon stock. The factors that determine these include increase in population and economic changes, among others. Remote sensing requires software that could easily be manipulated such as ENVI, that is, in addition to maps that are used in the field with the software Arc view 10.4.

Another advantage of remote sensing use in the DRC is that all images can be got from the office in Kinshasa without one going to the field. Moreover, land sat images whose resolutions are not

so high are available at no cost to countries and organisations. If FAO however opts for images with high resolution, it would have to pay for them.

It is important to point out that new European satellite watch is being released, and the DRC would participate in a pilot project of the monitoring of its forest and evaluating the rate of deforestation. Brazil is training twelve people in the use of remote sensing especially the Terracongo; these would work in the laboratory. The allometric equations are elements that complement the MRV approach to the carbon stocktaking.

The Lidar is used to estimate the carbon stock while Lidar remote sensing is used to do the carbon mapping. The advantage is that this tool helps organisations to estimate with accuracy the carbon stock. In the past, the carbon stock was usually calculated using the radar and optic captures such as spot, but the accuracy of the results was in doubt because of the spatial resolution and the land sat which is at 30 x 30 m; but the Lidar gives more precise and accurate results, which is seen as an advantage.

The use of remote sensing on permanent plots or parcels is becoming increasing in the application of Monitoring Reporting and Verification (MRV) in artificial and natural forests.

The installation of parcels by the UNIKIS (for example at Isangi) is practically for the MRV system. The parcels are installed in all types of forests, and a study on the rate of deforestation is already done (for example in Isangi and Mambasa). The evaluation of the forest cover from 2002 to 2012 has also been carried out. The parcels are in squares (50 x 50 m = 0.25 ha/ plot). The UNIKIS has mapped out 300 parcels in Isangi which are equivalent to 75 ha, and are distributed in different types of forests based on two criteria. Parcels should be well distributed in the zones of the project and should not be concentrated in a corner or a specific area. The other criterion is accessibility. Parcels should be in an accessible area where people can locate them easily. They are permanent parcels, which are quite visible, and the trees are marked to facilitate the periodic monitoring. The idea is that the agents can return periodically to take inventory to evaluate the changes that have occurred. However, in Mambasa, UNIKIS has to install 200 parcels of (50 x 50 m). The parcels represent emission factor data that UNIKIS is using to monitor carbon stock.

Remote sensing provides estimates of forest change as deforestation (loss) or increased forest cover (gain) in terms of forestland, and this is called activity data. The UNIKIS does a simulation of information obtained through remote sensing as a loss (deforestation) or gain (afforestation), and values provided as carbon stock (emission factor) calculated from the inventory of parcels. It

takes for example the loss (deforestation area) from 2002 to 2012, in terms of the forest cover and the carbon emitted (emission factor) in terms of carbon loss. The rate of deforestation is done through remote sensing using images. As noted above, land sat is free and can be downloaded from the website but the spot has to be bought. The Ministry of Environment has signed a contract with Spot to have access also to those images. The Université Catholique de Louvain which is based in France provides the land sat images. Land sat sends regularly images to the project. Images are managed in the UNIKIS, at a laboratory where young people are being trained.

Thus, the UNIKIS calculates the rate of deforestation using satellite images (activity data). There is also a process called validation (*contre vérité* in French) which means that technicians have to go to the field to validate the images from the laboratory and compare them with the measurements obtained in the field. The place seen on images is put on the GPS, and technicians go there to update the data from remote sensing.

Similar examples of the work by UNIKIS are carried out at Isangi where deforestation is measured according to hectares to represent activity data and the volume in cubic meters. The volume converted to carbon contents represents emission factor. The North Kivu Provincial Directorate has planted 183 ha to be used for the MRV where carbon sequestered should be calculated. In addition, the Directorate in collaboration with the WWF North Kivu plans to evaluate the biomass and carbon changes in all artificial tree plantations in the province. It needs remote sensing images to monitor deforestation.

Many organisations and projects in the forest sector tend to have different levels of understanding of and attitudes towards remote sensing application. Some of the organisations have highly experienced personnel which recognise the importance of remote sensing while some others do not even apply the technology. In either case, it is clear that the application of remote sensing in the DRC is unavoidable because of the size of the country and of its forests. The good and encouraging results from the application of remote sensing make the tool indispensable in forest cover and changes assessment which are important issues in policy development regarding climate change mitigation in the DRC.

4.8 Results from focus groups discussion in the DRC

Table 11 explains beneficiaries' participation in and understanding of climate change mitigation activities organised by different organisations, especially the four REDD+ pilot projects located in the DRC from which data were collected based on four focus group discussion. The respondents were composed of beneficiaries from the Mambasa REDD+ pilot project (12 participants), Isangi REDD+ pilot project (10 participants), Luki REDD+ pilot project (10 participants) and Eco-Makala REDD+ pilot project (12 participants) as presented in Table 5. Therefore, the mean per focus group participation was 11 participants.

Table 11: Role of Civil Society/Indigenous People in Climate Change Mitigation Activities

<p>Q1. What is your understanding of the REDD project? (Appendix B)</p>	<ul style="list-style-type: none"> - The REDD project helps people to participate in actions against global warming through tree planting activities which the project organises and also the protection of the anthropic savannah, essentially the inauguration of the model farmers' scheme in the Luki project in the Bas Congo Province; - The REDD educates people significantly on sustainable agriculture which could help even future generations. The REDD also helps beneficiaries to understand its goals; - Managers of REDD projects let the beneficiaries know that all their activities will bring rewards. For example the beneficiaries of the REDD project in Mambasa are involved in cocoa development. Once the cocoa matures and it is harvested, it generates income which reduces poverty among the beneficiaries. - REDD is the reduction of the emissions of GHGs which contribute to climate change. People have to continue to fight to prevent bush burning in the savannah in order to accumulate respectable income on each hectare of land per annum. The carbon credit can also be secured if people do not cut down trees. - REDD is a compensation people get when they preserve their forest.
<p>Q2. How does your organisation fight deforestation? (Appendix B)</p>	<ul style="list-style-type: none"> - By sensitising all community members to the negative impacts of climate change which are being felt everywhere; - The officials work in collaboration with eco-guards as in the Luki REDD+ project; - Each person uses own land for tree planting as in Luki and in Mambasa where people plant cocoa to stop relying on the forest; - People in villages have the obligation to disclose all activities which promote deforestation;

	<ul style="list-style-type: none">- On the problem of access to land in the Bas Congo, beneficiaries of the Luki project need partners who can lobby INERA to give them lands for agriculture in the transition or tampon zone. In return, beneficiaries would engage in agriculture, but they would plant trees which would belong to INERA. It is a way of fighting deforestation in this area;- Beneficiaries have to avoid bush burning on their farms;- They are also encouraged to try alternative activities facilitated by the projects such as apiculture, pisciculture, creation of model farmers, cassava and cocoa planting, and chicken and goat breeding.- Thus, the people are becoming engaged in other activities that help to generate more income and they do not have the time and need to go into the forest to carry out illegal logging. The planting of rice in the mountain at Luki is forbidden because it contributes to deforestation of the mountain forest. Instead, people are urged to plant rice in the plains – the rice is called lowland rice and is linked to ponds;- With the agro-forestry approach, people are encouraged to use the wood from their lands instead of cutting wood from the forest or reserves;- For those who wish to breed animals, the REDD projects provide genitors which are multiplied at home such as goats, chickens, pork, etc.- In Isangi, the CARG (Agro Rural Management Council) teach communities to avoid deforestation and bush burning on farms;- Each farmer is encouraged to operate small-scale farms in different areas. The aim is to reduce deforestation;- The practice of crop rotation in farming is also advised;- Communities offer their own lands for experimentation in REDD projects instead of allowing REDD to start new farms which can contribute to deforestation.- Populations work in co-operative units using silvo-pastoral practices as in the Mambasa REDD+ project. The aim is to the retain trees and plant more trees to fight deforestation. The planting of cocoa under the shade in Mambasa requires also that people plant more trees. The silviculture (forestry) is used mostly to fight deforestation, but beneficiaries need more training to improve their practices.
Q3. What progress is being made in the REDD projects and other activities of	<ul style="list-style-type: none">- Significant progress is being made in the REDD projects even though there are a few drawbacks. For instance, in the Luki project, beneficiaries need more training and technical support before the project takes off, and the WWF hands over to the people to manage. If

<p>climate change mitigation in which you are involved? (Appendix B)</p>	<p>there is no adequate training, there is a high risk of losing the project after the WWF hands over. Sustainability is important in all REDD projects;</p> <ul style="list-style-type: none"> - Furthermore, funds do not often arrive in time to implement all planned activities in all REDD projects. The funding mechanism should be improved so that projects can reach the third phase during which beneficiaries will receive money for the carbon credit. In the case of Isangi project for instance, there is sometimes no food for genitors because funds are not released for the project on time; - Regarding the WWF Eco-Makala pilot project in the North Kivu Province, there is little development among the people of Nyiragongo area because of scarcity of water. It is difficult to grow trees in such a situation where water is not available; - In the Mambasa REDD project, beneficiaries need the help of more technicians especially agronomists who can monitor their agricultural activities in order to increase their food production and improve the farming techniques; - Additionally, the change in the agricultural season is a serious problem in all projects. Therefore, beneficiaries need to learn how to adapt easily to these permanent changes in seasons. - All roads and bridges under construction should be completed to facilitate the transportation of farm products. In Isangi, beneficiaries can actually increase their products, but some areas have no motorable roads problems. However, in Luki, the project has acquired lorries for this purpose.
<p>Q4 As members of the civil society/local communities/indigenous people, how are you involved in climate change mitigation activities? (Appendix B)</p>	<ul style="list-style-type: none"> - Regarding the Luki project, local communities are structured in 50 CLDs (Local Development Committees) which are found in all targeted villages. In addition to this, there is a local steering committee composed of the MAB (Man and Biosphere) which is a national committee that helps the Luki Reserve, INERA, community-based organisations and customary chiefs to participate actively in all activities and decision-making. There are also 10 GCDs (Groups of Commercialisation and Development) that help beneficiaries to sell their products. All these organs meet to discuss how to encourage all beneficiaries to be committed to the project. All beneficiaries use their own lands in the project; - In Luki, the WWF involves local communities in its activities by training them, giving them technical support, and providing them seedlings to plant. Beneficiaries are also made to participate in exchange visits to other projects, while the project also provides

	<p>materials and tools for agriculture as well as office support, and opens stores for products from the farms. Several activities take place during the trainings, and individuals are free to choose the activity that interests them.</p> <ul style="list-style-type: none">- A special training of beneficiaries in Luki on fish farming was done, especially on the artificial insemination of <i>clarias</i>. Technicians used to come and practice on the Luki River. During this training, 1 300 small fishes were multiplied and distributed to fish farmers. Financial and technical support was also given to establish ponds;- The implementation of the 30 model farmers' scheme in Luki shows that the local community is involved. In addition, all beneficiaries in Luki sign a contract to commit themselves to the project especially to respect the different clauses;- In all the REDD projects, all categories of local communities were first contacted and made to understand the project objectives.- In the Isangi REDD project, all local tribes are involved in the REDD activities. There are three main tribes – the Lokele who are mainly fishermen, the Turumbu who are farmers, and the Topoke. Of the three tribes, the Topoke have vast areas of land for agriculture. People also gave their own lands in several villages including Lilanda, Yaekela, Ligasa, Yalosuna and Malinda to show that the project is for them, and not for other people.- In Isangi, CARG, in collaboration with OCEAN, has initiated a farmers' association under a special project. The CARG visits the farmers to monitor the progress on their farms. A special specie of cassava given to beneficiaries in Isangi is called Obama crop at the local level. It is preferred by people. After receiving different species of crops from the project, people who were working on small areas (10 m²) increased their allocation to two hectares;- Six bridges have already been built in Isangi to facilitate the transportation of products from farms. The nurseries established by the project also help beneficiaries to engage in agro-forestry on their lands where they also cultivate rice every year. Therefore, products from Kisangani are not consumed in the local market. Rather, the goal is that local communities should rely on their own products.- In Isangi, beneficiaries were also trained in the use of GPS. The problem is that they assumed that this tool would help communities to exploit the mineral called carbon when they go to the forest. They then understood the use of GPS for mapping and MRV. More explanation is needed to understand the significance of carbon and the use of GPS;
--	--

	<ul style="list-style-type: none"> - In the community project in Isangi, the CARG efforts are on civil and state levels and the organisation also have a system that helps the people to collaborate. The community is fully involved. Development associations, the civil service, leaders of sectors and villages, head of the civil service and the department of agriculture are all actively involved in the project. They understand that if any development project comes to the community, they have to participate and make their contribution. The project has begun consultation with communities. The fact that communities gave their lands without asking for something in return shows their commitment to the project. - In the Mambasa REDD project, the WCS supplies materials for agriculture and helps to prepare the land on which cocoa is planted so that communities would diversify their products under agro-forestry. Before the project took off, the community members were consulted and enough cocoa seedlings were provided to beneficiaries from the nurseries owned by the project. Beneficiaries also participate in building the cocoa nurseries to get more crops. Once harvested, the cocoa is bought by the enterprise called ESCO. - In the Eco-Makala REDD+ project, the WWF implements its activities through different co-operatives made up of civil society members.
<p>Q5 What energy sources do you use, and what are other energy sources do you envisage in mitigating climate change?</p> <p><i>(Appendix B)</i></p>	<ul style="list-style-type: none"> - The energy sources which are currently used are wood energy and charcoal. - However, the improved cook stoves consume less charcoal. The challenge is that a small proportion of households in the DRC have access to them. Although the community understands the value of solar energy, it is difficult to adopt because of its high cost. In addition, the Jatropha is seen as a source of bio-energy, but there is no development in this regard. Many people, as in Luki, have palm oil plantations from which oil can be produced as bio-fuel for generators in order to decrease the emission of the GHGs. A good example of this is the invention of a generator which runs on palm oil in Chelala in Boma. As the DRC has many rivers, the use of hydropower is envisaged to be a clean energy source. Unfortunately, many households have no electricity even though they are connected to the National Electricity Board (SNEL). Macro, micro and pico dams can be built to augment hydropower but there is no provision for that in the DRC budget.

<p>Q6 What sustainable mitigation strategies would you suggest for the forestry and energy sectors in the DRC?</p> <p><i>(Appendix B)</i></p>	<ul style="list-style-type: none">- Partners should help communities to promote the use of savannah zones for mechanised agriculture, and to plant in those areas trees which grow fast in order to have other wood energy source than the forest. This can decrease the pressure on the existing forests;- As demanded by the people, the government and projects should build all roads which can help farmers to transport their products from remote farms. If there are no good roads, people will be pushed to get income from charcoal making which contributes to deforestation;- Partners and REDD+ project managers should find more lands for people where they can practice agriculture without damaging the existing forests;- Communities should be prepared to manage REDD+ projects before they are handed over to them. Otherwise, there is a high risk of non-sustainability of these projects;- The international bodies should recognise the 2 300 000 Gt per year of GHGs or more which are being sequestered by the DRC, and compensate conservation efforts by releasing funds for the development of local communities. Communities which preserve these forests are poor and do not even have good houses, good schools or standard hospitals. Therefore, the local people living in the forest zones should be the beneficiaries of all compensations related to forest protection;- Good governance should be promoted in the DRC in order to manage funds related to environmental protection.- The DRC government should investigate how the high potential of hydropower can be tapped to produce energy for cooking and other activities.
---	--

On the issue of public awareness of the concept of REDD by beneficiaries (Table 11), much progress has been made. As beneficiaries mentioned, they were previously unaware of the relevance of the concept of REDD and REDD values. However, project interventions facilitated comprehension in terms of climate change in general and alternative activities that are being organised such as tree planting and other activities that generate income and stir the interest of the people in the project. The responses show that the goal of REDD is for beneficiaries to get benefit from their climate change mitigation activities. The projects aim at direct or indirect interventions that contribute to the reduction of deforestation. However, this would be possible only if beneficiaries through their respective projects co-operate to fight drivers of deforestation.

The practice of sustainable agriculture, collaboration with eco-guards, tree planting, and vertical development in agriculture are the main ways of fighting deforestation. The availability of funds is crucial to the implementation of REDD related projects. The use of hydropower in the DRC could also contribute directly to sustainable mitigation in the energy and indirectly in the forestry sectors.

4.9 Climate Change Mitigation Strategies in the Forestry and Energy Sectors in the RSA

This section explains in details the results got from key informants in the Republic of South Africa.

4.9.1 Results from key informants

This section gives in detail the results from different key informants in South Africa.

4.9.2 Strategies for combating deforestation in RSA

4.9.2.1 Introduction

Table 12 below contains responses from the interviewees to the question, “*What are the different strategies or measures that can be used to counter drivers of deforestation in the RSA? (Question 1, Appendix A).*”

Table 12 shows the six institutions that deal with activities which relate to forestry and energy development in the RSA. The institutions adopt various activities and functions that contribute substantially to climate change mitigation through forestry and energy strategies. Various Acts and laws which also contribute to forest protection in different ways but need to be reviewed because they do not directly address climate change as outlined in Table 12 which presents intensive data collected through interviews with key informants from each institution.

Table 12: Strategies or Measures for Combating Drivers of Deforestation in the RSA

N ^o	Organisations	Specific strategies or measures adopted by institutions
1	Department of Environmental Affairs (DEA) National Office	<ul style="list-style-type: none"> - Actually the DEA's role concerns all biomass, but the forestry department is tasked with regulating deforestation and degradation, but in the Republic of South Africa, the key problem is degradation; - South Africa has the National Forest Act which was issued to regulate the forestry sector (enforcement and compliance issues); - The registration of woodlands, thickets and natural forests, and towards to look more at the grassland restoration; - The government has put in place different forms of retro planning and regulations to enforce the control of deforestation. However, regarding the regulatory aspect, the department of forestry handles the forest stabilisation planning and the national forest conservation planning. Thus, the key issue in the National Forest Act (NFA) is to target the woodlands; - The state also manages plantations but plantations are being transformed in a private sector as well as thickets; - The NFA contains the international forest, fair and fire Act, and the woodlands strategy which was promulgated in 1998, hence it does not directly or explicitly mention climate change, but all processes mentioned in the NFA relate to climate change mitigation; - Thus, all these elements are like principles, criteria, indicators about the use of natural forests, and there is another policy that uses development control of coastal forests, a number of programmes to protect trees, and a programme which also deals with protecting certain species of trees. - Furthermore, the IEMA (International Environmental Management Act), the National Environmental Management Biodiversity Act, and the National Environmental Management Act of Protected Areas all focus on forest protection and considering all biomass;

		<ul style="list-style-type: none">- The Department of Environmental Affairs only handles climate change carbon sinks. The NRM (Natural Resource Management) handles work on the projects. However, some of the Acts on protected areas are old, and need to be revised because they do not explicitly address climate change mitigation. Some of the laws mention the need to maintain and enhance the carbon stocks when they talk about rehabilitation of vegetation especially trees.- Afforestation is also important and envisaged by the RSA in the fight against deforestation and- Unlike in other developing countries, South Africa has limited opportunities to cut emissions by tackling deforestation, a sector in which near-term emission reductions are more easily achieved through regulatory policies and enforcement type measures and are therefore inexpensive.
3	Food and Trees for Africa	<ul style="list-style-type: none">- Food and trees for Africa is a non-profit social enterprise which runs six programmes but three of the programmes relate to the fight against deforestation namely Trees for All, Trees for House (which has more impact on climate change) and Bamboo.- Food and Trees for Africa has been planting trees since 1990. The number of trees planted so far is estimated to be around 4.2 million which is quite significant. However, many people do not immediately relate these activities to climate change mitigation. They focus often on food security, providing shade or decreasing the dust in the atmosphere. There is no estimate of the number of hectares of bamboo already planted;- Food and trees for Africa has to estimate the carbon stock because South Africa would now implement the carbon tax and is in the process of formalising its registration, monitoring and credit operation.

		<p>- Schools and other institutions have private lands on which Food and Trees for Africa plants trees. However, in the case of public companies, the activity is carried out on public land such as public places, forests, parks, etc.</p>
4	Department of Forestry, Agriculture and Fisheries (National office)	<p>- The protection of Champion trees is regulated by the National Forests Act of 1998. No such trees may be cut or damaged. This Act also protects 47 tree species as well as trees found in natural forests. In terms of their protection status, these may not be cut or damaged without a license;</p> <p>- Tree species are listed by experts as protected according to scientific criteria of rarity (vulnerability), keystone species value (ecological role), use value (threat) and cultural value (traditional use and landscape impact). Bushman's tea (<i>Catha edulis</i>) has the distinction of also being protected by narcotics legislation, for its leaves can be used to produce a drug known as <i>khat</i>. Being stripped of their leaves repeatedly, the survival of these trees is in the balance in some areas.</p> <p>- Most licenses for tree harvesting are issued for commercially important trees such as camel-thorn, although only felling of dead trees is allowed. The listing of protected trees is therefore meant to control and not to prohibit the felling of such trees, except for rare species. Relatively small numbers of forest trees are harvested under license each year, subject to strict control. The only significant licensed use of forest trees apart from that in the Knysna Forest is <i>umzimbeet</i> (<i>Millettia grandis</i>), harvested in the Eastern Cape for making walking sticks and implement handles;</p> <p>- Besides being harvested for commercial use such as <i>braai</i> wood, protected trees are also felled for the ploughing of virgin agricultural lands and for development. The layout of development and agricultural lands can be influenced to reduce the number of affected trees, but this is seldom possible in the case of mining. In such cases, the license conditions may require compensatory action or other offset arrangements. This may take many forms such as the introduction of a trust fund for the rehabilitation of woodland or the establishment of a nature reserve.</p> <p>- Illegal harvesting and felling of protected trees for land</p>

	<p>clearance do occur especially bark harvesting and the harvesting of pole-sized trees in forests. It is difficult for law enforcement officers to cover the expansive areas under their jurisdiction especially in densely populated communal areas. Notwithstanding this challenge, a number of recent successful prosecutions received attention in the media, helping to serve as a deterrent. Most prominent was a case in 2008 in which three men received an effective eight-year jail sentence each, while their accomplices received five years each for cutting yellowwood trees in the Gongqogongqo Forest in Kwazulu-Natal;</p> <ul style="list-style-type: none">- Stricter control of trade in protected tree products has led to an increase in lead wood and camel-thorn <i>braai</i> wood as well as charcoal imports, displacing some of the pressure on resource use to neighbouring countries. Tropic timber from African countries further afield also moves through South African borders and ports, mostly in transit to foreign destination. The Timber Working Group periodically monitors the movement of such timber especially of trees protected under the convention on the International Trade in Endangered Species;- Wood identification is vital for monitoring and law enforcement. Samples taken of wood suspected to be of locally or internationally protected species are sent for microscopic identification. However, new technology may soon add a new dimension to wood identification through DNA sampling. The University of Johannesburg is involved in the barcoding of the DNA of trees in Southern Africa as part of the international Tree Barcode of Life Project (TreeBOOL). This project has so far amassed barcode records for more than 80% of the known trees in the region.- Dozens of introduced tree species have been listed as invasive under the Conservation of Agricultural Resources Act of 1983 and the National Environmental Management Biodiversity Act of 2004. Some of these such as rock <i>hakea</i> (<i>Hakea gibbosa</i>), are banned outright, while others may be planted under controlled conditions in commercial tree plantations or urban gardens, for example. Mechanical eradication of invader plants by Working for Water teams is
--	--

	<p>supplemented by the release of biological control agents. South Africa is regarded as one of the world leaders in the biological control of invader plants through the introduction of natural enemies such as insects and pathogens to invader plants. These are tested by the Department of Agriculture, Forestry and Fisheries under controlled conditions before being released. The renowned Forestry and Agricultural Biotechnology Institute also operates a facility for the breeding of biological control agents.</p> <p>- Nurseries and botanical gardens contribute to the protection of the species in various ways. Several rare or threatened tree species have been successfully propagated by nurseries. The rare pepperbark tree is more abundant in gardens today than the small population surviving in the wild because of nurseries. Botanical gardens also serve as a sanctuary for rare or threatened tree species, where <i>ex situ</i> protection may guard certain species and their genetic material against extinction.</p> <p>- South Africa's legislation to protect trees and to control invasive species is possibly more advanced than that of any other country on the continent. The measures are also varied and innovative. The main challenges lie in the lack of resources and expertise that would make full use of the excellent tools at hand. It is a task that requires dedication and one of which the merits should never be in doubt, because it concerns the future of the children.</p> <p>- The Champion Tree Project is aimed at identifying and declaring trees of national conservation importance as protected under the National Forest Act of 1998. To date, about 60 Champion trees have been declared by the Department of Agriculture, Forestry and Fisheries. These include indigenous trees of outstanding size, age or historic value. Each year, nominated trees are evaluated by a panel of experts according to set criteria. Each of the shortlisted trees has to be visited by forest scientists and measured to confirm their size, to assess their condition and to make management recommendations where necessary.</p> <p>- In November 2008 and August 2011, Stihl South Africa sponsored expeditions to find and measure the tallest trees in Africa. A stand of saligna gum trees (<i>Eucalyptus saligna</i>) that</p>
--	--

	<p>was planted in 1906 by Alexander Eastwood on the Woodbush Estate near Haenertsburg has been declared Champion Trees. A tree within this grove, measured at 81.5m by a land surveyor in 2002, was initially crowned the tallest tree in Africa. That was until the tree was toppled in a storm eight years ago and a new search for the next tallest tree began. Studies of this grove of trees on aerial images and in the countryside proved inconclusive and it was soon realised that the most reliable measurement could only be obtained by using tree climbers;</p> <p>- Natural forests and woodlands support millions of rural South African households in different ways including the use of firewood and medicinal plants, yet natural timber resources are scant from a commercial point of view. Fewer than 20 000 m³ of timber are harvested annually from natural forests and woodlands for commercial purposes, mostly for the small furniture and woodturning industries. The country had to afforest vast tracts of grassland and fynbos (similar to macchia) in the high rainfall regions to provide it with most of its timber needs. This sets South Africa apart from other major timber-producing and exporting countries on the African continent that rely on timber from the tropical rainforests and deciduous woodlands. Even-aged stands of fast growing introduced pine, wattle and eucalypt tree species require a different silvicultural and management approach than do complex rainforest ecosystems;</p> <p>- It took more than a century for the South African commercial forest sector to develop to its present status, which is gigantic by all African standards. Currently, the country's commercial plantations cover about 1.3 million ha. The commercial forest sector is a major player in the formal economy, employing about 201 000 people and creating a further 462 000 indirect jobs. Its contribution to rural development and its potential for poverty relief is evident. However, the industry faces some challenges such as the shortage of suitable land for future afforestation.</p> <p>- Forest guards have been at the forefront of forest conservation for two centuries, and have continued to carry out their duties in many state forests and forest-protected areas.</p>
--	---

5	Cirrus Group	<p>- South Africa does not experience much deforestation, as it engages in other projects such as afforestation, reforestation, conservation tillage and energy sector projects. South Africa has about ten projects which include the reforestation projects in the Western Cape which is rather small, and on the part of the government, two assessments of all mitigation options. There are also projects on reforestation, conservation tillage, afforestation and commercial plantations.</p> <p>- In another assessment, the policy support and the carbon sink were completed last year. The government has initiated another project focused on MRV and assessment of methodologies. Other projects include the commercial plantations or commercial forestry models which cover 20 000 ha of land in the Western Cape and 20 000 ha in Kwazulu-Natal. These commercial plantations make wood available to people once they are harvested after eight years.</p>
6	Federation for a Sustainable Environment (FSE)	<p>- The Federation for Sustainable Environment (FSE) is more focused on nuclear energy and has a lobbying privilege in the mining industry. There are significant reference wastes from mining activities of uranium and of other metals such as arsenic which is a metal wood, copper, cobalt, cadmium and aluminium; all these are toxic but uranium is not only chemically toxic but also radioactive. The wastes are deposited in areas which are highly populated. Of course, at least 1.6 million people live on top of these radioactive wastes or residues. Historically, the mining companies plant the aliens around the mining dams because they are tolerant of hostile environment, and there is high pollution from uranium and dust, issues of radioactivity which affect human health. The mining companies therefore plant these aliens (which are found in forests) because nothing grows around the mining dams and industry.</p> <p>- The alien plants are invasive taking much water from the soil, and they are unique species that grow around the mining dams and degraded land. The destruction of aliens around the mining dams increases the water and dust pollutions. Therefore, the FSE advocates against deforestation around the mining dams because mining activities promote deforestation.</p>

4.9.2.2 Strategies for Reducing Deforestation

4.9.2.2.1 Introduction

Six institutions are identified whose main strategies and functions are directed at reducing deforestation and forest degradation in order to reduce emissions from the forestry sector (Table 12). South Africa does not have a large forest that can satisfy its timber needs.

A detailed analysis of Table 12 shows clearly that all institutions and organisations understand the role of forest and energy sectors in climate change policy reform and mitigation. Thus, laws have been enacted to protect the existing small natural forests, which are reinforced by the establishment of commercial plantations which can supply timber to the people, and a series of researches which monitor endangered species.

Eleven institutions are identified in the RSA (Table 2) seven (Table 12) of whose functions directly relate to reducing deforestation and protecting the existing small forests based on different existing Acts and laws. However, the Acts and laws need to be updated to address climate change mitigation activities directly. The planting of botanical gardens in the country is one of the key strategies adopted to protect endangered species. However, it is well noted that deforestation is not a major issue in South Africa; fighting degradation is the main issue. Reforestation and afforestation are possible in South Africa. Unfortunately, unavailability of suitable land is a hindrance to the operation of commercial plantations on a large scale. The government should collaborate with the civil society to find a solution to the problem. All the activities of the seven institutions are compatible with Acts and laws that regulate the forestry sector in the RSA. The strategies in details employed by each organisation to reduce drivers of deforestation as a climate change mitigation measure are outlined below.

4.9.2.2.2 Department of Environmental Affairs (Number 1 in Table 12)

In 2014, the national office of the Department of Environmental Affairs did a terrestrial carbon sink assessment to quantify the carbon stock that was in all biomass. It was found that the main carbon sinks is the national forest with less than half a million hectare.

However, the major biomass is the grassland and the woodlands. The study reveals that between 80% and 90% of the South African carbon stock is in the grassland and savannah woodlands because of the size of these areas, and 90% of carbon stock sink is actually within the soil which

is called soil carbon. The remainder is in the biomass or underground biomass carbon. One of the objectives of DEA is to consider and identify mitigation options, which is a complex thing to do especially the act of managing the soil carbon which can change within the radius of a meter. Consequently, the soil carbon assessment by the DEA involves different approaches, mainly the use of remote sensing and a few strategic samples. However, the sampling approach is not rigorous because the DEA does not use the stratified approach.

Besides deforestation, degradation is also difficult to monitor. Degradation is caused by exploiting forest resources or overgrazing, and it is difficult to measure. Degradation affects more the quality of the forest while deforestation affects the quantity. To measure degradation, the quality of the forest has to be assessed by a forestry officer who works in the forest using GIS. Some research on indigenous forests has tried to detect change in the quality of the forest. Changes in the colour of leaves, if well calibrated, can show whether degradation is natural or anthropogenic. However, it is difficult to measure degradation, and if possible, the researcher should take several pictures which can be compared later. On the other hand, the rate of deforestation in the RSA has not yet been assessed quantitatively. Actually, all natural forests in the country are state forests; therefore, people cannot carry out illegal activities in them. Furthermore, emissions from agriculture and land-use change in South Africa constitute only around 5% of emissions, compared to an average of 44% in developing countries as a whole.

4.9.2.2.3 Food and Trees for Africa (Number 3 in Table 12)

In the case of the Food and Trees for Africa especially the Trees for All programme, the main targets are schools and community centres. Food and Trees for Africa receives applications from schools, clinics, hospitals and community centres which require trees for purification, to prevent soil erosion, to keep the dust down and for shade. The project does not focus on carbon stock, but it addresses social issues. After receiving the applications, and given that Food and Trees for Africa is tax exempt, the project then obtains donations from sponsors and makes it tax exempt so that no benefit would accrue to them. Subsequently, sponsors as well as Food and Trees for Africa list the organisations which would plant trees and schedule the events. Events take place in schools. The learners sing for the participants, introductions and vote of thanks are given, and then trees are planted. An event is usually sponsored by the corporate social investment arm of

the company in collaboration with the beneficiaries which are the schools and other institutions. The trees are planted to address social issues, but their carbon stock is not yet estimated.

Another programme called Trees for House has a larger impact on climate change. The programme has a larger impact because community educators are trained on the importance of environmental care and tree preservation. The key element in all these activities is to relate them to climate change. Sponsors then approach the communities to urge them to plant 5 000 trees to offset carbon emissions. The community educators who are trained in certain areas then locate where the trees would be planted. Food and Trees for Africa together with the sponsors proceed with the distribution of all the trees but the community educators do the monitoring. This is a carbon-registered programme.

The Bamboo project is also a carbon-registered programme. A company may wish to plant for example five hectares of bamboo which would be donated by sponsors. Therefore, the company conducts a carbon footprint, looks for impacts and decides to offset for the carbon offset programme. Food and Trees in collaboration with the sponsors then finds a suitable area to plant the bamboo and to generate carbon credit from that. Plants are not given to communities. Food and Trees plants trees and its members are paid for that service. If some thousand plants are donated to communities, they might not be able to plant them successfully because there are rules for planting bamboo and trees. Hence, the people are only taught how to dig proper holes and put the compost inside.

4.9.2.2.4 Department of Agriculture, Forestry and Fisheries (Number 4 in Table 12)

The national office of the Department of Agriculture and Fisheries established in 1876 the first commercial plantation of fast-growing eucalyptus in Worcester (near Cape Town) to provide firewood for steam locomotives. At that time, the discovery of diamonds and gold in the interior led to a demand for mining timber and much of the wood from this stand was eventually sold to De Beers Diamond Mines in the late 19th century at a great profit. Eucalypt trees were also planted on the reef in present-day Johannesburg to provide mining timber in the years after gold was discovered there. The potential value of commercial afforestation with introduced fast-growing trees therefore became evident when the local forest sector was still in its infancy. This value was underscored when mature pine trees at Tokai plantation fetched high prices owing to

the timber shortages caused by the First World War between 1914 and 1919. Nonetheless, except for the tan wattle plantations (started in the early 1880s); the private sector remained uninterested in the forestry industry. Commercial afforestation and the establishment of sawmills were largely directed by the government. In the two decades between the First World War and the start of the Second World War in 1939, the area under commercial tree plantations grew many times over, reaching 500 000 ha.

Private sector involvement in the forest sector actually started during the Second World War when timber imports were interrupted and prices escalated. A boom in afforestation and the building of sawmills by the State and private forestry companies followed. By 1960, more than 900 000 ha of plantations existed. These plantations could be divided roughly into three equal portions one for the pines and other softwood species, another for eucalypt and other hardwood species and the third for tan wattles. The two main divisions of the timber industry are the raw timber growers and the wood-processing industries that include sawmills, mining timber mills, pole treatment plants and the pulp and paper industries. These industries became well organised and various associations were established to protect their interests. The industries also became well served by research and training institutions, making the technological capabilities of the South African forest sector unequalled on the continent.

Afforestation continued rapidly until 1994, by which time various factors such as limited suitable land for commercial tree plantations, biodiversity concerns and limited water supply severely restricted options for further afforestation. From 1960, the plantation area increased to just over 1 million ha by 1980 and to about 1.3 million ha in 1994. In the past decade, the plantation area had a net increase of more than 10 000 ha. Actual loss of existing plantation areas included the withdrawal of commercial plantations which previously were established in sensitive areas like the wetlands.

SAFCOL was established in 1993 as part of the State's initiative to disengage itself from direct involvement in commercial forestry. At the end of the 20th century, the privatisation process was taken a step further when move was made to begin to transfer the remaining State forests and commercial plantations to private forestry enterprises through lease agreements. By 2009, only 6.9% (or 88 261 ha) of the commercial plantation areas were managed by the local authorities. Currently, SAFCOL, through its fully owned subsidiary Komatiland Forests, manages 10% of the

commercial tree plantation areas, while large forestry companies account for 59.3%, commercial farmers for 20.3% and small growers for 3.5%.

The total State land leased to private companies amounts to about 249 300 ha, which includes commercial plantations and conservation land use. About 68 000 ha of plantation had been identified for land-use conversion back to a natural state (in Mpumalanga, KwaZulu-Natal and Western Cape). By 2009, 1 058 908 ha (81.3%) plantations were privately owned and 215 960 (17%) were state-owned. Over the past three decades or so, the large forestry companies have increasingly encouraged their workers to become contractors, to the extent that by 2009, almost half of the forest industry workforce was employed as contractors. Therefore, the commercial plantations somehow contribute to the protection of the small natural forest which exists in the Republic of South Africa in spite of a certain number of challenges related to the establishment and management of these plantations.

In 1998, the National Forests Act (NFA) and the National Veld and Forest Fires Act (NVFFA) were promulgated to back up the new government policies. Both Acts are hailed as some of the best forestry and environmental legislation tools in the world. The NFA protects all forests, irrespective of land-ownership. It also provides for a range of protective measures including the declaration of forest protected areas, the declaration of controlled forest areas to control deforestation, forest monitoring and reporting and the declaration of protected trees. The NVFFA provides, *inter alia*, for the establishment of Fire Protection Associations to which landowners can belong to promote collective fire protection.

Monitoring and audits of natural forests areas have revealed that deforestation has become insignificant especially since 2005 when concerted efforts were made to stop the clearing of forest for subsistence agriculture. Exceptions are the destruction of most of the Dukuduku Forest in northern KwaZulu-Natal by an expanding informal settlement for more than two decades and the invasion of forests around Port St Johns. Although the loss of natural forest is minimal, many of the forests which are intact are degraded by activities such as the harvesting of pole-sized trees, bark harvesting, grazing of cattle in the understorey, and hot or frequent fires in the forest margins. These activities have persisted for centuries, but have intensified because of population pressure. In woodland areas, deforestation is more significant (more than 10 000 ha or 0.25% of the woodlands are affected per annum), mainly because of land-use change such as mining and the ploughing of virgin soil. These changes take place through land-use and environmental

authorisation processes by the so-called “green scorpions” to stop such activities which have lately intensified and caught the attention of the media.

Deforestation of natural forest for urban development is prohibited and such deforestation is controlled under a strictly enforced policy. Mining poses a potential threat to a few coastal forests where valuable mineral deposits have been found. Richards Bay Minerals is the only mining lease area currently affecting natural forests, where the mining of strategic minerals such as titanium and rutile along the northeast KwaZulu-Natal coast necessitates the removal of dune and coastal forest. The dunes are reshaped and stabilised after mining, allowing the regrowth of natural forest in successive stages. This forest rehabilitation process acts as an ideal study of forest regrowth process.

The National Forests Act of 1998 contains a set of principles that “guide decisions affecting forests”. These principles are as follows:

- (a) Natural forests may not be destroyed save in exceptional circumstances where, in the opinion of the Minister, a proposed new land use is preferable in terms of its economic, social or environmental benefits;
- (b) A minimum area of each woodland type should be conserved;
- (c) Forests must be developed and managed so as to:
 - (i) Conserve biological diversity, ecosystems and habitats;
 - (ii) Sustain the potential yield of their economic, social and environmental benefits;
 - (iii) Promote the fair distribution of their economic, social, health and environmental benefits;
 - (iv) Promote their health and vitality;
 - (v) Conserve natural resources, especially soil and water;
 - (vi) Conserve heritage resources and promote aesthetic, cultural and spiritual values;
 - (vii) Older people or categories of persons disadvantaged by unfair discrimination.

4.10 Contributions of the national REDD+ programme and other organisations to climate change

4.10.1 Introduction

Table 13 provides information from the interviewees in response to the question, “*How is the national REDD project unfolding and how does REDD and other organisations contribute to climate change mitigation in the RSA?*” (Question 2, Appendix A).

The RSA does not have a national REDD programme but the Department of Environmental Affairs is considering proposals in this regard. The Table 13 indicates that institutions are trying to work on this concern in the RSA.

Table 13: Contributions of National REDD Programmes and Other Organisations to Climate Change Mitigation in the RSA

N°	Organisations	Contributions of national REDD programmes and organisations to climate change in the RSA
1	Department of Environmental Affairs National office (DEA)	<ul style="list-style-type: none"> - The DEA has already drafted some documents on the REDD+ which are being used to work on and negotiate for the REDD and LULUCF even though they are yet to begin. The DEA tries to show why the REDD+ is needed in South Africa, but it has not yet accomplished much besides the proposal. The process is at the earliest stages. - In its climate change unit, the DEA focuses on carbon sinks particularly biomass in relation to carbon sink, and on the land sector as a whole. As the DEA operates in the agricultural sector, it is preoccupied mainly with agriculture and forestry. Its area of expertise includes all biomass and grasslands because nine types of biomass are found in the country, all of which have to be considered. However, in terms of the forestry sector, the DEA has been negotiating for the REDD+. - Consequently, some documents have been drafted. Under the legal definition of forests, woodlands can also be categorised as forest. The forestry sector therefore has developed a woodland strategy framework, but its mode of operation is not yet clear because of issues of capacity and resources. Nonetheless, certain projects have been initiated. The REDD+ and REDD land planning were identified as one of the mitigation options but they are

		<p>still in the pre-“Redness” phase.</p> <ul style="list-style-type: none">- The REDD strategy has not yet been developed. In terms of quantification, the DEA can use the carbon sinks assessment, but it also needs to develop the MRV. In this case, management is quite important, and the DEA has yet to develop its operations because the REDD package requires a number of things. Countries that develop it need reference levels, forest management system and the MRV system. The South African government therefore needs to take into account these issues.- The problem is that when institutions talk about the REDD+, they associate it with natural forests, whereas REDD is a trademark. Therefore, if this definition can be shown to include woodlands, as long as its MRV can be done, it can be considered a REDD project.- Another method is being developed within the REDD network under the UNFCCC. Negotiation of the funding is ongoing as well as the groundwork because up to now no country makes provisions for REDD funds, but some countries have already received some funds while others will get theirs later. However, there is also the issue of equity. Under the UNFCCC, parties are considering how to generate adequate capital to fund the whole system like the RSA’s 2020 land approach which does not only consider the forest. Under the LULUCF, there are also four projects, and for one of them, countries have to propose additional activities. The LULUCF in RSA only handles reforestation and afforestation. These activities focus on green vegetation, thicket land management, wetland management and grasslands management. The agro forestry is also included in the green vegetation programme.- In a natural forest, the carbon sink is higher than that of any other site that is not natural. The carbon sequestration is specific and depends on the climate in an area. The soil also depends on specific species. Therefore, in a natural forest, trees are taller because the density of carbon is higher in the forest. In every hectare of a natural forest, the carbon concentration is higher
--	--	---

		<p>than any biome. When plants absorb the carbon, they produce what is called the GPP (Gross Primary Product), and when they lose oxygen through respiration, we have the NPP (Net Primary Production). However, if fire, grazing or similar elements are introduced, the NEP (Net Ecosystem Product) is produced. All these elements can be read in the LULUCF manual by the IPCC.</p> <p>- The DEA has used the worldwide approach to measure the carbon stock in lands, but did not use stratified numbers. It used certain strategic samples and the carbon with remote sensing. The DEA also had another project for the natural terrestrial carbon sink. This system could always be updated. Its first phase is the carbon sinks assessment, but the project will be further equipped to improve its output. The system is used for planning even at the municipality level.</p>
2	WWF South Africa (Gauteng and Cape Town offices)	<p>The WWF South Africa is not involved in REDD+ initiatives because natural forests are not seen as a priority ecosystem for conservation in South Africa. The focus is more on reducing the impact of plantations on other ecosystems such as grasslands and wetlands.</p>
3	Cirrus Group	<p>There is no REDD project in South Africa but the Cirrus Group was involved in the REDD+ Tayna Kisimba Ikobo project located in the DRC especially in the North Kivu's Lubero territory. Unfortunately, this project was stopped before the end of the first phase. In South Africa, the government needs to obtain funds to develop projects in different villages. The Cirrus Group uses allometric equations to calculate the amount of the CO₂ and the weight of the trees.</p>

4.10.2 Analysis of the contribution of REDD in the RSA

REDD is the mitigation of climate change through activities that reduce emissions from deforestation and forest degradation. In the case of the RSA, only the DEA has drafted a document on REDD+. However, the RSA has experts in this field such as the Cirrus Group

which has been working on the carbon stock in the Tayna REDD project in the DRC. The RSA focuses on nature conservation and sustainable management of forests but the activities are carried out by state institutions and NGOs. In a REDD project, the carbon stock of a particular forest has to be calculated. The RSA focuses on terrestrial carbon sinks through surveys which are organised periodically by the Department of Environmental Affairs in collaboration with other organisations.

Countries have to follow certain directives or rules in implementing the REDD initiatives. They should also put in place an MRV system of GHG emissions. In this regard, the RSA does not yet have a REDD package or a clear methodology for REDD. It is still in its earliest stage.

4.11 Involvement of the civil society, local communities and indigenous people in climate change mitigation strategies activities

4.11.1 Introduction

This section provides enough information on the ways local communities are involved in climate change mitigation strategies in the RSA.

Question 3: How does your organisation involve the civil society/local communities/indigenous people in climate change mitigation activities through the REDD or other programmes in the RSA? (Appendix A)

Table 14: Roles of the Civil Society/Local Communities and Indigenous People in Climate Change Mitigation Strategies through the REDD and Other Programmes in the RSA

N°	Organisation	Climate change mitigation activities of civil society/local communities and indigenous people
1	Department of Environmental Affairs (DEA)	<p>- In all projects that the DEA handles, participation from different sectors is required. The constitution of and principles that guide the DEA require that stakeholders from various sectors including the academia, NGOs, civil society organisations be involved in the projects of the department. However, other processes, especially those related to climate change such as the IGCCC (Intergovernmental Committee on Climate Change) also involve NGOs in their programmes.</p> <p>- A climate change conference was organised in 2014</p>

		<p>that attracted participation from various sectors including the civil society which also made presentations and actively engaged in discussions. Each sector presented its contribution during of the meetings. NGOs implement projects, while the Department of Environmental Affairs plays the role of coordinating, facilitating and regulating the deliberations to ensure that the inputs not work in isolation. Even with the DEA's projects, steering committees are set up to help guide the projects.</p>
2	WWF South Africa	<ul style="list-style-type: none"> - The civil society and indigenous people have been involved extensively in a government-led wetland restoration project that the WWF initiated in 2001. It is called Working for Wetlands. The goal of the project is to restore wetlands in labour intensive ways using previously unemployed people, with the view to also have meaningful socio-economic impact. - South Africa has approximately 1.1 million hectares of tree plantations that generate significant economic wealth for the companies that own them and create job opportunities for the community members. The industry contributes to the GDP of the country. - The WWF has a good relationship with the civil society organisations which play different roles in the march and research on the international level, the WWF has a climate change team, participates also in negotiations during COP meetings and collaborates with the civil society at the global level. The WWF encourages people to engage in sustainable practices that contribute to the protection of the environment. - The WWF also works with the labour union in South Africa (COSATU) which is deeply committed to promoting sustainable energy production. COSATU is passionate about the issue of climate change because it affects food production and water resources as well as energy production.
3	Cirrus Group South Africa	<p>The Cirrus Group is involved in the identification of projects with the society and in certain government projects. The Cirrus Group works with conservation</p>

		groups or NGOs such as the WWF, Conservation International, and the National Park Board which all participate in the implementation process. Cirrus also has little engagements with commercial plantations.
4	Federation for a Sustainable Environment	The FSE is very much involved with the civil society especially the poor communities and organises workshops for communities affected by mining activities. The FSE engages in advocacy for them.
5	Department of Forestry, Agriculture and Fisheries (National office)	<p>- The first democratic elections in South Africa in 1994 captured the attention of the world. It was a momentous occasion with far-reaching forest policy implications. The new policy direction was laid down in the 1996 White Paper entitled Sustainable Forest Development in South Africa. The White Paper identified three main focus areas (called “streams of Endeavour”), namely to ensure the sustainable management of natural forests and promote the protection of woodlands, to maintain commercial forestry as a major economic activity supplying the timber needs of the country and to use forestry as a vehicle to improve living conditions and relieve poverty. Although community forestry and its associated greening and wood-lot projects were already practiced by 1994, this new policy had a much broader focus on people and poverty alleviation.</p> <p>- Transformation of the old forestry mandate, as set out in the White Paper, required the creation of a new forestry branch with a head office and regional offices. Forest areas are organised in Forest Management Units with estate managers, forest workers and forest guards. A process was initiated to transfer State forests to conservation agencies by delegation or assignment because the newly created Department of Water Affairs and Forestry is designed to have a policy and oversight function rather than a direct management function for forest areas. The government also accelerated privatisation through the leasing of most of the remaining State forests with commercial plantations to forestry enterprises and</p> <p>- A participatory Forest Management Committee in</p>

		<p>the Eastern Cape one of several such committees was established to facilitate cooperation on forest management between the government and rural communities.</p>
6	Earthlife Africa	<ul style="list-style-type: none">- The target audience for Earthlife Africa's education project is composed of school youths community groups and community based organisations as well as individuals who are committed to its concerns. The education is focused on climate change energy. The participants learn about climate change, the impact of climate change especially the impact on their lives, its origin and future, and what can be done to reduce electricity use at home. Earthlife Africa does not demand a radical change from the communities, but it puts pressure on the government to change its policy. Earthlife Africa works also with activists, and some of those trained by Earthlife Africa engage in advocacy by rallying social movements to create awareness of these issues.- Earthlife Africa also offers a service which rallies different groups in the community. The idea of this is to promote a ground-up process as opposed to the top-down approach employed by the government. Earthlife Africa's projects are based in schools, and the organisation collaborates with school working groups with the aim of involving participants in the activities while they are still young in order to build a lasting legacy for Earthlife Africa's climate change projects.- The community that Earthlife targets is composed of women based groups. Thus, the focus is on women. Although many people are involved, the people who drive these projects, who have actually formed a forum and identified the school communities, are women. The ultimate beneficiaries of the project are women who are based in these communities. They are designated as the drivers of the project on the ground. An education officer is appointed to see to the development of projects on the ground, and Earthlife has recently started four projects at the school in

		<p>Quantema called Kanyezi Primary School;</p> <ul style="list-style-type: none"> - Pupils and community members are also enthusiastic about the project. Much of their engagement is volunteer work because the community already knows the benefits it will get after the implementation of the given project. The expectation is that when it is fully developed, coming generations of participants would take the project out of the schools and implement it in the community. That is Earthlife Africa goal because all practices will be based on renewable technologies; - The first step is to expand the project in the community and then consider what the Earthlife Africa and people are doing in terms of ownership of the project. Both parties can start building other technologies that could be useful in climate change mitigation. These are issues that Earthlife can focus on to grow the organisation; - The community and school working groups have also been trained in the use of the biogas digester and stoves, solar panel, and water tanks with the view that they would eventually take ownership of the project and advance it. Earthlife Africa is scheduled to hand over the project to the community after three years of implementation. Getting the community and schools to understand the project and to prepare to take ownership, and helping them to put in place a structure that accommodate all the projects are important aspects of these projects. - The strategy is that when Earthlife Africa completes its term, the community can take over and own the project. From the onset, the people were made to understand that the project belonged to them and not to the NGOs that initiated it. The project is important not only for the South African people, but also for the entire African continent. Implementing the project in Africa can facilitate exchange of ideas and experiences with other peoples.
7	Energy Research Centre (ERC) (University of Cape Town)	<ul style="list-style-type: none"> - The ERC publishes all its research except some confidentiality agreements that the Centre has with Eskom, the Department of Environmental Affairs and

		the government. - The ERC organises seminars and honours external invitations. Seminars are organised when there is research on a specific topic that pertains to community based organisations or community members, the civil society and the business members.
--	--	--

4.11.2 Collaboration between organisations and local associations in climate change mitigation strategies activities

The fight against deforestation and climate change is complex. It is not personal, but a collective fight. Governments coordinate activities to fight against climate change, but to make it possible, they have to involve local people/civil society. The top down approach does not favour local people because they find themselves excluded from all activities of climate change mitigation. The involvement of the civil society from the beginning of each activity has to be encouraged. This contributes to the sustainability of the project as stated by the Earthlife Africa organisation (Table 14). Each organisation has its own ways of involving the civil society. It depends on activities that are being organised.

4.12 Energy sources used in the RSA and potential energy seen by the government and other organisations

4.12.1 Introduction

The present section explains in detail the energy sources used and envisaged in the RSA to mitigate climate change.

Question 4: What are the energy sources used in the RSA and what other energy sources are envisaged by the government and other organisations for mitigating climate change? (Appendix A)

Table 15: Energy Sources Envisaged by Governments or Organisations in the RSA for Mitigating Climate Change

N ^o	Organisations	Energy sources currently used in the RSA and others envisaged by the government and other organisations
1	Department of Environmental Affairs (DEA)	<p>- The only part of energy source that relates to climate change service is biomass. Therefore, the DEA uses this to identify mitigation options of carbon sink including bio digester for the year 2015. Some projects on bio digester, feedstock, and technologies which also attract social benefits are.</p> <p>- The major energy source used in the RSA is coal followed by oil which is mainly imported, and small natural gas followed by renewable energy mainly biomass that is used in rural areas. Coal is major in terms of electricity generation, as almost 94% of the electricity is obtained from coal, 4% from the nuclear energy, and renewable energy is rather minimal. However, with the recent initiative of the renewable energy independent power producer procurement programme, the percentage of renewable energy is increasing. In addition, a nuclear plant that generates about 1 800 MGW is located in the Western Cape. Most of the coal plants are located in Mpumalanga and some parts of Limpopo where the RSA's coal resources are located. Details of the coal reserve can be found in the South African Mineral Resource Report.</p> <p>- South Africa's gas reserves are very few. A facility from which natural gas is drawn is located in the Western Cape as well as a State oil company called PetroSA which is a refinery that generates petrol and oil products. The RSA is also a leader in liquid coal production.</p> <p>- On the energy service provided by the DEA, an Energy White Paper Policy was promulgated in 1998 which outlines the energy plan for the country, as the policy remains the key document that guides the energy sector, and it recognises coal as South Africa's main energy resource. However, the environmental impacts of using coal are huge, and the RSA has to address that</p>

		<p>issue through the diversification of energy. Rather than rely solely on coal, South Africa is now considering other sources of energy including renewable energy sources such as solar energy which has huge potential in the RSA, as well as the potential for wind energy in the coastal areas. The RSA does not have much potential for hydropower.</p> <ul style="list-style-type: none">- Therefore, in terms of the renewable energy policy which issued a target of 10 000 GW by 2015, the proposal was made in the Integrated Resource Plan of 2010. The IRP 2010 is an electricity plan for the country which outlines what the country needs to project. It is not an energy sector document but an electricity plan.- South Africa has an Integrated Resource Plan for Electricity 2010-2030 (IRP). The current iteration of the IRP for South Africa, initiated by the Department of Energy (DoE) after a first round of public participation in June 2010, led to the Revised Balanced Scenario (RBS) that was published in October 2010. It laid out the proposed generation of a newly built fleet for South Africa for the period of 2010-2030. This scenario was derived based on the cost-optimal solution for building new options (considering the direct costs of building new power plants), which was then “balanced” in accordance with the qualitative measures such as local job creation. In addition to all existing and committed power plants, the RBS included a nuclear fleet of 9.6 GW; 6.3 GW of coal; 11.4 GW of renewable; and 11.0 GW of other generation sources.- A second round of public participation was conducted in November-December 2010, which led to several changes to the IRP model assumptions.
2	Department of Energy (DoE)	<ul style="list-style-type: none">- South Africa has a high level of renewable energy potential and presently has in place a target of 10 000 GWh of renewable energy. The Minister has determined that 3 725 megawatts (MW) to be generated from renewable energy sources is required to ensure continued uninterrupted supply of electricity. The 3 725 MW is broadly in accordance with the capacity allocated to renewable energy generation in

	<p>IRP 2010-2030.</p> <ul style="list-style-type: none">- The IPP Procurement Programme has been designed to contribute to the target of 3 725 megawatts and to socio-economic and environmentally sustainable growth, which would initiate and stimulate the renewable energy industry in South Africa;- The following are considered qualifying technologies for selection under the IPP Procurement Programme: Onshore wind (1850 MW), concentrated solar thermal (200 MW), solar photovoltaic (1450 MW), biomass (12.5MW), biogas (12.5 MW), landfill gas (25 MW), small hydro (75 MW), and small projects (100 MW).- In the IPP Procurement Programme, the Bidders will be required to bid on tariff and the identified socio-economic development objectives of the Department. The tariff will be payable by the Buyer pursuant to the PPA to be entered into between the Buyer and the Project Company of a Preferred Bidder.- The generation capacity allocated to each technology is in accordance with the adjacent table and the maximum tariff that a Bidder may bid for purposes of the IPP Procurement Programme is as set out in the RFP.- Based on the principles of the IPP Procurement Programme, the Department plans to introduce a separate Small Projects IPP Procurement Programme for electricity generation projects of less than 5 MW.- Prior to accessing the RFP, each prospective Bidder shall be required to pay a non-refundable fee of R15 000 (fifteen thousand Rand) per Bidder, and to complete the registration form. Payment of the documentation fee shall be made without set off or deduction.- Regarding the issue of gas, the current development of regional gas-fields will lead to natural gas becoming a more important fuel in South Africa. With the availability of natural gas in neighbouring countries such as Mozambique and Namibia, and the discovery of offshore gas reserve in South Africa, the gas industry in South Africa is undergoing rapid expansion. In addition to coal gas and Liquid Petroleum Gas (LPG), South Africa produced about 930 000 tons of
--	--

		<p>natural gas and 104 860 tons of associated condensate in 2003. The entire gas and condensate output is dedicated to PetroSA's liquid-fuel synthesis plant, and accounts for about 1.5% of total primary energy supply.</p> <ul style="list-style-type: none">- Gas manufactured from coal accounted for 5% of net energy consumption, while LPG accounted for about 6%. Natural gas and coal play separate roles in the energy system, with natural gas being used solely as a feedstock for the production of synthetic fuels, and coal gas as an industrial and domestic fuel.- Furthermore, South Africa supplies two-thirds of Africa's electricity and is one of the four cheapest electricity producers in the world. Almost 90% of South Africa's electricity is generated in coal-fired power stations. Koeberg, a large nuclear station near Cape Town, provides about 5% of the capacity. A further 5% is generated through hydroelectric and pumped storage schemes. South Africa has few, if any, new economic hydro sites that could be developed to deliver significant amounts of power.- Electricity generation is dominated by Eskom, the national wholly state-owned utility, which also owns and operates the national electricity grid. Eskom supplies about 95% of South Africa's electricity. In global terms, the utility is among the top seven in generating capacity, among the top nine in terms of sales, and has one of the world's biggest dry-cooled power stations, the Matimba Power Station.- Eskom was converted into a public company on 1 July 2002. It is financed by net financial market liabilities and assets as well as reserves. While Eskom does not have exclusive generation rights, it has a practical monopoly on bulk electricity. It also operates the integrated national high-voltage transmission system and supplies electricity directly to large consumers such as mines, mineral beneficiaries and other large industries.- In addition, it supplies electricity directly to commercial farmers and, through the Integrated
--	--	--

		<p>National Electrification Programme (INEP), to a large number of residential consumers. It sells in bulk to municipalities, which distribute to consumers within their boundaries. Access to electricity in 1994 was at 34%, but since 1994, INEP makes it possible to electrify 5.977 million households which resemble 88% access to electrification nationwide.</p> <ul style="list-style-type: none">- Between January 2003 and January 2004, South Africa increased its electricity output by 7.1%, with a peak demand of 34 195 MW on 13 July 2004, compared to the 31 928 MW peak in 2003. Of the new capacity to be built, Eskom will target about 70% (in MW), with the balance coming from independent power procurement programme (IPPs).- Due to a sharp increase in the demand for electricity, the Eskom Board of Directors took a final decision in 2003 to restore services in the three power stations namely Camden in Ermelo, Grootvlei in Balfour and Komati between Middelburg and Bethal which were mothballed in the late 1980s and early 1990s. Unit 6 at Camden Power Station was then identified as the first unit to be commissioned. Two other units were commissioned in 2006, three units in 2007, and the last of the eight units in 2008.- Again, South Africa's indigenous energy resource base is dominated by coal. Globally, coal is the most widely used primary fuel, accounting for about 36% of the total fuel consumption of the world's electricity production. About 77% of South Africa's primary energy needs are met by coal energy. This is unlikely to change significantly in the next two decades owing to the relative lack of suitable alternatives to coal as an energy source. Most of the deposits can be exploited at extremely favourable costs and, as a result, a large coal-mining industry has developed.- In addition to the extensive use of coal in the domestic economy, about 28% of South Africa's production is exported, mainly through the Richards Bay Coal Terminal, making South Africa the fourth largest coal exporting country in the world;
--	--	---

		<ul style="list-style-type: none">- South Africa's coal is obtained from collieries that range from among the largest in the world to small-scale producers. Due to new entrants, operating collieries increased to 64 in 2004. Of these, a relatively small number of large-scale producers supply coal primarily to electricity and synthetic fuel producers.- About 51% of South African coal mining is done underground and about 49% is produced with open-cast methods. The coal-mining industry is highly concentrated with five companies accounting for 85% of saleable coal production.- Production is concentrated in large mines, with 11 mines accounting for 70% of the output. South African coal for local electricity production is among the cheapest in the world. The beneficiation of coal, particularly for export, results in more than 65 Mt of coal discards being produced every year.- About 21% of the run-of-mine coal produced is exported, and 21% is used locally (excluding power-station coal). The rest is not saleable and is discarded.- The remainder of South Africa's coal production feeds the various local industries; 62% is used for electricity generation, 23% for petrochemical industries (Sasol), 8% for general industry, 4% for the metallurgical industry (Mittal), and 4% is purchased by merchants and sold locally or exported.- By international standards, South Africa's coal deposits are relatively shallow with thick seams, which make them easier and, usually, cheaper to mine. At the present production rate, there should be more than 50 years of coal supply left.- The White Paper on Renewable Energy (2003) has set a target of 10 000 GWh of energy to be produced from renewable energy sources (mainly from biomass, wind, solar and small-scale hydro) by 2013.- Following Cabinet's approval of the White Paper, the Department of Energy proceeded with the development of its renewable energy strategy. The implementation plan of the various technologies was identified in a macroeconomic study undertaken in 2003.- The White Paper's target of 10 000 GWh renewable energy contribution to final energy consumption by
--	--	---

		<p>2013 was confirmed to be economically viable with subsidies and carbon financing. Achieving the target will:</p> <ul style="list-style-type: none">• Add about 1.667 MW new renewable energy capacity, with a net impact on GDP as high as R1.071 billion a year;• Create additional government revenue of R299 million;• Stimulate additional income that will flow to low-income households by as much as R128 million, creating just over 20 000 new jobs; and• Contribute to water savings of 16.5 million kiloliters, which translates into a R26.6 million saving; <p>- Renewable energy sources, other than biomass (the energy from plants and plant-derived materials), have not yet been exploited optimally in South Africa. The DoE has strengthened international relationships in this area via partnerships established during the World Summit on Sustainable Development (WSSD) in 2002.</p> <p>- Such partnerships will overcome market barriers and promote widespread use of sustainable energy solutions. These include the Global Village Energy Partnership and the Renewable Energy and Energy Efficiency Partnership.</p> <p>- The 2003 study also highlighted the technologies to be implemented first, based on the level of commercialisation of the technology and natural resource availability.</p> <p>- These technologies include:</p> <ul style="list-style-type: none">• Sugarcane bagasse (the fibre that comes from crushing the sugarcane) for cogeneration;• Landfill gas extraction;• Mini-hydroelectric schemes;• Commercial and domestic solar water heaters. <p>- These technologies were to be deployed in the first phase of the target period, from 2005 to 2007. The</p>
--	--	--

		<p>Department has introduced nominal, once-off capital subsidies to assist project developers in implementing economically sound projects that are readily financed by financial institutions.</p> <ul style="list-style-type: none">- The vision of the Department of Energy (DoE) is to make adequate and affordable energy available to developing communities through a mix of providing alternative energy resources at a reasonable cost. The aim is to satisfy the basic needs of the developing sector and at the same time promote the effective utilisation of South Africa's vast alternative energy sources.- Regarding nuclear energy, the mandate of the Department of Energy is to administer all matters related to nuclear energy as required by legislation and international agreements. These can be divided into three key activities namely Nuclear Safety, Nuclear Technology, and Nuclear Non-Proliferation.- Nuclear energy, technology and safety policies facilitate the integration of the nuclear sector in various facets of South African society. These policies position the South African industry to be world-class leaders in various fields of nuclear expertise.- The nuclear sector in South Africa is based mainly on the Nuclear Energy Act 1999, Act 46, of 1999 and the National Radioactive Waste Disposal Institute Act, Act 53, of 2008. The National Nuclear Regulator (NNR) Act, Act 47, of 1999. These Acts are administered by the Department of Energy.- On 23 June 2009, the Minister of Energy in her budget vote speech stated that, “The Department will ensure that one million solar water heaters (SWHs) are installed in households and commercial buildings over a period of five years.” This bold executive statement is clearly indicative of the South African government’s steadfastness to pursue an energy mix that includes clean and renewable energy resources.- The government’s solar water heating (SWH) programme which is currently underway is managed by Eskom – the “SWH Rebate Programme”. All
--	--	--

		<p>information (requirements for participation) related to this programme is obtainable from www.eskomidm.co.za. Further, a <i>fiscus</i> funded SWH programme through a Department of Revenue Services (DoRA) allocation is currently rolled out in various municipalities (City of Tshwane, Sol Plaatje and Naledi). The private sector is also not turning a blind eye on the government's resolve to create a robust and self-supporting SWH industry. In this regard, certain commercial banks, insurance companies, and benevolent donors are driving various SWH initiatives in different parts of the country. However, the key immediate barrier to increased uptake is high upfront-capital cost of systems coupled with limited funding currently available. Recognising this hindrance, the Minister during her 2015 budget vote speech announced a Standard Offer incentive scheme that will fund all Energy Efficiency and Demand Side Management (EEDSM) interventions. This scheme is aimed at creating an expanded opportunity for attracting the much-needed sustainable financial stimulus into the programme. SWH is amongst the allowable technologies.</p> <ul style="list-style-type: none">- Through engagements with Eskom, the National Energy Regulator of South Africa (NERSA) and the Department of Energy (DoE) is fine-tuning a funding model to ensure that this tariff-funded scheme is actualised. This will enable leveraging other funding sources from local and international financiers. To ensure a smooth transition into the new incentive scheme, a phase-in approach for the integration of the standard offer and rebate programmes will be adopted. This approach and the timelines for its implementation are being developed by Eskom, DoE and NERSA.- The Integrated Resource Plan (IRP) 2010-2030 was promulgated in March 2011. It was indicated at the time that the IRP should be a "living plan" which would be revised by the Department of Energy (DoE) every two years i.e. an update was required in 2013. Since the promulgation of the Integrated Resource Plan
--	--	--

	<p>(IRP) 2010-2030, there have been a number of developments in the energy sector in South (ern) Africa. In addition, the electricity demand outlook has changed markedly from that expected in 2010.</p> <ul style="list-style-type: none">- Energy is one of the key elements in production processes. The lack or shortage of energy has a serious effect on the economy and gross domestic growth. By virtue of its size and economic importance, the energy sector periodically requires considerable investments in new and replacement supply capacity. Historically, such decisions were primarily driven by concerns regarding maintaining supply security, without giving considering fully the economic, environmental and social impacts of all alternatives. As a consequence, the tendency has been towards the construction of large-scale capital-intensive supply facilities and the neglect of alternatives that might have been more cost effective in the long term, and had greater employment benefits and more favourable environmental impacts.- In recent years, the contribution of different sectors to the country's Gross Domestic Product has changed significantly. In the last two years, the industrial policy has shifted towards a greater focus on knowledge-intensive sectors and human resource development, placing less emphasis on comparative advantage based on natural endowments. Primary production such as agriculture and mining now contribute less to the economy than the tertiary or services sector. The tertiary sector contributes almost two-thirds of the gross domestic product. This implies a lowering of overall energy intensity, as the energy required per unit product (measured in Rand) is less for the tertiary sector compared with the primary sector. The shift is similar to what has occurred in most industrialised nations. This does not mean that agriculture and mining are unimportant, but that the energy sector may re-focus efforts on how to exploit South Africa's endowments further. Such re-focusing may be based on integrated energy planning.- The Kyoto Protocol to the United Nations Framework
--	--

		<p>Convention on Climate Change aims to curb air pollution which is said to contribute to global warming. It came into force on 16 February 2005, seven years after it was signed. The accord requires countries to cut emissions of carbon dioxide and other greenhouse gases. About 141 countries, accounting for 55% of greenhouse gas emissions, have ratified the treaty which pledges to cut these emissions by 5.2% by 2012.</p> <ul style="list-style-type: none"> - A regulation under Section 25 of the National Environmental Management Act establishing the Designated National Authority (DNA) was gazetted on 24 December 2004 by Martinus van Schalkwyk, the Minister of the Department of Environmental Affairs and Tourism. The regulation established the DNA within the Department of Minerals and Energy and provides the DNA with its legal mandate to oversee the Clean Development Mechanism (CDM) in South Africa; - The CDM was established in December 1997 by the Third Conference of Parties to the United Nations Framework Convention on Climate Change (UNFCCC). The CDM allows industrialised countries with emission-reduction commitments to meet part of their commitments by investing in projects in developing countries that reduce greenhouse-gas emissions while contributing to the local sustainable development needs of the host country. To facilitate CDM projects, host countries need to designate national authorities to evaluate and approve the operation of CDM projects in their country. - South Africa has established a Designated National Authority to fulfil this function as well as other functions related to the successful implementation of the CDM in South Africa including the promotion of investment in CDM projects.
3	Sunfire solutions	<ul style="list-style-type: none"> - The SunFire solution company distributes solar cookers to the people of South Africa. These solar cookers are parabolic as they capture heat from the sun to boil water in the pot. The solar cooker can function for five to 10 years. It does not need fuel or gas and

		<p>uses no cable. It only requires exposure to the sun. However, some local people believe that the supplier of the cookers is operating with witchcraft because of the absence of cables on the cookers.</p> <ul style="list-style-type: none"> - With the big parabola, the pot is boiled and can quickly be used to cook eggs. The solar cookers are designed to protect the environment by decreasing the emission of GHGs in the atmosphere. Solar cookers have been on the market for more than 12 years. Unfortunately, most of the people refuse to use them because of the association with witchcraft – as the cookers use neither cable nor fuel. The company has sold almost 1 000 solar cookers mostly in Zambia, Botswana and Zimbabwe. The company is now making solar light. Solar cookers which use free energy have a 10-year lifespan and cost about ZAR 2 000. - Sun glasses are used when handling the solar cookers. South African improved cook stoves that use charcoal or wood are also available in the company.
4	WWF South Africa	<ul style="list-style-type: none"> - The key issue in South Africa is not deforestation but the production of electricity from coal which contributes to climate change due to high pollution; - Coal is the primary energy resource in South Africa and is the major source of electricity generation. However coal is also converted to liquid (Sasol), and is used as fuel; - Another energy resource is oil, which is generally imported; diesel and gas are obtained from Mozambique; - The primary source of electricity is bio fuel coal with a small production of nuclear energy in Cape Town. However, South Africa has made much progress in the area of renewable energy in the last five years; - As a government policy, South Africa’s Integrated Energy Plan (IEP) considers the whole energy plan of the country. IEP is the broader umbrella under which the IRP (Integrated Resource Plan) operates. - South Africa has few strategies for tackling issues of bio-fuel, gas, coal, etc. - The WWF South Africa recommends that the country

	<p>should consider changing its method of generating electricity. This is because the burning of coal to generate electricity makes the RSA the biggest polluter in Africa. Besides the climate change implications, there are also serious problems with people living around the coal power stations. Therefore, the WWF tries to influence policies and push for cleaner energy sources which include renewable energy and to work with civil society organisations especially research institutions.</p> <ul style="list-style-type: none">- WWF South Africa also tries to develop raw evidence-based research that can influence policy. It tries to locate all these renewable energy potential to determine what is feasible based on the policy;- The vision of the WWF is that households would be able to generate their own energy because it has no extensive plan that would cover the whole country. The generation can begin by a community, households, a town such as Johannesburg and this will evolve with time. Therefore, it is important to establish massive power plants that generate electricity for every one because the problems faced by Eskom in South Africa is affecting the whole country;- The government is considering 9600 MGW of nuclear energy which is regarded as green because it does not emit carbon dioxide to the atmosphere. However, the WWF thinks that nuclear energy may not be the right solution for the country because its production could have other negative impacts on the people besides that it also requires huge capital and a higher budget;- The WWF in South Africa does not engage in the project on the improved cook stoves but it does policy works.- South Africa is an importing Country of Electricity from Mozambique but it would be helpful to work on sustainable energy at the SADC level. Discussions between the RSA and the DRC have been prolonged because of various challenges. Other problems are probably related to the countries through which the power will pass.
--	---

5	Earthlife Africa	<ul style="list-style-type: none">- Coal is the number one source of energy in South Africa. Therefore, Earthlife Africa argues that no new coal power station is needed because South Africa already has enough coal. Earthlife Africa envisages wind and solar as alternative energy sources. Earthlife Africa is not an implementation office; it works on policy and education, and follows the energy process of the government, comments on, and educates people on and try to put inputs in the government process;- Earthlife Africa is involved in what is called sustainable energy and livelihood project;- Earthlife Africa also runs a project called SOP in which it is working with four schools in the Gauteng region. The project focuses on four aspects of renewable energy namely solar power, use of biogas digesters to turn waste into fertiliser and gas that can be used in schools, and alternatives to electricity and other gases for cooking. Earthlife Africa also promotes the use of rainwater tanks to collect and store water which can be used to irrigate the food gardens. Earthlife has identified these four aspects and the communities have expressed their interest in getting this project on ground.- What Earthlife Africa has done is to install energy solar panels on the school's administration buildings to supplement the electricity usage. Thus, the idea is to reduce the municipal Eskom grid electricity by using solar panels. Next to the administration building, the project has also planted a large food garden with a biogas digester, where all the school's waste is processed. Waste is not thrown away to the rubbish dump but is put in the biogas digester which turns it to gas. A pipe is then used to convey the biogas to the kitchen where a stove also uses the gas from the biogester to cook. This project takes place in a community of about 400 people;- Thus, these people use gas from waste instead of gas from the lake or from fuel. However, the biogas digester also liquefies all the waste, and instead of having manure or compost, this liquid is used as fertiliser in the garden;- These activities will be replicated in other schools.
---	------------------	---

		<p>Earthlife Africa in collaboration with the community has already identified 90 schools in the Soweto, and Motswapele Primary School is pegged for the pilot project. Some of these projects would include the installation of solar panels and the biogas digester;</p> <ul style="list-style-type: none"> - With all these initiatives, Earthlife Africa is determined to prove that renewable energy can be used to bring down the cost of electricity to these schools. Ultimately, Earthlife Africa can demonstrate to the government and other organisations that renewable energy can be a reality and a valuable alternative to coal energy. - Presently, Earthlife focuses on solar energy rather than wind or other forms of energy.
6	Energy Research Centre (ERC) of the Cape Town University	<ul style="list-style-type: none"> - South Africa uses electricity mostly generated from coal, some renewable energy, some nuclear and a little bit of gas. However, coal is the main energy source (about 78%) in addition to other alternative technologies; - The Renewable Energy Independent Power Producer Procurement Programme (RIPPPP) that took off in 2011 is also making significant contributions in terms of renewable energy with some additional Kilowatts that have been assigned to it. Thus, there is much room for the expansion of this programme which basically targets huge power stations with the capacity of at least 5 Megawatts. - For mitigation, the renewable energy is the best approach besides the option of nuclear energy. At present, South Africa has only one nuclear power plant, that is, in Cape Town (Koeberg). Now the government is aiming to procure more nuclear energy even though the ERC does not think that it is a good idea for mitigation because of the expensive cost. Moreover, renewable energy gives much better coverage and it is easier to combine with coal.
7	Cirrus Group	<p>The Cirrus Group focuses on biomass energy from sugarcane, otherwise known as biogas digesters.</p>

4.12.2 Energy Use in RSA from a Climate Change Perspective

The RSA is unique in its lack of potential in hydropower. Hence, its major source of energy is composed of coal at 78% (Table 15). However, the situation does not stop the RSA from considering renewable energy potential that exists in the country, because the use of coal in energy generation contributes to high pollution in South Africa. Many renewable energy sources are envisaged in the RSA such as wind energy, solar energy, gas, biofuel and others, in line with the use of different technologies such as sugarcane bagasse, landfill gas extraction, mini-hydroelectric schemes, and commercial and domestic solar water heaters to cut emissions of greenhouse gases. The energy efficiency is also a strategy that contributes to climate change mitigation in the energy sector. Discussions between the RSA and the DRC on getting hydropower from the Inga III have been prolonged because of several challenges. However, according to the United Nations Okapi Radio, the DRC president recently issued, on 13 October 2015, an edict establishing the agency for the promotion, development and implementation of the great Inga project between the DRC and the RSA. This might help the RSA to cut its emissions from the energy sector significantly. Hence, the two countries should adopt more strategies to facilitate the implementation of this huge project. The RSA is also considering nuclear energy to cut emissions. However, before nuclear energy is adopted, it is important to note that uranium exploitation affects the environment and human beings negatively. Scientists should continue discussion on whether or not nuclear energy is renewable. The energy sources used and envisaged by the RSA are given in details in the following sections.

4.12.2.1 Department of Environmental Affairs (Number 1 in Table 15)

The IRP by the Department of Environmental Affairs is based on the resources needed by the RSA, and it states the capacity that a plant should be. Thus, the IRP shows the plan as well as what the country is committed to achieving. However, the benefit and importance of the IRP lie in the fact that it is a critical document in terms of renewable energy. Certain electricity policies also empower the Minister of Energy to determine how to meet the energy demands. The IRP therefore spells out what the demands are and how to obtain funds to meet them. The energy policy gives the Minister of Energy the mandate to express himself through what is called the Minister's determination.

However, the department has to work hand-in-hand with the RSA's national energy regulator. In terms of the mitigation policies under what is called the renewable energy independent power procurement producers' programme, the Minister has made some announcements through the determination which is simply a document which spells out the capacities of plants that are needed and the resource that would be used.

The Minister has announced the establishment of two pie plants using the gas-generated plant. It is a way to convert crude oil to an energy resource and they are regarded as plants in the sense that they augment the output from coal and from independent power producers. In terms of renewable energy space, and what he has to pronounce saying that this is the allocation is based on various resources which are from the solar PV, wind, biomass, waste, and little hydropower because the RSA does not have the capacity for huge hydro plants.

The Minister also announced the volume of imports the RSA will require. The capacities that were pronounced by the allocation or the determination was about 1450 MGW from solar PV, 200 MGW from CSP, 1850 MGW from wind, 12.5 MGW from biogas which is the same from biomass, 25 MGW landfills, and 25 MGW from hydropower. The department sends out a request to bidders, and when they meet the criteria included the price element, the result is that over the years the cost of renewable energy has dropped drastically. It means that the tariff that was used for Window 1 is different from what was obtained from the Window 2 since the price has been dropping. The Minister has announced the success to the bidders and some of these renewable energy plants have started generating power. This has contributed to the generation of renewable energies. The Minister has again announced that the government has considered expanding the programme. A new determination for the renewable energy programme will be done, but the renewable energy sector is expected to grow with time.

The government has also taken certain steps to develop wind energy and expand its potential. One of such steps is the establishment of the South African Wind Energy Programme which is funded by the Global Water Facility. The programme tries to provide support for wind energy developers through some feasibility studies for example on wind hangers which detects where the wind is awake and located for power generation. Another government initiative is the building of the solar room in what is called solar park corridor, which operates in the hottest parts of the RSA especially in the Western Cape.

The Wind Energy programme is a government initiative, and it tries to facilitate the development of renewable energy in the country. The government is also considering other resources especially bio fuel which could be used to offset the use of oil. Little research has been conducted in this field except what is called bio fuel strategy which was promulgated in 2007 and seeks to achieve 2% penetration rate of bio fuel into the national liquid supply space. The strategy has achieved so much success even though initially there was a problem with selecting the crops, as the government did not want the strategy to affect the stock of food. The government therefore approved four crops namely sugarcane, sugar beet, sun flour oil and canola, and limited production to those four sources.

The Energy Efficiency Strategy was endorsed in 2005, and it is supposed to produce an overall 12% reduction in electricity consumption. What it does is to set different targets for different sectors. It has a target of 15% for industry and commercial, and a different target for residential areas, about 10 which is not much in terms of improving efficiency plant generation. Thus, all those targets were set for the period of 2007 to 2015. At present, the DEA especially the energy service unit has started working on the revised energy efficiency target for all of the identified sectors. There were a number of challenges because the deadline was not fixed, and it was difficult for the government to carry out the monitoring. The DEA has recently come up with a monitoring report which is now being used for the data consumption, which means that other experts will verify whether the efficiency is improving.

Some of the key mitigation programmes that are under control in the RSA are increase in adaptation, selling water and working on energy. With these mitigation programmes, the government should consider how to use energy from water. Another key reflection programme to identify in terms of climate change mitigation activities is the Renewable Energy Flagship Programme. The programme is inclusive of a scaled-up renewable energy programme, based on the current programme specified in IRP 2010 and using, for example, the evolving South African Renewables Initiative led by the Department of Public Enterprise and the Department of Trade and Industry (DTI), as a driver for the deployment of renewable energy technologies. The programme will be informed by enhanced domestic manufacturing potential and the implementation of energy efficiency and renewable energy plans by local governments. Furthermore, the Department of Energy's solar water heating programme will be expanded

through, amongst others, the promotion of the domestic supply of products for solar heating with support from the DTI to build local manufacturing capacity.

As part of the Energy Efficiency and Energy Demand Management Flagship Programme, the DoE will continue to develop and facilitate an aggressive energy efficiency programme in industry, building on the experience of Eskom's Demand Side Management programme and the DTI's National Cleaner Production Centre, and covering non-electricity energy efficiency as well. A structured programme will be established with appropriate initiatives, incentives and regulation, and a well-resourced information collection and dissemination process.

A residential energy efficiency programme will also be included in two parts:

- The development of appropriate initiatives, incentives and regulations will be finalised by the DoE and the DTI. Furthermore, the development of energy specifications for low-income housing will be determined through the National Sustainable Settlements Facility under the Department of Human Settlements.
- Regulation of commercial and residential building standards to enforce green building construction practices. The National Registration Council will ensure that building construction and operations conform to green building requirements including measures such as controlled ventilation, using recycled material, solar power, etc.

A government building energy efficiency programme managed by the Department of Public Works that initiates energy and emission audits of all government buildings and facilities will be developed. It will develop comparable indicators and benchmarks, and make appropriate interventions. The programme will include major programmes for key government buildings including Parliament and the main government buildings in Pretoria. Ambitious goals for energy efficiency will be set for all new government buildings.

Under the Department of Environmental Affairs, the Waste Management Flagship Programme will establish the GHG mitigation potential of the waste management sector including, but not limited to, investigating waste-to-energy opportunities available within the solid, semi-solid- and liquid-waste management sectors, especially the generation, capture, conversion and/ or use of methane emissions. This information will be used to develop and implement a detailed Waste-Related GHG Emission Mitigation Action Plan aimed at measurable GHG reductions aligned with any sectoral carbon budgets that may be set. This Action Plan will also detail the

development and implementation of any policy, legislation and/or regulations required to facilitate the implementation of the plan.

In addition, the Carbon Capture and Sequestration Flagship Programme which is championed by the DoE in partnership with the South African Energy Research Institute includes, among other initiatives, the development of a Carbon Capture and Sequestration Demonstration Plant to store the process emissions from an existing high carbon emission facility.

South Africa currently imports hydropower from Mozambique and it has for a long time tried to get hydropower from the DRC with little success. The RSA engages in import as well as export. When the RSA has supplies, it shares with Botswana and Lesotho. Projects on improved cook stoves are ongoing in South Africa and they are not run by the government but by NGOs. The challenge with the NGOs is that many of them are funded by donors, and when the donors leave, the projects collapse.

Nonetheless, the solar cook stove programmes have been successful and many are run by NGOs. The government does not have a programme on solar cookers but on solar water heating about which the Minister has announced that the RSA needs to roll out 1 000 000 router heating by 2016. The programme is also supported by the fiscal of the Department of Energy, as well as municipal governments but the process of meeting the target number is slow.

4.12.2.2 Earthlife Africa (Number 5 in Table 15)

Regarding the role of Earthlife Africa in the promotion of the renewable energy, it got something more practical that shows the government and organisations what should be focused on. Earthlife Africa is considering schools in the Gauteng Province, but it also collaborates with another organisation called Gender CC in Africa on four projects in the Western Cape and Limpopo Province. Earthlife Africa receives some funds from the African Union through Oxfam, and its managers donate USD10 a year to provide items such as tanks for rainwater, biogas digester and solar panels.

4.13 Application of remote sensing in the RSA

Question 5: Does your organisation use remote sensing? If yes, what are its advantages and disadvantages, and what issues relate to the use of this tool? (Appendix A)

Table 16: Advantages and Disadvantages of Remote Sensing in the RSA

N ^o	Organisations	Advantages and disadvantages of remote sensing
1	Department of Environmental Affairs (National Office)	<p>- In respect of carbon sinks assessment, the DEA uses strategic sampling, data set and remote sensing to obtain data via technology. The reason is that if the DEA plans to carry out a physical sampling, it requires high quality and capacities in terms of human resources. This means that the DEA officials would need more time, resources and capacities, and ensure that quality is guaranteed. Remote sensing is less expensive and takes less time when employed by experts. However, the disadvantage is that the accuracy is always questionable and can result in confusion if the vegetation is not well identified. Hence, it requires fieldwork for confirmation. If the sampling is done with remote sensing, accuracy can increase for example in the area of national inventory. The saving in time and cost are benefits of remote sensing, but accuracy is the most important thing when field data is used. The idea is to combine the physical sampling and remote sensing sampling in order to obtain accurate results. The South African Space agency offers certain products and services including national surveillance and images. However, when images are bought, they are rather expensive. Thus, the various departments ought to operate a Geographical Information section, but this could be expensive.</p> <p>- Some people are trained in the field of GI and remote sensing in the department of forestry, but there are also capacities issues when it comes to the use of the GIS. A private company also works for the Government and the DEA called GTI (Geo Terra Image).</p> <p>- On the government's level skills in remote sensing, the capacity is under-resourced and this is a serious problem. Even though some people are trained in Geographical Information, it does not mean that they have adequate skills and experiences. The WWF runs the TCA (terrestrial carbon accounting) in the RSA, but at present, it might not have the funds to do so. Actually, South Africa has two projects on biochar and a project on developing standards and methodologies for carbon offset projects. Therefore, the DEA can develop domestic standards and link them to the international standards, which may also be related to the idea of carbon tax. Tony Knowles from the Cirrus Group South Africa worked on the issue.</p>

2	WWF South Africa	The WWF South Africa uses remote sensing for its wetland operations. Advantages include obviously the ability to get a good contextual picture over a large area, but the resolution is extremely coarse.
3	Cirrus Group South Africa	Remote sensing is used for particular projects as in the national carbon sink assessment; land sat images are also obtained free of charge from the University of Maryland, but the Cirrus group does not have a space agency.

The RSA uses remote sensing and has a spatial agency. The main issue is the availability of human resources specialists in the field. The RSA government needs to train more people in this area. On the practical level, remote sensing data have to be combined with field data to obtain an accurate data on the different drivers of deforestation. The RSA is more accustomed to terrestrial carbon assessment, and for that reason, the rate of deforestation in South Africa is not also known. Remote sensing is important and the RSA government should promote it by training more people.

CHAPTER FIVE: DISCUSSION OF FINDINGS

5.1 Introduction

In this chapter, the findings from the interviews and focus group discussions are brought into conversation with results obtained by previous researchers on related topics. The present chapter is composed of the following sections:

- a) The biographical information of respondents;
- b) The results from the Democratic Republic of Congo;
- c) The results from the Republic of South Africa;
- d) Similarities and differences between South Africa and the Democratic Republic of the Congo in terms of climate change mitigation in the forestry and energy sectors;
- e) Strengths and weaknesses of climate change mitigation strategies in both South Africa and the DRC;
- f) A design for sustainable mitigation in the forestry and energy sectors of the DRC and the RSA.

5.2 Biographical Information of Respondents from Both South Africa and the DRC

In this section, the results related to the biographical information of respondents are examined. The biographical elements are based on the gender of the key informants and participants in the focus group discussions.

In respect of the quantitative study, 83.9% of key informants are male and 16.1% female. A significant difference is observed therefore in the proportion of male and female key informants. Given that all key informants are representatives of or experts in a given organisation, the reason for this disproportionate gender distribution could be, based on the present research sample, that most of the institutions in the forestry and energy sectors are headed by men, while women are supposed to be at the centre of environmental protection.

In the focus group discussions in the DRC, 65.9% male and 34.1% female respondents participated. The proportion of women is again less than the proportion of men. Focus groups were composed mainly of associations that work with NGOs on environmental protection

especially the REDD+ pilot projects. It is also possible that women are underrepresented in associations that collaborate with NGOs on environmental protection because women are inadequately informed about environmental issues.

5.3 Findings from the DRC

The overall findings from the DRC are considered in what follows.

5.3.1 Different strategies or measures adopted to fight drivers of deforestation in the DRC

It was found that in the DRC, strategies adopted to fight drivers of deforestation such as the evaluation of different causes of deforestation, launching of individual and community tree planting programmes, distribution of seeds to plant trees, and public awareness of the need to fight deforestation, even in secondary schools and universities. Other strategies include the creation of tree plantations to supply firewood and building materials in order to forestall illegal logging, environmental education on the local level through the media about sustainable management of ecosystems and the environment, sustainable development, publishing pamphlets to publicise the negative impacts of deforestation, and using image boxes to explain graphically the threat against the environment. Competitions especially in primary schools during the International Day of the Environment, promotion of renewable energy and improved cook stoves, implementation of six REDD+ pilot projects with different alternative activities, curtailing bushfire which is also an important driver of deforestation, the coalition of organisations to influence decisions at the international level on reducing GHG emissions are included in the strategies. Additionally, the DRC's efforts include encouraging people to farm in degraded zones such as swamps or marshland which are unsuitable for forestry, practicing agro forestry and sustainable agriculture, organising anti-emission campaigns on local media, introducing reforestation approach to regenerate the forest especially in degraded areas, establishing nurseries, and collaboration between different authorities, communities and organisations that work on environmental protection. Lastly, projects employ park guards, engage in capacity building of community-based organisations and indigenous people in planning conservation projects and land planning, conflict resolution initiatives, workshops and wood energy projects,

penalise according to the law those who degrade the forest, initiate the NAMA, LEDS and green growth projects, and promote the electrification of villages around parks or protected areas.

The data analysis showed that strategies for fighting deforestation are rather complex and require the involvement of all stakeholders. The uniqueness of the DRC is the focus on the REDD+ pilot projects which would contribute to the fulfilment of the National Frame Strategy. The six pilot projects are making progress but not at the same pace. Lack of or inadequate funding remains the main hindrance to the progress of the projects. Therefore, it is difficult to conclude that a National Frame Strategy is already in place in the DRC until the completion and evaluation of the six REDD+ pilot projects which are experimental activities against drivers of deforestation.

Apart from the six REDD+ pilot projects, a number of NGOs also contribute their expertise to fight deforestation. These include the WWF which is implementing two REDD+ projects namely the Eco-Makala+ in the North Kivu Province, and the Luki project in the Bas Congo Province. The Wildlife Conservation Society (WCS) also manages the Mambasa REDD+ forestry project while OCEAN runs the Isangi REDD+ project. The only private REDD+ pilot project in South Kwamouth is managed by the NGO called NOVACEL. These show that most of the expertise in combating deforestation comes from NGOs. In the DRC, NAMA and LEDS seem to be new as their implementation is not yet a reality as noted in the analysis of the findings. All the strategies are suitable for combating deforestation but the major challenge is the issue of management. Ochejo (2003) explains that combating deforestation requires factual data about what is going on in our forests. However, such data is not readily available. It is difficult to have accurate information on drivers of deforestation in a country where good governance is absent. Good governance is crucial to the success of all these strategies which require impartial application of the law and proper monitoring of the forest. The above strategies can be effective if there is already consensus on what constitute the drivers of deforestation in the DRC. Actually, the implementation of the REDD+ projects in the DRC were preceded by a study on drivers of deforestation.

According to the UNFCCC (2011), arresting drivers of deforestation and forest degradation has been part of REDD+ discussions and UNFCCC negotiations for many years. Decision 2 of COP 13 in Bali encouraged parties to explore a range of actions, identify options and undertake efforts, including demonstration activities, to address the drivers of deforestation. The view of the UNFCCC corroborates the experimental activities designed to fight deforestation in the DRC

mainly the six REDD+ pilot projects such as Eco-Makala+ in the North Kivu Province, the Equatorial, Mambasa Forestry, OCEAN Isangi, South Kwamouth and the Luki projects. The identification of key efforts by the DRC is an important phase of the fight against drivers of deforestation.

Schmook (2011) adds that natural causes of forest losses are fire, hurricanes, or other disturbances; however, most deforestation activities are anthropogenic. Although illegal logging, fuel wood collection, fire, management, and grazing can lead to unintentional deforestation, in most cases, anthropogenic deforestation is a deliberate act. Schmook's observation corroborates with the REDD+ strategy in the DRC, which focuses on human beings and all the strategies adopted by NGOs such as launching individual and community tree planting programmes, distributing seedlings to plant trees, creating awareness in youths in secondary schools and universities, and establishing tree plantations for firewood and building materials instead of relying on the forest. Others include environmental education through the media at the local level on sustainable management of ecosystems and environment, sustainable development, and publication of pamphlets to sensitise people to the negative impacts of deforestation. If people are not exposed to alternative activities, they will always be tempted to put pressure on the existing forest. Thus, the REDD+ initiatives are important to the development of indigenous and local people and confirm that deforestation is anthropogenic, and the solution to it should be focused on human beings.

Causes of deforestation are varied but the principal factor is human, as human beings depend most often on the forest. Natural causes of deforestation such as hurricane are not the most important cause of deforestation in the DRC as argued by Schmook. Anthropogenic causes are central in the Democratic Republic of Congo. As noted by respondents, even bushfire is more often triggered by human beings than natural phenomena. Geist *et al.* (2002) identify two categories of causes of deforestation namely proximate and underlying causes. The development of infrastructure and the expansion of agriculture as proximate causes are directly related to the human activities.

The above strategies for fighting deforestation cannot be implemented by only a certain category of people. According to the UNFCCC (2012), all parties are encouraged to address drivers of deforestation and forest degradation. This declaration corroborates the view of respondents that creating public awareness is a good way to fight deforestation, for example, by sensitising school

pupils to climate change issues through competition and environmental education as the CREF Network in the DRC does.

The forestry sector in the DRC has not yet arranged an official payment for environmental services. However, people who protect the savannah without burning it for a whole year receive incentives of U\$D 5 per hectare per annum under the Luki REDD+ pilot project. As Börner (2011) notes, the REDD+ promotes three complementary ways of affecting the drivers of deforestation from national to local levels namely incentives, disincentives, and enabling measures. The fight against drivers of deforestation in the DRC with incentives is not common even though it could have significant impact. As respondents have noted, disincentives are also employed such as paying a fine or being sent to jail after engaging in illegal logging. However, corruption and absence of good governance weaken these disincentives. Penalising those who destroy the forest as prescribed by the law is one of strategies noted by respondents during the interviews. The law recommends penalty for offenders as a disincentive but the government finds it difficult to apply these laws to armed groups which degrade forests as well as the pro-deforestation agents who have political power in the country. This is a great challenge as the forest code promulgated in 2002 and other laws in the DRC are rendered ineffective. Therefore, as Börner (2011) argued, incentives, disincentives and enabling measures need to be reinforced in the DRC.

Kissinger and Herold (2012) also identify policy and administrative reform, forest management/CBFRM/Participatory Forest Management, fuel wood efficiency/cook stoves, and promoting alternatives to wood fuel (energy sector) as strategies for fighting drivers of deforestation. Respondents confirmed that strategies such as the establishment of tree plantations for domestic firewood, promotion of renewable energy and improved cook stoves, environmental education through media at the local level about sustainable management of ecosystems and environment, and sustainable development also contribute to the fight against deforestation.

The policy and management reform in the forestry sector were not highlighted by many of the respondents except by one respondent from the North Kivu Province Ministry of Environment. Perhaps respondents assume that there was no need to mention the issue of good governance which still seems unattainable in the DRC. There are several laws and policies which are not respected or applied.

Kissinger and Herold (2012) point out that the use of improved cook stoves is becoming popular in the DRC. Unfortunately, only few people have access to them. Most brands of improved cook

stoves have been advertised in the North Kivu Province and in some parts of South Kivu by the WWF as noted during the fieldwork. People in the Bas Congo Province talk about improved cook stoves as a history because they have existed for a short time. The Renewable Energy Development Centre (CERD) located in the South Kivu Province is at the early stage of its development and does not have a mandate to distribute improved cook stoves. This is still a big challenge because not everyone has access to them except to fixed improved cook stoves found in the Equatorial and North Kivu provinces. The improved cook stoves are important as they help reduce charcoal consumption and tree cutting. It is an intermediary way of fighting drivers of deforestation at the same level as tree plantations from which people can get wood to make charcoal. The WWF North Kivu and the NOVACEL in South Kwamouth are working on tree plantations to protect existing forests.

One of the strategies mentioned by respondents is the establishment of many nurseries that can also help reforestation and afforestation efforts (Kissinger and Herold, 2012). REDD+ projects can contribute to forest protection in the DRC because they promote alternative activities such as grazing, planting of crops such as cassava, cocoa and rice, apiculture, pisciculture, and poultry farming, etc. These activities keep the people engaged the whole day and prevent them from going into the forest. However, the main challenge is the lack of regular supply of electricity in the DRC in spite of the country's high potential in hydropower. This could be a sustainable solution to the problem of deforestation such as the electrification of villages around protected areas by the ICCN North Kivu. Environmental education which is mentioned in the list of strategies given by respondents is also important. The strategy can motivate people to engage in environmental protection activities but creating public awareness about the issue is the key to success.

5.3.2 Contributions of national REDD projects and of other institutions to climate change mitigation in the DRC

The findings from the interviews confirm that at present, the DRC has six REDD+ pilot projects in five different provinces including the NSK (NOVACEL REDD+ pilot project on agroforestry in South Kwamouth), the Geographically Integrated REDD+ pilot project around the Luki Reserve Biosphere, and the Equatorial REDD+ pilot project. The others are the OCEAN Geographically Integrated REDD+ pilot project in Isangi, the WCS Mambasa Forestry REDD+

pilot project, and the Eco-Makala REDD+ pilot project by the WWF North Kivu. The NSK (NOVACEL REDD+ pilot project on agroforestry in South Kwamouth) has a carbon stock of more than 60 000 tons which continues to grow with eight tons of CO₂ /hectare/annum. Additionally, 210 tons per hectare per annum on the left side of the Congo River, and on the right side 195 tons per hectare per annum come from the OCEAN Geographically Integrated REDD+ pilot project in Isangi, and 230 tons per hectare per annum from the WCS Mambasa Forestry REDD+ pilot project. The Eco-Makala has not yet estimated its carbon stock and the carbon stock from the Luki REDD+ project is about 16 000 tons of CO₂e per annum.

The carbon stocks are available because of the implementation of alternative activities in villages around the forests. The Eco-Makala of WWF North Kivu is a little different because it focuses on wood energy plantations and helps to protect areas such as the Virunga National Park. Increasing the carbon stock through these REDD projects tallies with the view by Sathaye *et al.* (2007) that reducing deforestation and degradation is a forest mitigation option with, in the short term, the largest and most immediate carbon stock impact per ha and per annum globally. This is because large carbon stocks (about 350-900 tCO₂ /ha) are not emitted when deforestation is prevented. However, funding is required to implement these alternative activities. The carbon stock can be maintained if the forest is left intact which is possible when people engage in other alternative activities. As REDD is an international programme, the agreements that were signed by the COP 21 in Paris are welcome by many activists and countries which have protected their forests for a long time.

Alternative activities geared towards maintaining the carbon stock in the Congolese forests cannot be sustained without incentives and compensations. The people who live around the forests are mostly poor and in need of development and financial support. Tacconi *et al.* (2010) confirm that the REDD would need to offer financial incentives to developing countries to conserve their forests, which could include payments to people with rights over the forests in question. The question is where will the funds for these payments come from, and how will the benefits be shared? These issues were discussed at the recently concluded climate change meeting in Paris which is known as the capital of climate change. It is easy to say that people should maintain the existing carbon stock, but this requires a lot of money. REDD projects can attain the three phases as recommended if funds are available. All REDD projects in the DRC could have been completed at the end of the year 2015 if sufficient funds were available.

Unfortunately, some of the projects could extend to the end of 2016 without reaching the phase of implementation at which the carbon credit should be paid to people.

The Eco-Makala REDD+ project has never calculated its carbon stock and the credit cannot be paid out without proof of the amount of carbon available on a given project. The main goal of REDD as mentioned by Dooley (2011) is to slow, halt and reverse the loss of forest cover and carbon emissions. Thus, all the REDD projects in the DRC can succeed if the forest cover which directly increases the carbon sequestration is maintained. Many alternative activities are organised by all the REDD projects of the DRC. However, not all the projects are making good progress because of the delay in remitting funds by the African Bank of Development and the Congo Basin Forestry Fund. The case of the Mambasa REDD+ forestry project is remarkable in that it was observed that there is not a significant difference between the carbon stock of a cocoa plantation and that of a natural forest. The experiment conducted by the managers of the project showed that the difference is about 10 tons of CO₂. The implication is that the cultivation of cocoa contributes not only to the economic development but also at the same time to the carbon sequestration. This is not the case where only cassava is cultivated as in the OCEAN Isangi REDD+ project.

The MRV is used in all the REDD+ projects in which the carbon stock is already estimated. Body (n.d.) notes that the MRV stands for measuring, reporting and verifying mitigation commitments, actions and support. It is an important aspect of slowing down climate change because it presents the results of the mitigation commitments by developed countries and provides transparency regarding their mitigation actions. The MRV surfaces in REDD+ pilot projects through the aspect called ecological monitoring. Winkler *et al.* (2011) confirm that forests play an important role in the global carbon budget by acting as either sinks or sources of carbon. Thus, it is clear that without protecting the forest no carbon budget can be released.

5.3.3 Roles of the civil society/indigenous people in climate change mitigation strategies through REDD and other programmes in the DRC

Communities are involved in climate change mitigation activities in different ways, depending on each organisation. According to the results from the fieldwork, the different ways of involving the civil society/local people and indigenous people in the activities of climate change mitigation include the distribution of solar panels to local people in villages especially by the Gorilla

Organisation, implementation of activities through local organisations, and approaching conservation and research through local communities. Other ways include the involvement of minority people such as the pygmies of the DRC in the projects, distribution and advertisement of the improved cook stoves to the people, training of local cook stove makers, reforestation activities through local associations, and providing revolving micro credit to help poor people. Additionally, there is the use of a participative approach and promotion of community ideas especially by the CREF Network which works with community-based organisations, evaluation of activities by beneficiaries in general assemblies, promotion of the application of the communities' consent in all REDD+ projects to defend their rights, and the involvement of communities in identifying problems and priorities. The involvement of local communities in the establishment of nurseries, formation of a network of all field workers on environmental protection, use of local labour, involvement of local communities in pure forestry and in different alternative activities (e.g. agriculture and grazing), and the provision of trucks to communities to transport their products are some other forms of community engagement. Furthermore, projects encourage cooperation among beneficiaries as a way of promoting their commitment, the involvement of customary chiefs from all villages in the project zone, formation of committees to monitor projects and ensure their progress, the employment of eco-guards from local communities as in the Luki project and the WWF Eco-Makala, and offsetting up local steering committees for development. Both the project and the communities develop strategies to involve communities at the national, local and international levels. Thus, organising training in participative cartography, collaborating with CARG, adopting the new approach by the ICCN North Kivu which encourages co-operation between people and communities living near the nature reserve and conservators, establishing nurseries in schools to involve youths, and getting churches to encourage their members to plant commemorative trees on special sacrament or other occasions are some other strategies.

Lund *et al.* (2010) claim that involving the communities highlights that attention being paid to climate change mitigation is increasing, but while ambitious national targets are hard to come by, several regions, cities, towns, institutions, and communities have taken matters into their own hands. International agreements might not have much impact, but communities and governments have established their own ambitious targets for reducing carbon dioxide emissions, and are in the process of finding ways and means to meet these targets. This should be the situation in each

developing country. The key element to success is the involvement of communities at all stages of climate change mitigation strategies. Thus, Castillo *et al.* (2012) remark that despite widespread recognition that local ownership is crucial to the REDD+ success, the scope and intensity of their participation have not always been adequate and often their roles in the project implementation are not clear. However, transparency and the clear definition of the roles of local communities can help organisations and REDD+ projects to succeed. Castillo *et al.* (2012) also suggest that local communities participate actively in various other important mitigation activities such as producing renewable energies in their territories (e.g. wind, hydropower and geothermal). In this regard, the Gorilla Organisation has a project that distributes solar panels in villages which shows that the production of renewable energy sources should be done with the involvement of the local people who could take over ownership of the projects.

Hence, communities need not only participate in forest protection activities, but also in projects that relate to energy generation, which are not many in the DRC. Most people rely on generators to get electricity in different areas. Unfortunately, this source of energy contributes greatly to pollution. A law was promulgated in 2014 by the DRC government that allowed people to initiate their own hydropower projects which would generate energy from rivers, but many people are not yet aware of this law. Therefore, the involvement of local people in the forestry and energy sectors is crucial. Badrinarayana *et al.* (2013) affirm that REDD+ may offer an effective vehicle for addressing the multiple threats faced by forest-dwelling indigenous people. These threats can be easily addressed if local communities or indigenous people are fully involved in the projects such as in the use of a participative approach and promotion of community ideas as done by the CREF Network in the North Kivu Province, and the formation of steering local committees as in the Luki project.

5.3.4 Existing and envisaged energy sources envisaged by the government and other institutions to mitigate climate change in the energy sector in the DRC

Given that the energy sector contributes much to the pollution of the atmosphere, it is important to consider existing and envisaged sources of energy that can contribute to the climate change mitigation in the DRC. After data collection through interviews of organisations and REDD+ projects, existing and envisaged sources of energy are found to include rural projects on solar energy by the Gorilla Organisation, promotion of improved cook stoves as an intermediary

solution, the use of hydropower and briquettes, marketing of the biomass kit, and the extraction of methane gas especially from the Kivu Lake. Other sources include the geothermic energy from the volcanic zones, manufacturing of stoves called Bukavu, use of imported generators, wind energy but only in limited areas, the energy potential from agriculture which is envisaged, and the use of charcoal from trees. The DRC also envisages using the carbonisation method which consumes fewer trees, the establishment of plantations for firewood, the industrial production of charcoal from acacia and the biogas kit, and the use of dead woods for wood energy by villagers. Most of these energy sources have been used in the DRC except for some which are still in the pipeline such as the biogas kit, the energy potential from agriculture, and methane gas from the Kivu Lake. The DRC has the potential of generating 100 000 MGW from rivers, which could prove adequate. Unfortunately, dam projects exist only on paper and their implementation is impossible because funds are hardly available. The use of these MGW could help the DRC and other African countries to stock more carbon. The Inga III dam project in the DRC could also help save carbon with implications at the international level. Despite issues of governance and politics, the DRC could protect its forests through hydropower and help many other African countries. According to data collected from the field in the DRC, some people with access to hydropower continue to use charcoal because of cultural issues.

For example, one of the respondents claimed that cassava leaves which are cooked using hydropower do not taste as good as cassava cooked on a stove with charcoal. Such cultural issues pose a challenge. In relation to the energy sources in the DRC, Moomaw *et al.* (2011) explain that for development to be sustainable, the delivery of energy services needs to be secured and should have low environmental impacts. The use of wood energy from tree plantations as mentioned in the list of envisaged energy sources does not guarantee environmental protection. Only the installation of the envisaged 100 000 MGW hydropower dam in the DRC can contribute to a sustainable development which does not promote environmental destruction. The consumption of fossil fuels in generators in the DRC is contradicted by Bamiloke *et al.* (2011) that renewable energy sources can assist in limiting the use of fossil fuels, reducing pollution and lowering dependency on imported fuels.

The results also showed that traditional biomass is being used in the DRC even though traditional biomass energy use is said to result in serious environmental drawbacks (Bamiloke *et al.*, 2011). The DRC is rich in biomass but the traditional biomass contributes to pollution. The briquettes

envisaged by the NGOs in environmental protection are not popular with the people who have tried to use them. According to the findings from the interviews, the briquettes emit more smoke, and the emission of smoke means that CO₂ is released into the atmosphere.

On the use of solar panels, the results show that only the Gorilla Organisation has been distributing them in villages. Apart from efforts by the Gorilla, many people in the urban areas also invest in solar panels but the availability of solar energy depends on sunshine. Little research has been done on geothermal and wind energy sources in the DRC but their potential should be studied to see how the transfer of technology could be done as discussed under the UNFCCC.

5.3.5 Application of remote sensing in the DRC

The findings from the interviews show that remote sensing is used in the DRC, but only by few organisations such as the WWF and the DIAF whose offices are located in Kinshasa. The DRC does not have satellites to monitor its forests, and most of the images are provided by France, OSFAC, MOAPI and other organisations. The access to images is free for the land sat, but the spot images are difficult to access because they are quite expensive. The resolution of the land sat images is not as clear as in the spot images. Even the national Ministry of Environment has serious difficulty in getting images of provinces and territories but without this tool, it is difficult to determine the rate of deforestation and compare the condition of the forest from one period to another.

Sajjad *et al.* (2015) confirm that the GIS and remote sensing are becoming important in forest cover mapping. In this respect, the DRC is supposed to use remote sensing to its forest; otherwise, the resultant lack of data could make forest management difficult.

Some stakeholders which operate around the Virunga National Park believe that remote sensing could have negative impacts on ecosystems if it emits radioactive rays, which can kill animals and destroy forest vegetation and protected areas. Thus, such people are hesitant to use remote sensing and they prefer that further research be conducted on remote sensing to determine whether or not it emits radioactive rays. This way of thinking disagrees with the observation by Abdulrahman (2010) that remote sensing is the process of acquiring data/information about objects/substances not in direct contact with the sensor, by gathering its inputs using electromagnetic radiation or acoustical waves that emanate from the targets of interest. Therefore,

the electromagnetic radiation or acoustical waves are different from the radioactive rays, a situation which requires capacity building of participants on the importance of remote sensing.

Remote sensing is a new technology and it could prove inadequate if used alone. Therefore, it should be combined with fieldwork. For example, it was discovered on images through remote sensing use that the middle of the Salonga Park was being destroyed but the perpetrators of the act were unknown. After the field observation, researchers discovered that that part of the forest was being destroyed by elephants from the same park. That case confirms that data from remote sensing should be complemented by fieldwork. This corroborates with Nagesh (n.d) who argues that remote sensing needs cross verification with ground (field) survey data to confirm what has been seen during the spatial step.

Evidently, images could be misinterpreted but the advantage of remote sensing is that it helps organisations and countries to estimate the rate of deforestation and the areas that need to be reforested (by planting trees in destroyed places). The main challenge however is identifying the forest degradation indicators. The DRC does not have enough specialists in remote sensing, and it needs to train more specialists in this field, as specialists who operate presently in DIAF in Kinshasa are from Brazil. With this situation, many REDD + projects have no experts in remote sensing except the WWF which has some assistants. Another issue is that in some provinces, government agents working in environmental services ignore the use of remote sensing for environment protection by NGOs. This shows that the collaboration between NGOs and government institutions is only partial.

5.4 Findings from the RSA

This section presents the discussion of data got from the Republic of South Africa.

5.4.1 Different strategies or measures against drivers of deforestation in the RSA

The findings from the RSA reveal that the major problem has more to do with degradation than deforestation. The strategies for fighting drivers of deforestation include the promulgation of the National Forest Act that was given the mandate to regulate the forestry sector (that is, in the area of enforcement and compliance issues) and the registration of woodlands, thickets and natural forests. The government has also put in place different forms of retro planning and regulations to

enforce the control of deforestation, the national conservation planning, the International Environmental Management Act which deals with and forest protection, and the National Act of Environmental Management of Protected Areas to protect forests and all biomass, programmes on afforestation, and commercial plantations. Other strategies include initiating programmes such as Trees for All, Trees for House and Bamboo especially by the NGO called Food and Trees for Africa environmental education of pupils through tree planting activities, and establishment of the Champion Tree Project that aims to identify and protect trees of national conservation importance in terms of the National Forests Act of 1998. Arresting illegal loggers of trees such as yellowwood, enforcing stricter control of trade in protected tree products, adopting the convention on International Trade in Endangered Species, initiating the wood identification project which is vital for monitoring and law enforcement, controlling invasive species, planting nurseries and botanical gardens that contribute in various ways to protecting species constitute some other strategies. In addition, the strategies include the use of forest guards who have been at the forefront of forest conservation for two centuries and have continued to carry out their duties in many state forests and forest protected areas as well as the implementation of reforestation, conservation tillage, afforestation and commercial plantation projects. The above all constitute strategies for fighting drivers of deforestation in the Republic of South Africa.

South African legislation on tree protection and controlling invasive species is possibly more advanced than that of any other country on the continent. In fact, the case of South Africa seems to be an exception. However, as we have also seen, all the aforementioned Acts do not overtly refer to climate change. Hence, they need to be updated to reflect clearly issues that relate to climate change. The UNFCCC (2011) shows that to fight drivers of deforestation a range of actions and options have to be explored including pilot projects. In the case of South Africa, the results reveal that the issue is more about degradation than deforestation. The pilot projects in South Africa are more oriented towards tree planting and commercial plantations for carbon offset. However, the Acts and laws play a major role in the fight against drivers of deforestation. The UNFCCC (2012) also encourages all parties to address drivers of deforestation and forest degradation. However, this encouragement would apply only to the issue of degradation because deforestation is not regarded as a major problem in South Africa.

However, Börner (2011) has emphasised that national decision-makers in the REDD+ project rely on three complementary ways of affecting the drivers of deforestation from the national to

the local level namely incentives, disincentives, and enabling measures. The views of the South African government and Börner do not align because there is no REDD project in the RSA except for some written drafts, that is, according to a respondent from the Department of Environmental Affairs. Therefore, REDD+ is not a strategy for fighting drivers of deforestation in South Africa but disincentives such as arresting illegal loggers of yellowwood are attested. South Africa's Acts and laws do play a major role in forest protection and the regulation of the activities related to forest exploitation.

5.4.2 Contributions of national REDD programs and other institutions to climate change mitigation in the RSA

Regarding the contribution of REDD programmes to climate change mitigation in the RSA, the following results were found: The Department of Environmental Affairs has already drafted some documents on the REDD+ and helps on and negotiate with the REDD and LULUCF even if it has not yet begun a project. The DEA tries to show why REDD+ is needed in South Africa, but it has achieved little besides drafting the proposal. The process is at the earliest stages. Countries that develop REDD need reference levels and a forest management and MRV systems. All these should be developed by the South African government. However, REDD should not only be linked to natural forests, but should be considered a national trademark. In this regard, respondents tried to show that South Africa can participate in the REDD process even if it has a small natural forest area. According to the respondents, woodlands and grasslands should also be taken in consideration.

Other respondents mentioned that South Africa is not involved in REDD+ initiatives because natural forests are not seen as a priority ecosystem for conservation. The focus is more on reducing the impact of plantations on other ecosystems such as grasslands and wetlands. However, we would argue that the small existing natural forests should also be considered a conservation priority which should not be overlooked, as it could push the South African government to calculate the carbon stock in the existing forest area and the area of the 4.2 million trees which include bamboos planted by the NGO Food and Trees for Africa. This would be a good move because the South African natural forest is protected by laws and Acts which actually work.

5.4.3 Roles of the civil society/indigenous people in climate change mitigation strategies through the REDD and other programmes in the RSA

On the involvement of the civil society and local people in activities of climate change mitigation, the findings for the Republic of South Africa include participation of different sectors including the academia, NGOs, civil society organisations, consultation based on the DEA's constitution and principles. There is a clear need to involve different levels of stakeholders, and the establishment of the IGCCC (Intergovernmental Committee on Climate Change) which also includes NGOs, and the formation of steering committees to offer input on existing projects ensure community involvement in the projects. The civil society and indigenous people have been involved extensively in a government-led wetland restoration programme called Working for Wetlands which was initiated by the WWF in 2001, and restores wetlands in labour-intensive ways using previously unemployed people. The programme has had positive economic impact on the communities. The involvement of the civil society in marches and research, formation of international climate change teams especially by the WWF South Africa, encouraging sustainable practices which contribute to environmental protection, collaboration of organisations especially the WWF with the COSATU on sustainable energy production, and identifying projects with the civil society are other ways of promoting grassroots participation. Other ways include collaborating with and organising workshops in disadvantaged communities, identifying forest areas in Forest Management Units with estate managers and forest workers and guards, formation of a participatory Forest Management Committee in the Eastern Cape, one of several such committees established to foster cooperation between the government and rural communities. Additionally, environmental education of youth in schools and anyone who is committed to environmental protection, the establishment of community groups and community-based organisations which focus on climate change energy, adoption of Earthlife's ground-up rather than the government's top-down approach, and involvement of women's groups in climate change mitigation activities are also various ways of involving communities in projects. The subsequent handover plan of projects to local communities, publication of all data on climate change and energy except for some confidentiality agreements with organisations especially by the University of Cape Town's Energy Research Centre, and organising seminars on specific research topics that involve community-based organisations or community members, the civil society and businesspeople also promote community involvement in projects. Comparing the

above ways of involving the civil society in the activities of climate change mitigation, Lund *et al.* (2010) observe that communities and governments have established their own ambitious targets for reducing carbon dioxide emissions. The involvement of the youth and community-based organisations in climate change mitigation pushes them to initiate different programmes and contribute to the decrease in carbon dioxide emission whether in the forestry or the energy sector. However, most of the actions in the RSA are focused on the energy sector. The establishment of their own ambitious targets is possible when community-based organisations are aware of the issues at stake, and if the feedback from research is available to all stakeholders to stir them to action.

The Energy Research Centre of the University of Cape Town not only organises seminars and workshops with community-based organisations, it makes available the results of its publications to the civil society. In addition, the WWF South Africa also tries to collaborate with the country's labour organisation known as COSATU. Similarly, the Earthlife for Africa also rallies the civil society to organise marches for example against the installation of more coal plants that contribute to the high pollution in the atmosphere in South Africa. As noted by Castillo *et al.* (2012), local communities also have to participate in various other important mitigation activities such as producing renewable energies in their territories (e.g. wind, hydropower, and geothermal). This is in line with the goals of Earthlife Africa which has initiated projects on solar energy in schools as well as the use of the biogas digester for light and cooking. The target population owns all these projects. The involvement of communities in the commercial plantations project does not only have positive environmental impact, but also brings economic benefit to the community.

5.4.4 Existing and envisaged energy sources envisaged by the government and other institutions for mitigating climate change in RSA's energy sector

The South African energy sector which is huge has been the focus of many researches. After data collection, the existing and envisaged energy sources found through interviews are as follow:

- The Department of Environmental Affairs has some projects on the biogas digester, feedstock, and technologies which also attract social benefits in the year 2015.
- Coal is major in terms of electricity generation, as almost 94% of the electricity is from coal, 4% from the nuclear energy, and renewable energy is rather minimal. However, with

the recent initiative on the renewable energy independent power producer procurement programme, the percentage of renewable energy is increasing. In addition, a nuclear plant that generates about 1800 MGW is located in the Western Cape.

- South Africa's gas reserves are very few. A facility from which natural gas is drawn is located in the Western Cape as well as a State oil company called PetroSA which is a refinery that generates petrol and oil products. The RSA is also a leader in liquid coal production. An Energy White Paper Policy was promulgated in 1998 which outlines the energy plan for the country, as the policy remains the key document that guides the energy sector, and it recognises coal as South Africa's main energy resource. South Africa has a high level of renewable energy potential and presently targets 10 000 GWh of renewable energy. The Minister of Energy announced that 3 725 megawatts (MW) to be generated from Renewable Energy sources is required to ensure the continued uninterrupted supply of electricity. The 3 725 MW is broadly in accordance with the capacity allocated to renewable energy generation in IRP 2010-2030;
- The following technologies shall be considered as qualifying technologies for selection under the IPP Procurement Programme: onshore wind (1850 MW), concentrated solar thermal (200MW), solar photovoltaic (1450 MW), biomass (12.5 MW), biogas (12.5 MW), landfill gas (25 MW), small hydro (75 MW), and small projects (100 MW);
- The 2003 study also highlighted the technologies to be implemented first, based on the level of commercialisation of the technology and natural resource availability. The technologies include:
 - Sugarcane bagasse (the fibre that comes from crushing sugar cane) for cogeneration;
 - Landfill gas extraction;
 - Mini-hydroelectric schemes;
 - Commercial and domestic solar water heaters.
- The nuclear sector in South Africa is mainly governed by the Nuclear Energy Act, Act 46 of 1999 and the National Radioactive Waste Disposal Institute Act, Act 53 of 2008. National Nuclear Regulator (NNR) Act, Act 47 of 1999. These Acts are administered by the Department of Energy; and

- The SunFire Solution Company provides solar cookers to people in South Africa. The SunFire parabola captures sun energy to boil water in pots. The validity of a solar cooker is between five and ten years. It needs neither fuel or gas nor cables - only exposure to the sun.

As the major source of electricity in South Africa is coal, the country experiences high pollution of its atmosphere. This situation weakens the argument by Bamiloke *et al.* (2011) that Africa does not have any cause to rely on fossil fuels when it has enough potential to exploit renewable energies. However, the alternative to coal can lead to the reduction of GHG emissions. South Africa also has potential for renewable energy except hydropower because it does not have enough rivers. The existing technologies, available natural resources, and sources which cause less pollution should be probed and exploited to enhance climate change mitigation efforts in the energy sector in the RSA. Moomaw *et al.* (2011) confirm that renewable energy sources play a role in providing services in a sustainable manner and, in particular, in mitigating climate change. Coal cannot provide services in a sustainable manner because it contributes to the emission of GHGs in South Africa. Although nuclear energy does not cause pollution, it contributes to the destruction of the environment in the course of the uranium mining. Additionally, uranium is radioactive with high risks on human and animal health; hence, it is doubtful that nuclear energy can be regarded as true renewable energy.

5.4.5 Application of remote sensing in the RSA

Respondents have revealed that remote sensing is used in South Africa, but it would cost less money and time if experts were available. The disadvantage is that the accuracy is always questionable which can create confusion if vegetation is not well identified. Hence, it is important to carry out fieldwork for confirmation. If the sampling is done with remote sensing, the level of accuracy would increase for example when it comes to the national inventory. The South African Space Agency has certain products including the national surveillance and images which can be obtained through it even though at a costly rate. Thus, all departments should have a Geographical Information section which is also quite expensive. Although some people are trained in the field of Geographical Information and remote sensing in the Department of Forestry, South Africa still needs to train more people in remote sensing use even though it has a spatial agency.

5.5 Similarities and Differences between South Africa and the Democratic Republic of Congo in Terms of Mitigation in the Forestry and Energy Sectors

The DRC forest covers about 66% of the national territory, which is not the case in South Africa which has a small natural forest area. Hence, the DRC has already adopted the REDD programme which does not exist in the RSA. The RSA on the other hand conducts advanced research on invasive species by determining their DNA, which is not the case in the DRC. The DRC tries to fight deforestation through six REDD+ pilot projects which need to be duplicated in the provinces. In the RSA, more commercial plantations contribute to the carbon offset and tree planting by NGOs such as the Food and Trees for Africa which has already planted 4.2 million trees. Reforestation and afforestation activities in the DRC are carried out by NGOs and the REDD+ projects. The strategies for combating drivers of deforestation in the RSA include new Acts and laws as well as advanced researches.

The involvement of the civil society/local communities in activities on climate change mitigation seems to be the same in both the RSA and the DRC but more REDD alternative activities are carried out in the DRC which enable the people to receive funds to engage in more alternative activities than their counterparts in South Africa. Commercial plantations in South Africa benefit beneficiaries or the labour which is used. The beneficiaries work on company projects whereas in the DRC, beneficiaries use their own lands.

South Africa's major energy is from coal, as noted earlier but the DRC has a high potential in hydropower which can generate up to 100 000 MGW. Coal is used to produce electricity in South Africa even though certain problems are associated with its supply. However, in the DRC, electricity generation remains a serious problem despite the high potential in hydropower. The research on South Africa focuses more on the energy sector than in the DRC. The DRC produced its Atlas on renewable energy sources in 2014 but no concrete actions have followed until now. The IEP (Integrated Energy Plan) also receives more attention in South Africa where the use of nuclear energy is also unique as it is not available in the DRC.

Remote sensing is used in both the DRC and the RSA but the RSA has a Spatial Agency, which the DRC does not. However, both countries need to train more people in remote sensing and geographical information. The access to spot images is still a challenge for both countries.

5.6 Strengths and Weaknesses of Climate Change Mitigation Strategies in the DRC

Table 17: Strengths and Weaknesses of Climate Change Mitigation Strategies in the DRC

Strengths	Weaknesses
<ul style="list-style-type: none"> - Existence of multiple organisations (NGOs), networks and institutions operating in the forestry sector; - Creation of tree plantations around protected areas -The existence of a huge forest area in the DRC; - The implementation of six REDD projects which are to be replicated with time; - The existence of alternative activities related to REDD in which the local people (beneficiaries) are involved; - Existence of many rivers with a high potential in hydropower - Cooperation at the international level in activities related to mitigation in the forestry sector; - Consensus on drivers of deforestation in the DRC after field studies; - Existence of laws on forest protection (DRC forest code); - Use of remote sensing by some NGOs; - Presence of the REDD Climate Working Group of the civil society (GTCR); it is a way of including the civil society among decision makers. - Presence of a national Directorate which follows REDD-related activities. 	<ul style="list-style-type: none"> - The non-exploitation of the potential of the 100 000 MGw of hydropower which could contribute to increase in the forest carbon stock, not only in the DRC but in the whole of the SADC, that is, through the decrease in the use of charcoal; - Many projects related to the energy sector are operational on paper more than in the field, as there is no concrete implementation of such projects except for projects by the Gorilla Organisation and the ICCN North Kivu which respectively have distributed solar panels to villagers and built some micro dams. - Insufficient access of Congolese households to the improved cook stoves with the consequence of consuming more charcoal contributes to deforestation. - The DRC forest code is not applied as expected because of governance issues, war and lack of capacity by institutions - Limited human resources in the field of remote sensing; experts at the national level are mostly foreigners. - Limited access to spot images of territories and provinces - The DRC does not have a spatial agency - Delay in funding REDD's alternative activities. - Limited number of tree plantations for commercial purposes, charcoal making and building materials

5.7 Strengths and Weaknesses of Climate Change Mitigation Strategies in the RSA

Table 18: Strengths and Weaknesses of Climate Change Mitigation Strategies in the RSA

Strengths	Weaknesses
<ul style="list-style-type: none"> - Existence of organisations and state institutions that do research on the mitigation of the energy sector in the RSA; - Establishing commercial plantations which create jobs and supply timber to the people; - Plantation of trees and bamboos by NGOs for carbon offset; - Existence of laws and acts which contribute to the protection of the small existing natural forests; - Existence of plans and projects to improve the efficiency in the energy sector; - Collaborating with neighbouring countries to obtain electricity; - Use of remote sensing by some NGOs - Planting botanical gardens and conducting advanced research on the DNA of trees and endangered species; - Existence of a spatial agency in the RSA; - There is no deforestation in the RSA because laws are enforced; - Collaboration with COSATU, a civil society organisation, in promoting climate change mitigation strategies. 	<ul style="list-style-type: none"> - There are currently no REDD programmes in the RSA. - The RSA does not have rivers that could supply water for hydropower. - Use of coal plants as the main source of energy result in high pollution of the atmosphere; - The RSA has only a small natural forest which is unable to sequester all greenhouse gases that are emitted from different sources; - Limited number of experts in remote sensing; - Use of nuclear energy which indirectly affects the environment, animals and human beings during the uranium exploitation; Thus, it is difficult to confirm that nuclear energy is totally a renewable energy even if it does not emit GHGs during power supply; - Insufficient spaces to increase the number of commercial tree plantations due to a high demand of timber by South African residents and for exportation; - Limited access to spot images because they are expensive.

In Table 17 and Table 18, the strengths and weaknesses of both the DRC and the RSA are internal to organisations and institutions. The RSA and the DRC can build on their strengths to find solutions to their weaknesses. However, the two countries can also look for more opportunities to decrease the influence of their weaknesses in order to promote sustainable climate change mitigation strategies in the forestry and energy sectors. A regular evaluation of these strategies can help all stakeholders to improve them both in the DRC and the RSA.

5.8 Proposed Model for Sustainable Mitigation in the Forestry and Energy Sectors of the DRC and RSA

The following figure summarises the researcher's contribution for a sustainable mitigation in the domains of forestry and energy of the DRC and RSA. It shows what both the DRC and RSA can accomplish together and what each country can handle alone in order to activate sustainable mitigation strategies in these two domains.

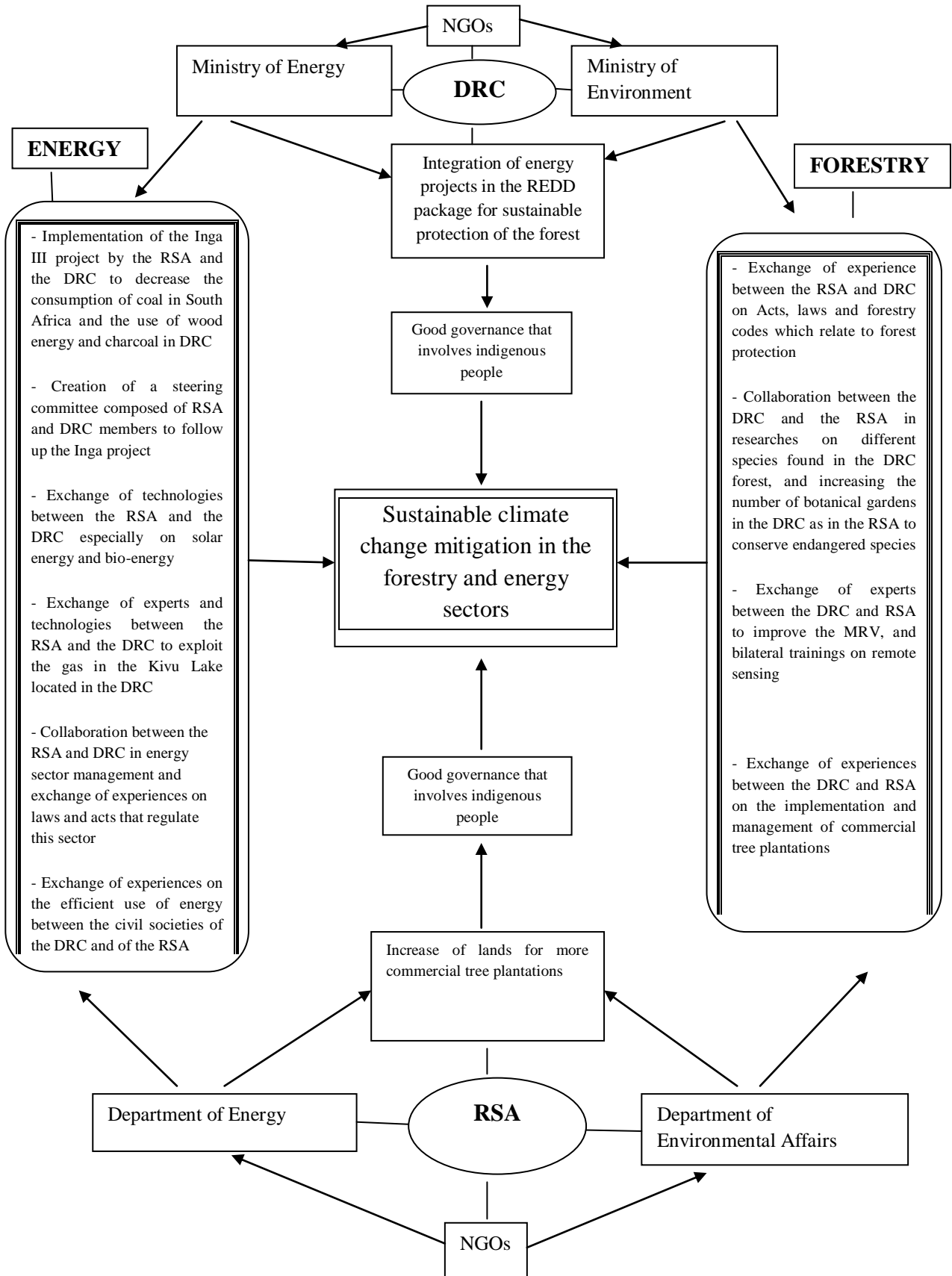


Figure 5: Model for Sustainable Mitigation Strategy in the Forestry and Energy Sectors of the DRC and the RSA

CHAPTER SIX: CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

The title of this study is *Climate change mitigation strategies in relation to the forestry and energy sectors in SADC region with emphasis on DRC and RSA as case studies*. Leading from the previous chapter that presented, analyzed and discussed key research findings, this chapter summarizes the key findings, draws conclusions and presents recommendations from the findings. However, before the foregoing can be presented, it is imperative that there is a recap of the questions and objectives of the study.

6.2 Questions and objectives of the study: a recap

The main research question was: What are the climate change mitigation strategies used in the forestry and energy sectors in the SADC with emphasis on the DRC and the RSA?

In addition to the main question, some secondary questions are posed as follow:

- What are the existing strategies implemented in the DRC and the RSA to address issues of deforestation?
- How do the national REDD programmes and other organisations contribute to climate change mitigation in the DRC and the RSA?
- What is the level of involvement or commitment of the local communities or people in climate change mitigation strategies in the DRC and the RSA?
- What energy sources are used and envisaged to mitigate climate change in the forestry and energy sectors in the SADC with specific reference to the DRC and the RSA?
- What is the level of remote sensing application in the SADC with specific reference to the DRC and the RSA?

The general objective of this study was to evaluate climate change mitigation strategies in relation to the forestry and energy sectors in SADC with specific reference to the DRC and the RSA. From this main objective, specific objectives were stipulated to guide the study. The first objective was to evaluate the performance/efficacy of the strategies currently implemented to reduce deforestation rate. The second objective was to evaluate the contributions of national REDD

programmes and other organisations to climate change mitigation; and the third objective was to evaluate the involvement of the civil society/local communities in climate change mitigation strategies. In addition, the fourth specific objective was to evaluate the energy sources that are used and envisaged in climate change mitigation, and the fifth was to evaluate the remote sensing application in SADC with specific reference to the DRC and RSA.

This research is a comparative, and has given details on climate change mitigation strategies in the forestry and energy sectors of the DRC and RSA. A snowballing sampling was also used to reach unknown institutions that work in the field of environmental protection with the aim of obtaining data saturation. The instrument tools used during data collection are the interview guide and the focus group guide.

The use of the snowballing sampling helped the investigator to get rich information from 45 stakeholders including institutions in both countries, 34 from the DRC, and 11 from the RSA. In DRC the focus was on six REDD+ pilot projects and activities of other government, national organizations, projects and NGOs. The dissertation not only covered the carbon stocks per each REDD+ project, but also focused on how these projects can contribute to development by alleviating poverty in the DRC. Eleven organizations in the RSA are distributed across forestry and land use (3), environment (3), and energy (5). Commercial plantations characterize the RSA.

6.3 Summary of key findings

The study found that some strategies and measures have been put in place to fight drivers of deforestation in both the DRC and RSA. The primary focus of the DRC is the REDD+ projects but these projects suffer from lack of funding which hinders them from reaching the third phase of implementation during which the carbon credit would be paid. Of the six REDD+ pilot projects, the Eco-Makala in North Kivu is yet to put in place its MRV system and has never calculated the carbon stock for the project. The OCEAN Isangi REDD+ and Mambasa Forestry REDD+ projects are not even close to the end of the first phase of preparation because the Project Design Document for both projects is not ready. Other NGOs such the ICCN, WWF, CREF Network, and WCS try to contribute to securing the protected areas, activities of reforestation and ensuring the involvement of the indigenous people in the REDD+ project. However, the findings reveal that the Kisimba Ikobo REDD+ project was suspended due to bad management and the lack of the involvement of local communities as recommended.

During interviews, fewer respondents in the DRC referred to the forest code and laws that are established to protect the forest. This could be linked to the issue of bad governance which is experienced throughout the public sector in the DRC. The focus is on REDD+ project but few respondents talked about the implementation of the law. The REDD+ projects in the DRC are implemented with the goal of coming up with a National Frame Strategy which could help to fight successfully the drivers of deforestation that have been identified in previous studies. It should be recalled that before the implementation of REDD+ pilot projects in five different provinces, there was a consensus on what constitute the drivers of deforestation. Subsequently, if the pilot projects do not reach the third phase of implementation, it would be difficult to produce the National Frame Strategy.

The lack of electricity is one of the factors that push people to use firewood for cooking. This is a major challenge for the DRC because it has a potential of generating 100 000 MGW of energy from hydropower which could help save the existing forests, and increase the carbon stock greatly. Wood energy projects exist in the DRC such as that in North Kivu managed by the WWF and the one by NOVACEL in South Kwamouth. Unfortunately, there is a high demand for wood energy because of the increase in population which means more tree plantations are needed, as regular supply of electricity is in the DRC only feasible in the future.

In the RSA, the focus is on the implementation of commercial plantations with the aim of achieving carbon offset and on the protection of the small existing natural forest area through Acts and laws as noted in the result discussion. South Africa does not have a REDD programme and the existing small natural forest in the RSA does not constitute a major priority in terms of conservation. A number of studies have been carried out on forest conservation in South Africa and the DNA of some species has been determined. Afforestation and reforestation projects are also being implemented in South Africa. In short, commercial plantations respond to the timber and economic needs of the population but South Africa remains a major emitter of GHGs in Africa and it should see to reinforcing its carbon sink.

On the secondary objective which relates to the contributions of the REDD programmes and other organisations to climate change in the RSA and the DRC, the results show that no REDD programme operates in the RSA at present. It does not mean that South Africa has never considered the project because the Department of Environmental Affairs has already drafted

some documents on REDD+, and it works on and negotiates with REDD and LULUCF even though it has not yet begun own operations.

The DEA tries to show why REDD+ is needed in the South Africa, but it has achieved little besides drafting the proposal. The process is at the earliest stages. Countries that develop REDD need reference levels and a forest management and MRV systems. All these should be developed by the South African government. However, REDD should not only be linked to natural forests, but should be considered a national trademark. Other respondents had mentioned that South Africa is not involved in REDD+ initiatives because natural forests are not seen as a priority ecosystem for conservation.

Regarding the involvement of the civil society in the DRC projects, communities are involved in climate change mitigation activities in different ways through the different organisations. The findings from the field show that different ways the civil society/local people and indigenous people engage in the activities of climate change mitigation include distribution of solar panels to local people in villages especially by the Gorilla Organisation, implementation of activities through local organisations, and approaching conservation and research through local communities. Other ways include the involvement of minority people such as the pygmies of the DRC in the projects, distribution and advertisement of the improved cook stoves to the people, training of local cook stove makers, reforestation activities through local associations, and providing revolving micro credit to help poor people.

Additionally, there is the use of a participative approach and promotion of community ideas especially by the CREF Network which works with community-based organisations, evaluation of activities by beneficiaries in general assemblies, promotion of the application of the communities' consent in all REDD+ projects to defend their rights, and the involvement of communities in identifying problems and priorities. The involvement of local communities in the establishment of nurseries, formation of a network of all field workers on environmental protection, use of local labour, involvement of local communities in pure forestry and in different alternative activities (e.g. agriculture and grazing), and the provision of trucks to communities to transport their products are some other forms of community engagement.

On the involvement of the civil society and local people in activities of climate change mitigation in the RSA, the following results were found: participation of different sectors including the academia, NGOs, civil society organisations, consultation based on the DEA's constitution and

principles. There is a clear need to involve different levels of stakeholders, and the establishment of the IGCCC (Intergovernmental Committee on Climate Change) which also includes NGOs, and the formation of steering committees to offer input on existing projects ensure community involvement in the projects.

Other ways include collaborating with and organising workshops in disadvantaged communities, identifying forest areas in Forest Management Units with estate managers and forest workers and guards, formation of a participatory Forest Management Committee in the Eastern Cape, one of several such committees established to foster cooperation between the government and rural communities.

Additionally, environmental education of youth in schools and anyone who is committed to environmental protection, the establishment of community groups and community-based organisations which focus on climate change energy, adoption of Earthlife's ground-up rather than the government's top-down approach, and involvement of women's groups in climate change mitigation activities are also various ways of involving communities in projects. The subsequent handover plan of projects to local communities, publication of all data on climate change and energy except for some confidentiality agreements with organisations especially by the University of Cape Town's Energy Research Centre, and organising seminars on specific research topics that involve community-based organisations or community members, the civil society and businesspeople also promote community involvement in projects.

On the objectives of the energy sources that are being used or envisaged in the DRC, a number of results were found. Since the energy sector contributes much to atmospheric pollution, it is important to consider existing and envisaged sources of energy that (can) contribute to climate change mitigation in the DRC. After data collection through interviews of organisations and REDD+ projects, existing and envisaged sources of energy are found to include rural projects on solar energy by the Gorilla Organisation, promotion of improved cook stoves as an intermediary solution, the use of hydropower and briquettes, marketing of the biomass kit, and the extraction of methane gas especially from the Kivu Lake.

Other sources include the geothermic energy from the volcanic zones, manufacturing of stoves called Bukavu, use of imported generators, wind energy but only in limited areas, the energy potential from agriculture which is envisaged, and the use of charcoal from trees. The DRC also envisages using the carbonisation method which consumes fewer trees, the establishment of

plantations for firewood, the industrial production of charcoal from acacia and the biogas kit, and the use of dead woods for wood energy by villagers.

The South African energy sector which is huge has been the focus of many researches. After data collection, the existing and envisaged energy sources found through interviews are as follow:

- Biogas digester, feedstock, and technologies which also attract some social benefits in the year 2015.
- Coal is major in terms of electricity generation, as almost 94% of the electricity is obtained from coal, 4% from nuclear energy, and renewable energy is rather minimal.
- The nuclear sector in South Africa is guided mainly by the Nuclear Energy Act, Act 46 of 1999 and the National Radioactive Waste Disposal Institute Act, Act 53 of 2008, and the National Nuclear Regulator (NNR) Act, Act 47 of 1999. These Acts are administered by the Department of Energy;
- The SunFire solution company provides solar cookers to people in South Africa. The SunFire parabola captures sun energy to boil water in pots. The validity of a solar cooker is between five and ten years. It needs neither fuel or gas nor cables - only exposure to the sun.

On the application of remote sensing in the DRC and RSA, the following results were found:

According to the data obtained from the field, remote sensing is used in the DRC, but only by a few organisations such as the WWF and the DIAF for whose offices are located in Kinshasa. The DRC does not have satellites to monitor its forests, and most of the images are provided by France, OSFAC, MOAPI and other organisations. The access to images is free for the land sat, but the spot images are difficult to access because they are quite expensive.

Some stakeholders which operate around the Virunga National Park believe that remote sensing could have negative impacts on ecosystems if it emits radioactive rays, which can kill animals and destroy forest vegetation and protected areas. Thus, such people are hesitant to use remote sensing and they prefer that further research be conducted on remote sensing to determine whether or not it emits radioactive rays.

The DRC does not have enough specialists in remote sensing, and it needs to train more specialists in this field, as specialists who operate presently in DIAF in Kinshasa are from Brazil.

With this situation, many REDD+ projects have no experts in remote sensing except the WWF which has some assistants. Another issue is that in some provinces, government agents working in environmental services ignore the use of remote sensing for environment protection by NGOs. This shows that the collaboration between NGOs and government institutions is only partial.

According to the respondents, remote sensing is used in South Africa but it can cost less money and take less time if specialists are available. The disadvantage however is that the accuracy is always questionable which can create confusion if vegetation is not properly identified. Hence, it is helpful to conduct fieldwork for confirmation. If the sampling is done with remote sensing, this can increase accuracy for example of the national statistics. The South African Space Agency has certain products including the national surveillance and images which can be obtained through it even though at a costly rate. Thus, all departments should have a Geographical Information section which is also quite expensive. Although some people are trained in the field of Geographical Information and remote sensing in the Department of Forestry, South Africa still needs to train more people in remote sensing use.

6.4 Conclusions

Climate change is a global phenomenon that affects us all. Two main approaches of dealing with climate change are through mitigation and adaptation. The present study is focused on mitigation. Climate change mitigation seeks to reduce the emission of greenhouse gas into the atmosphere. This study assessed climate change mitigation strategies in the forestry and energy sectors of the DRC and RSA. It is evident from the results that all institutions and organizations understand the role of forests and energy sectors in climate change policy and reform and mitigation.

The research came to find some weaknesses of the climate change mitigation strategies in the forestry and energy sectors of the DRC and RSA which have been analyzed in this study. Improvements of the weaknesses noticed are suggested through new policies on climate change mitigation. Good governance and the international funding of mitigation activities in the forestry and energy sectors are key entry points for success in the climate change domain both in DRC and RSA. The dissertation has suggested a model for sustainable mitigation in the forestry and energy sectors of both countries, which can be applied in other countries.

6.5 Recommendations

The OECD (2007) indicates that climate change mitigation by both public and private sectors rests on three pillars. These pillars are namely: the development of relevant policies, investments in infrastructure and technologies, and behavioral change. In view of this, the following are recommendations for the DRC and RSA to be able to play a major role in mitigating climate change through the forestry and energy sectors:

1. The DRC need to ensure that the exploitation of forest resources benefit the Congolese community by building infrastructure such as hospitals and schools;
2. The DRC need to integrate the project of dam construction in the alternative activities of REDD+ projects as one of the sustainable solutions for forest protection;
3. The DRC need to learn from other countries with good governance in the forestry sector so that local communities/indigenous people can be direct beneficiaries of all compensations related to forest protection;
4. The DRC should ensure that the six ongoing REDD+ pilot projects reach the third phase of implementation with positive implication for the National Frame Strategy for fighting drivers of deforestation and carbon credit;
5. The gap between policy (DRC forest code application), awareness and implementation should also be explored;
6. There is a high need for the DRC government to create a mechanism for accessing spot images with high resolution each year for provinces and territories. This strategy can help the DRC to do a permanent monitoring of its forest cover;
7. The conservation of the flora is important in the DRC. The government should implement botanical gardens in all provinces in order to preserve all endangered species;
8. A budget allocation is needed for the implementation of climate change mitigation activities both in DRC. The UNFCCC should make available the REDD+ funds from 2020 as decided in the COP 21 held in Paris last December 2015;
9. Climate change mitigation strategies in DRC need to involve all civil society members for success. The GTCR (REDD Climate Working Group of the Civil Society) should be restructured and REDD centres in all the DRC provinces should be maintained;
10. There is a need to reduce emissions from deforestation. The DRC government should transcend the production of the Atlas that was published in 2014 and explore the potential

of hydropower in the DRC by investing in dam projects that could generate up to 100 000 MGW of electricity;

11. The South African government specifically the Department of Forestry, Agriculture and Fisheries, and the Department of Environmental Affairs should update all Acts that have been promulgated so that they directly relate to climate change issues;
12. The South African government need to combat deforestation emanating from mining activities, and organise the regrowth of natural forests in mining areas;
13. The use of coal as source of energy in South Africa contributes to a high pollution. The South African government and the department of Energy (DoE) need to decrease the use of the coal as a source of energy by importing electricity from other SADC countries, and implement projects on renewable energy;
14. The nuclear power has positive and negative aspects when it is implemented. The South African government and the Department of Energy should limit the establishment of nuclear plants because they are very expensive, and the exploitation of uranium because of its high radioactivity that contributes to environmental degradation and pollution of water which are dangerous for human and animal health.

6.6 Recommendations for future studies

This study suggests the need for two supporting studies. The first is a need for a study focusing on policies supporting climate change activities in the forestry and energy sectors of the DRC and RSA. Such a study will serve to shed light on a number of issues related to the gap between the implementation of climate change activities and policies. The second study would be an examination of how governments, NGOs and civil society members can collaborate to make successful climate change mitigation strategies in the forestry and energy sectors both in the DRC and RSA.

REFERENCE LIST

- Abdullah Al-Wassai F & Kalyankar NV n.d.: Major imitations of satellite images. Yeshwant computer science department, Mahavidyala College: Nanded, India.
- Abdulrahman K 2010: Remote sensing. Department of applied science. (1st Ed.) Ministry of higher education and scientific research, Iraq.
- Agrawal A, Nepstad D & Chhantre A 2011: Reducing emissions from deforestation and forest degradation. *Annual reviews*. University of Michigan.
<http://www.annualreviews.org/doi/pdf/10.1146/annurev-environ-042009-094508>.
- Alden-Wily L 2002: Participatory forest management in Africa: an overview of progress and issues. Second international workshop in Africa, Kenya: Ministry of environment.
- American Society of Photogrammetry 1975: Remote sensing for hydrologic modeling, Cambridge University Press, Cambridge, United Kingdom.
- Andrews P, Antonowicz N, Brandt R, Krishnamurthy K, Shirokova V & Westlund J 2011: *Cancún de-briefing: an analysis of the Cancún agreements*. Climatico analysis, Mexico, COP16, UNFCCC. <http://www.climaticoanalysis.org/wp-content/uploads/2011/02/Canc%C3%BAAn-De-briefing.pdf>.
- Appiah M, Blay D, Damnyag L, Dwomoh F, Pappinen A, Luukkanen O 2009: Dependence on forest resources and tropical deforestation in Ghana. *Environment Development and Sustainability*
- Arfat Y 2010: Land Use\Land Cover Change Detection and Quantification-A case study in Eastern Sudan, Sweden, Land University: Department of Earth and Ecosystem Sciences.
- Arvizu D, Balaya P, Cabeza L, Hollands T, Jager-Waldau A, Kondo M, Konseibo C, Meleshko V, Stein W, Tamaura Y, Xu H & Zilles R 2011: Direct solar energy. In Edenhofer O, Pichs-Madruga R, Sokona Y, Seyboth K, Matschoss P, Kadner S, Zwickel T, Eickemeier P, Hansen G, Schlomer S & Von Stechow C (eds): *IPCC special report on renewable energy sources and climate change mitigation*. Cambridge University Press: Cambridge, UK.

- Alig R., Adams D , McCARL, Callaway JM, Winnett S 1997: *Assessing effects of mitigation strategies for global climate change with an intertemporal model of the us forest and agriculture sectors*. Environmental and resource economics, Vol 9, Kluwer Academic Publishers, the Netherlandais
- Adger WN n.d: Scales of governance and environmental justice for adaptation and mitigation of climate change, journal of international development, J, Tyndall Centre for Climate Change Research and CSERGE, University of East Anglia, Norwich, UK
- Badrinarayana D, Boom K, Burkett M, Cha M, Charle-Newton E, Crippa A, Davis M, Dong P, Johnstone N, Kameri –Mbote P, Kebec P, Krakoff S, Lavallee J, Liu J, Long A, Miranda L, Yow Mulalap C, Nyukuri E, Osofsky H, Royster V, Stoyanova L, Sutton V, Techera J, Thériault S, Tsosie R, Van Tuyn P & Yu W 2013: *Climate change and indigenous peoples: the search for legal remedies*. Edward Elgar:Northampton, MA.
- Bamiloke A, Walid E, Salma H, Martin K, Majafela M, Josephine M, Shingirirai M, Tomothy S, William S & Kamelia Y 2011: *Energy transition in Africa*. African Institute of South Africa: Pretoria, 1.
- Bazilian M, Hobbs B, Blyth W, MacGill I & Howells M 2011: *Interactions between energy security and climate change: a focus on developing countries*. Energy Policy, RSA.
- Bele MY, Somorin OA, Sonwa DJ, Nkem JN & Locatelli B 2010: Forest and adaptation policies in Cameroon. Mitigation and Adaptation Strategies for Global Change.
- Bernard HR 1995: *Research methods in anthropology*. (2nd Ed.) AltaMira Press: Walnut Creek, 95.
- Blay D, Appiah M, Damnyag L, Dwomoh FK, Luukkanen O, Pappinen A 2008: Involving local farmers in rehabilitation of degraded tropical forests: some lessons from Ghana. *Environment Development and Sustainability*.
- Body A n.d: *South African Approaches to measuring, reporting and verifying: a scoping report*. University of Cape Town Energy Research Centre: Cape Town.
http://www.erc.uct.ac.za/Research/publications/12-Boyd-et-al_Approches_to_MRv.pdf.

- Börner J 2011: *Drivers of deforestation and forest degradation*. Lexeme Consulting: Vancouver, Canada.
- Birdsey R, Pretgitzer & Lucier A 2006: Forest carbon management in the United States. Vol 35, School of Forest Resources and Environmental Science. Michigan Technological University
- Bruckner T, Bashmakov IA, Mulugetta Y, Chum H, De la Vega Navarro A, Edmonds J, Faaij A, Fungtammasan B, Garg A, Hertwich E, Honnery D, Infield D, Kainuma M, Khennas S, Kim S, Nimir HB, Riahi K, Strachan N, Wisser R and Zhang X, 2014: Energy systems. In Edenhofer O, Pichs-Madruga R, Sokona Y, Farahani E, Kadner S, Seyboth K, Adler A, Baum I, Brunner S, Eickemeier P, Kriemann B, Savolainen J, Schlömer S, von Stechow C, Zwickel T and Minx JC (eds.) *Climate change 2014: mitigation of climate change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge University Press: Cambridge, UK.
- Burns N & Grove S 2005: *The practice of nursing research: conduct, critique and utilization*. (5th Ed.) Elsevier: St Louis.
- Castillo AR, McLean KG, Raygorodetsky G, Eickemeier P, Minx J, Monagle C & Johnston S 2012: *Climate change mitigation with local communities and indigenous peoples: practices, lessons learned and prospects*. Ameyali Ramos and Kirsty Galoway McLean (eds.). Cairns, Australia.
<http://www.unutki.org/downloads/File/Publications/Meetings/CCMLCIP-2012-Crn-3-Report-Final.pdf>.
- Chandler W, Schaeffer R, Dadi Z, Shukla PR, Tudela F, Davidson O & Atamer S 2002: *Climate change mitigation in developing countries: pew centre on global climate change*. Federal University of Rio de Janeiro. http://www.c2es.org/docUploads/dev_mitigation.pdf.
- Canadell JG & Raupach MR 2008: *Managing Forests for Climate Change Mitigation*, Vol 320, American Association for the advancement of SCIENCE.
- Chum H, Faaij A, Moreira J, Berndes G, Dhamija P, Dong H, Gabrielle B, Goss Eng A, Lucht W, Mapako M, Masera Cerutti O, McIntyre T, Minowa T & Pingoud K 2011: Bioenergy. In Edenhofer O, Pichs-Madruga R, Sokona Y, Seyboth K, Matschoss P, Kadner S, Zwickel T, Eickemeier P, Hansen G, Schlömer S & Von Stechow C (eds): *IPCC special report on*

renewable energy sources and climate change mitigation. Cambridge University Press: Cambridge, UK.

MILLAR CI, Nathan L, Stephenson & STEPHENS SL 2007: *climate change and forests of the future: managing in the face of uncertainty*, Ecological Society of America, Vol 17, N° 8.

Civil Society 2009: *Position of the Congolese Civil Society Working Group on UN-REDD mission in the Democratic Republic of Congo*. Government Printer: Kinshasa.

Creswell JW 1998: *Qualitative inquiry and research design*. Sage Publications: London.

Dale VH, Joyce LA, McNulty S, Neilson RP, Ayres MP, Flannigan MD, Hanson PJ, Irland L, Lugo A, Peterson CJ, Simberloff D, Swanson FJ, Stocks BJ, and Wotton BM 2001: Climate change and forest disturbances, volume 51, No 9. *Bio Science*.

David CL 2011: *South African risk and vulnerability: a handbook for Southern Africa*. Council for Scientific and Industrial Research: Pretoria.

Davidson O, Winkler H, Kenny A, Prasad G, Nkomo J, Sparks D, Howells M, Alfstad T 2006: *Energy policies for sustainable development in South Africa*. Energy Research Centre: Cape Town.

Decree No 09/40 of 26/11/09 on the creation of REDD, composition and organisation of the structure for implementing the process for reducing emissions from deforestation and forest degradation, acronym REDD in DRC: Ministry of environment.

DEAT 2004: *Greenhouse gas inventory South Africa from 1990 to 2000: compilation under the United Nations Framework Convention on Climate Change*. Department of environmental affairs and tourism, South Africa.

http://rava.qsens.net/themes/theme_emissions/government-publications/SA%20GHG%202000.pdf.

Diasotuka 2012: Personal communication. Official in charge of the national project in the office of the National REDD Directorate. Kinshasa.

Dixon R K, Brown S, Houghton RA, Solomon AM, Trexler MC, & Wisniewski J 1994a: *Carbon pools and flux of global forest ecosystems*. *Science*

DoE 2012: *A survey of energy-related behaviour and perceptions in South Africa: The Residential Sector*, Department of Energy.

- Donald G 1999: *Growing the forest in South Africa*, South Africa DoE 2012. *A survey of energy-related behavior and perceptions in South Africa: the residential sector*. Department of Energy, Tappi Journal: Pretoria.
- Dooley K 2011: *Forest watch special report-UNFCCC climate talks*. Cancun, EU forest watch. <http://www.fern.org/sites/fern.org/files/Cancun%20update.pdf>.
- DRC Government 2002: Democratic Republic of Congo Forest Code. Ministry of Environment: Kinshasa.
- DST n.d.: South African risk and vulnerability. http://www.rvatlas.org/download/sarva_atlas.pdf.
- Eisner E 1991: *The enlightened eye: qualitative inquiry and the enhancement of educational practice*. Macmillan: New York.
- Dunlap RE, Catton JWR 2002: Which function(s) of the environment do we study? a comparison of environmental and natural resource sociology. *Society and Natural Resources*.
- EPA 2012: *Climate change indicators in the United States*. (2nd Ed.) Research and development and the office of water, United States. <http://www.epa.gov/climatechange/pdfs/climateindicators-full-2012.pdf>.
- Fearnside PM 2000: *Uncertainty in land-use change and forestry sector mitigation options for global warming: Plantation silviculture versus avoided deforestation*. Department of Ecology, National Institute for Research in the Amazon (INPA), Amazonas, Brazil.
- FAO 2004: *Trends and current status of the contribution of the forestry sector to national economies*. Forestry Department: Rome.
- FAO 2011: Submission to the UNFCCC secretariat on issues identified in decision 1/CP.16, paragraph 72 and appendix II: in answer to the invitation of paragraph 5 of draft conclusions UNFCCC/SBSTA/2011/L.25. <http://unfccc.int/resource/docs/2012/smsn/igo/70.pdf>.
- FAO 2010: *Climate change implications for agricultural development and natural resources conservation in Africa*, Nature and fauna magazine, volume 25, Issue 1, Accra, Ghana
- Firuz A Al-Wassai & Kalyankar NV 2011: *Major limitations of satellite images*. Nanded, India: Yeshwant Computer Science Department.
- FPP 2010: Consultation with indigenous peoples and others affected by REDD initiatives in the DRC: an example of best practices? *Rights, forests and climate briefing series*. E-Newsletter: Kinshasa.

- Geist HJ & Lambin EF 2002: Proximate causes and underlying driving forces of tropical deforestation, *Bioscience*, 52(2). [http://www.bioone.org/doi/pdf/10.1641/0006-3568\(2002\)052%5B0143%3APCAUDF%5D2.0.CO%3B2](http://www.bioone.org/doi/pdf/10.1641/0006-3568(2002)052%5B0143%3APCAUDF%5D2.0.CO%3B2).
- Golafshani N 2003: Understanding reliability and validity in qualitative research. *Qualitative Report*, 8.
- Goldstein B, Hiriart G, Bertani R, Bromley C, Gutierrez-Negrin L, Huenges E, Muraoka H, Ragnarsson A, Tester J & Zui V 2011: *Geothermal energy*. In Edenhofer O, Pichs-Madruga R, Sokona Y, Seyboth K, Matschoss P, Kadner S, Zwickel T, Eickemeier P, Hansen G, Schlomer S & Von Stechow C (eds): *IPCC special report on renewable energy sources and climate change mitigation*. Cambridge University Press: Cambridge, UK.
- Golub A, Hertel T, Lee HL, Rose S, Sohngen B 2009: The opportunity cost of land use and the global potential for greenhouse gas mitigation in agriculture and forestry. *Resource and Energy Economics*.
- Gorte RW & Sheikh PA 2010: Deforestation and climate change: congressional research service. <http://fpc.state.gov/documents/organization/140767.pdf>.
- Gordon C, Jallow AM, Lawson ET, Jesse S, Ayivor JS Adelina & Mensah M 2010: *Food security and natural resources management: Overview on climate change implications for Africa*: in Nature and fauna magazine, volume 25, Issue 1, Accra, Ghana
- Griffiths T 2008: *Seeing REDD? Forest, climate change mitigation and the rights of indigenous peoples and local communities*: update for Poznan (UNFCCC COP14), forest peoples programme. England, UK: UNFCCC.
- Grainger A 1993: *Controlling Tropical Deforestation*. Earthscan, Publications Ltd., London, UK.
- GTCR 2012: Memorandum of Congolese Environmental Civil Society on the REDD process in DR Congo, Kinshasa. http://www.forestpeoples.org/sites/fpp/files/news/2012/07/Memorandum%20SC%20FCPF_English_0.pdf.
- Halim M 2013: *Africa-Democratic Republic of Congo*. New York: Macmillan.
- Hartiz M 2011: *Climate change law, policy and series, an inconvenient deliberation*: Kluwer Law international BV: the Netherlands.
- Hillel D & Rosenzweig C 2011: *The role of soils in climate change*. ICP Series on climate change impacts, adaptation, and mitigation (Vol.1). Imperial College Press: London.
- IEA 2010: *World energy outlook*. OECD: France.

IPCC 2007: Climate change, the physical science base. Cambridge University Press, UK: Cambridge.

IPCC 2007a: Climate Change, the Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Solomon S, Qin D, Manning M, Chen Z, Marquis M, Tignor KBM and Miller HL (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

IPCC 2007b: Climate Change, Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Parry ML, Canziani OF, Palutikof JP, Van der Linden PJ, Hanson CE (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

IPCC 2007c: *Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, B. Metz, O.R. Davidson, P.R. Bosch, R. Dave, L.A. Meyer, eds., Cambridge University Press, Cambridge, United Kingdom and New York, N.Y.

ISDR 2008: *Climate change and disaster risk reduction*. United Nations: Geneva.

Guiney I & Khavaghali V 2012: Rights-based REDD-plus dialogue. Department of Environmental Affairs: Cape Town.

Guiney I 2011: South African perspective. Department of Environmental Affairs: Cape Town.

Jackson W 2011: Intergovernmental panel on climate change. In *Green politics*. Sage Publications: London.

Kal FB, Ame, Luukkanen O, Elsiddig EA & Glover EK 2010: Tree Knowledge and Livelihood Activities in a Changing Environment: Views From Smallholder Farmers in Kosti, Sudan

Kilawe E 2010: *Climate change mitigation and REDD+ in Africa: Issues, options and challenge for REDD+ implementation*. In *Nature and fauna magazine*, volume 25, Issue 1, Accra, Ghana

Kindermann G, Obersteiner M, Sohngen B et al. 2008: Global cost estimates of reducing carbon emissions through avoided deforestation. *Proceedings of the National Academy of Sciences*

- Kissinger G & Herold M 2012: *Drivers of deforestation and forest degradation: a synthesis report for REDD+ policymakers*. Lexeme Consulting: Vancouver, Canada.
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/65505/6316-drivers-deforestation-report.pdf.
- Koch B. 2010: Remote sensing supporting national forest inventories. Department of remote sensing and landscape, information systems, faculty of forest and sciences, Albert-Ludwigs University of Freiburg: Freiburg.
- Kumar A, Schei T, Ahenkorah A, Caceres Rodriguez R, Devernay JM, Freitas M, Hall D, Killingtonveit A & Liu Z 2011: *Hydropower*. In Edenhofer O, Pichs-Madruga R, Sokona Y, Seyboth K, Matschoss P, Kadner S, Zwickel T, Eickemeier P, Hansen G, Schlomer S & Von Stechow C (eds): *IPCC special report on renewable energy sources and climate change mitigation*. Cambridge University Press: Cambridge, UK.
- Lavrakas 2008: *Encyclopedia of survey, research methods, purposive sample*. Sage Knowledge, University of South Africa: Pretoria.
- Lewis A, Estefen S, Huckerby J, Musial W, Pontes T & Torres-Martinez J 2011: *Ocean energy*. In Edenhofer O, Pichs-Madruga R, Sokona Y, Seyboth K, Matschoss P, Kadner S, Zwickel T, Eickemeier P, Hansen G, Schlomer S & Von Stechow C (eds): *IPCC special report on renewable energy sources and climate change mitigation*. Cambridge University Press: Cambridge, UK.
- Lewis SL, Lopez-Gonzalez G, Sonke B, Affum-Baffoe K, Baker TR, Ojo LO, Phillips OL, Reitsma JM, White L, Comiskey JA, Djuikouo KM, Ewango CE, Feldpausch TR, Hamilton AC, Gloor M, Hart T, Hladik A, Lloyd J, Lovett JC, Makana JR, Malhi Y, Mbago FM, Ndangalasi HJ, Peacock J, Peh KS, Sheil D, Sunderland T, Swaine MD, Taplin J, Taylor D, Thomas SC, Votere R & Woll H 2009: Increasing carbon storage in intact African tropical forests. *Nature*, UNDP
- Locatelli B, Kanninen M, Brockhaus M, Colfer CJP, Murdiyarso D & Santoso H 2008: *Facing an uncertain future: how forest and people can adapt to climate change*. Bogor, Indonesia: CIFOR.
- Locatelli B, Evans V, Wardell A, Andrade A & Vignola R 2011: *Forests and Climate Change in Latin America: Linking Adaptation and Mitigation*, volume 2, Cedex, France.
- Lund H & Stergaard PA 2010: Climate change mitigation from a bottom-up community approach *in sustainable communities: design handbook*, Amsterdam, Chapter 14, 247: Elsevier

- Mack N, Woodsong C, MackQueen K, Guest G & Namey E 2005: *Qualitative research methods: a data collector's field guide*. USA: Family Health International.
- Mandla S 2011: The green economy and climate change, risks and opportunities for Africa. In *Green economy and climate mitigation: topics of relevance for Africa* Africa Institute of South Africa: Pretoria.
- McClanahan P 2008: *Avoided deforestation in the Democratic Republic of Congo*.
http://dukespace.lib.duke.edu/dspace/bitstream/handle/10161/846/MP_pmm14_a_200812.pdf?sequence=1.
- Mckechnie J, Colombo S, Chen J, Mabee W & Maclean HL 2011: Mitigation strategies through capturing and storing atmosphere CO₂. *Environmental science and technology*, vol 45, N^o2.
- MECNT 2009: *Greenhouse gas inventory of the Democratic Republic of the Congo: compilation under the United Nations Framework Convention on Climate Change*, Kinshasa: Ministry of Environment
- MECNT, UN-REDD, GTCR, & FAO 2012: *Qualitative study on causes of deforestation and forest degradation in the DRC*. Government Printer: Kinshasa.
- MECNT 2008: *Environmental and climate change policy*. University of Gothenburg: Gothenburg.
- Mintzberg H 1994: *The rise and fall of strategic planning*. Basic Books: Free Press.
- Moomaw W, Yamba F, Kamimoto M, Maurice L, Nyboer J, Urama K, Weir T 2011: *Introduction*. In Edenhofer O, Pichs-Madruga R, Sokona Y, Seyboth K, Matschoss P, Kadner S, Zwickel T, Eickemeier P, Hansen G, Schlomer S & Von Stechow C (eds): *IPCC special report on renewable energy sources and climate change mitigation*. Cambridge University Press: Cambridge, UK.
- Mouton J 2001: *How to succeed in your Master's and doctoral studies: a South African guide and resource book*. Van Schaik: Pretoria.
- Nabuurs GJ, Masera O, Andrasko K, Benitez-Ponce P, Boer R, Dutschke M, Elsiddig E, Ford-Robertson J, Frumhoff P, Karjalainen T, Krankina O, Kurz WA, Matsumoto M, Oyantcabal W, Ravindranath NH, Sanz Sanchez MJ & Zhang X 2007: Forestry. In Metz B, Davidson OR, Bosch PR, Dave R & Meyer LA (eds.). *Climate change 2007: mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge University Press: Cambridge,

UK. <http://www.ipcc-wg3.de/assessment-reports/fourth-assessment-report/.files-ar4/Chapter09.pdf>.

- Nabuurs GJ, Masera O, Andrasko K & al. 2007: Forestry. In: Climate Change 2007: Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, UK and New York, USA
- Nabuurs GJ & al., in Climate Change 2007: Mitigation, B. Metz et al., Eds. (Cambridge Univ. Press, Cambridge).
- Nagesh D n.d: Remote sensing: Introduction and basic concepts. Bangalore.
- Nhamo G 2011: The green economy and climate change, risks and opportunities for Africa. In Green economy and climate mitigation: topics of relevance for Africa. African Institute of South Africa: Pretoria.
- Ochego H 2003: *Application of remote sensing in deforestation monitoring: a case study of the Aberdares (Kenya)*. Marrakech, Morocco.
- Panwar NL, Kaushik SC, Kothari S 2011: Role of renewable energy sources in environmental protection: A review, Department of Renewable Energy Sources, College of Technology and Engineering, Maharana Pratap University of Agriculture and Technology.
- Parker C, Mitchel A, Trivedi M & Madras M 2009: *The little REDD+ book*. Global Canopy Programme (3rd Ed.) Oxford, UK.
- Patenaude G, Milne R, Dawson TP 2005 : Synthesis of remote sensing approaches for forest carbon estimation: reporting to the Kyoto Protocol. *Environmental Science and Policy*
- Ruark G, Schoeneberger M & Nair PK 2003: Agroforestry-helping to achieve sustainable forest management. In *The role of planted forests in sustainable forest management*. Wellington.
- Raupach MR *et al.* 2007: in *The Global Carbon Cycle: Integrating Humans, Climate and the Natural World*, C. B. Field, M. R. Raupach, Eds. (Island Press Washington, DC)
- Rose SK, Sohngen B 2011: Global forest carbon sequestration and climate policy design. *Environment and Development Economics*.
- Sajjad A, Hussain A, Wahab U, Adnan S, Ahmad Z, Ali A & Ali S 2015: Application of remote sensing and GIS in forest cover change in Tehsil Barawal, District Dir, Pakistan. *American Journal of Plant Sciences*.
- Sandker M, Nyame SK, Förster J, Collier N, Shepherd G, Yeboah D, Blass DE, Machwitz

- M, Vaatainen S, Garedew E, Etoga G, Ehringhaus C, Anati J, Quarm ODK, Campbell BM 2010: REDD payments as incentive for reducing forest loss. *Conservation Letters*
- Sathaye, J, Najam, A, Cocklin, C, Heller, T, Lecocq, F, Llanes-Regueiro, J, Pan, J, Held, G, Rayner, S, Robinson, J, Schaeffer, R, Sokona, Y, Swart, R & Winkler, H 2007: Sustainable development and mitigation. In B Metz, Davidson OD, Bosch P, Dave R and Meyer LM (eds.). *Climate Change 2007: mitigation, contribution of Working Group III to the IPCC Fourth Assessment Report*. Cambridge University Press: Cambridge, UK.
- Sathaye J, Cannell M, Kauppi P, Finlancl 2000: Management of Forests for Mitigation of Greenhouse Gas Emissions, Sandra Brown, USA
- Schelhas J, Samar S, Johnson C, Asumadu K, Tease F, Stanturf J, Blay D 2010: Opportunities and Capacity for Community-based Forest Carbon Sequestration and Monitoring in Ghana: in *Nature and fauna magazine*, volume 25, Issue 1, Accra, Ghana
- Schmook B 2011: Deforestation. In *Green politics*. Sage Publications: London.
- South African Weather Service 2012: *South Africa's geography*. SAinfo material: Pretoria.
- Smith P, Martino D, Cai Z et al. 2007a: Agriculture. In: Chapter 8 of *Climate change 2007: Mitigation. Contribution of Working group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* (eds Metz B, Davidson OR, Bosch PR, Dave R, Meyer LA), pp. 497–540. Cambridge University Press, Cambridge, UK and New York, USA.
- Smith P & Olesen JE 2010: Synergies between the mitigation of, and adaptation to, climate change in agriculture. *Journal of Agricultural Science*, Cambridge University Press.
- Sims REH, Rogner HH, Gregory K 2003: Carbon emission and mitigation cost comparisons between fossil fuel, nuclear and renewable energy resources for electricity generation. Centre for Energy Research, Massey University, Palmerston North, New Zealand
- Smith P, Martino D, Cai Z et al. 2008: Greenhouse gas mitigation in agriculture. *Philosophical Transactions of the Royal Society B: Biological Sciences*.
- Sohngen B 2009: *An analysis of forestry carbon sequestration as a response to climate change*. Copenhagen Consensus Center, Denmark.
- Stenbacka, C 2001: Qualitative research requires quality concepts of its own. *Management Decision*, 39(7), 551-555.
- Tacconi L, Mahanty S & Suich H 2010: *Payments for environmental services, forest conservation and climate change: livelihoods in the REDD?* Edward Elgar Publishing: Northampton, MA.

UNCE and FAO 2005: European forest sector outlook study 1960-2000-2020. Timber Branch: Geneva.

UNCED 1992: *Towards a sustainable future*. United Nations: Brazil.

UNEP 2013: *Emissions reductions profile in the DRC*. Kinshasa: Ministry of Environment.

UNFCCC 2009: *The fact sheet: the need for mitigation*.

http://unfccc.int/files/press/backgrounders/application/pdf/press_factsh_mitigation.pdf.

UNFCCC 2010: Implications for indigenous People's Local Adaptation and Mitigation Measures. Item 3 of the provisional agenda. New York.

UNFCCC 2011: *Fact sheet: climate change science - the status of climate change science today*. http://unfccc.int/files/press/backgrounders/application/pdf/press_factsh_science.pdf.

UNFCCC 2012: *Methodological guidance for activities relating to reducing emissions from deforestation and forest degradation, and the role of conservation, sustainable management of forests and enhancement of forest carbon stock in developing countries*. Subsidiary Body for Scientific and Technological Advice. Thirty-sixth session, Bonn, Germany, 15.

United States Department of Energy 2010: Energy Sector-Specific Plan, USA.

UN-REDD 2012: Programme on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries. United Nations: Geneva.

Wang X, Lewis BJ, Qi G, Yu D, Zhou L & Dai L 2013: An application of remote sensing data in mapping landscape level forest biomass for monitoring the effectiveness of forest policies in Northeastern China. Springer Science +Business Media: New York.

Waggoner PE 1994: How Much Land Can Ten Billion People Spare for Nature? Task Force Report No. 121, Council for Agricultural Science and Technology, Ames, IA, USA, 64 pp.

Winkler H 2008: *Climate change mitigation negotiations with an emphasis on options for developing countries*. University of Cape Town Energy Research Centre: Cape Town. http://www.erc.uct.ac.za/Research/publications/08Winkler-UNDP_Mitigation.pdf.

Winkler H, Hohne N & Elzen M 2008: *Methods for quantifying the benefits of sustainable development policies and measures (SD-PAMs)*. University of Cape Town Energy Research Centre: Cape Town. http://www.eri.uct.ac.za/Research/publications/08Winkler-et al_Quantifying_benefits_SDPAMs%20methods.pdf.

- Winkler H & Marquand A 2009: *Changing development paths: from an energy-intensive to low-carbon economy in South Africa*. University of Cape Town Energy Research Centre: Cape Town. http://startinternational.org/library/archive/files/energy-and-climate_7cb692b5af.pdf.
- Winkler H, Marquard A, Manley J, Davis S, Trikam A, Den Elzen M, Hohne N & Witi J 2008: *Quantifying SD-PAMS: national energy models and international allocation models for climate change mitigation*. South African case study. University of Cape Town Energy Research Centre: Cape Town.
- Winkler H, Rahlao S, Mantlana B & Knowles T 2011: *South Africa's national REDD+ initiative: assessing the potential of the forestry sector on climate change mitigation*. Energy, Environment and Climate Change Programme. University of Cape Town Energy Research Centre: Cape Town. http://www.erc.uct.ac.za/Research/publications/12Rahlao-etaleSP_REDD_for_SA.pdf.
- Wiser R, Yang Z, Hand M, Hohmeyer O, Infield D, Jensen PH, Nikolaev V, O'Malley M, Sinden G & Zervos A 2011: Wind energy. In Edenhofer O, Pichs-Madruga R, Sokona Y, Seyboth K, Matschoss P, Kadner S, Zwickel T, Eickemeier P, Hansen G, Schlomer S & Von Stechow C (eds.). *IPCC special report on renewable energy sources and climate change mitigation*. Cambridge University Press: Cambridge, UK.
- Zheng D, Ducey MJ & Heath LS 2008: Satellite detection of land-use change and effects on regional forest aboveground biomass estimates: *Environ Monit Assess*.

APPENDIXES

APPENDIX A: INTERVIEW GUIDE USED WITH KEY INFORMANTS

INTERVIEW GUIDE

Place:

Sex:

Interviewer:

Date:

Start:

End:

(Question 1)

What are the different strategies or measures that can be used to counter drivers of deforestation in the DRC/RSA?

(Question 2)

How is the national REDD project unfolding and how does REDD with other organisations contribute to climate change mitigation in the DRC/RSA?

(Question 3)

How does your organisation involve the civil society/local communities/indigenous people in climate change mitigation strategies activities through REDD or other programmes in the DRC/RSA?

(Question 4)

What are the energy sources used in the DRC/RSA and what other energy sources are envisaged by the government and other organisations for mitigating climate change?

(Question 5)

Does your organisation use remote sensing? If yes, what are its advantages and disadvantages, and what issues relate to the use of this tool?

APPENDIX B: FOCUS GROUP GUIDE USED IN FOCUS GROUP DISCUSSIONS

FOCUS GROUP GUIDE

Place:

Number of participants:

M ...

F ...

Moderator:

Interviewer:

Note-taker:

Date:

Transcriber:

Start:

End:

(Question 1)

What is your understanding of a REDD project?

(Question 2)

How does your organisation fight deforestation?

(Question 3)

What progress is being made in the REDD projects and other activities of climate change mitigation in which you are involved?

(Question 4)

As members of the civil society/local communities/indigenous people, how are you involved in climate change mitigation activities?

(Question 5)

What energy sources do you use, and what other energy sources do you envisage in mitigating climate change?

(Question 6)

What sustainable mitigation strategies would you suggest for the forestry and energy sectors in the DRC?



APPENDIX C: CONSENT FORM USED DURING DATA COLLECTION

CONSENT FORM

TITLE OF RESEARCH PROJECT

Climate Change Mitigation Strategies in relation to the forestry and energy sectors in the SADC region with emphasis on the DRC and RSA as case studies

Dear Mr/Mrs/Miss/Ms _____ Date...../...../20...

NATURE AND PURPOSE OF THE STUDY

The purpose of this double case study is to gain a deeper understanding of the climate change mitigation strategies in the SADC with specific reference to the forestry and energy sectors in the DRC and the RSA. The research aims to contribute to the strengthening of academic knowledge regarding the subject, to motivate researchers to conduct further studies, and to motivate decision makers to carry out possible interventions to the problem. This research would use focus groups and interviews to get primary data from members of institutions and organisations involved in climate change mitigation activities, or environmental protection; local or forest dweller communities; and members of the environmental civil society.

The study is also considered a double case study because it focuses on climate change mitigations strategies in both the Democratic Republic of Congo and the Republic of South Africa, by investigating different strategies for reducing greenhouse gases emissions in the forestry and energy sectors.

RESEARCH PROCESS

1. The study requires your participation in focus groups and interviews to discuss climate change mitigation strategies in the forestry and energy sectors of the SADC with specific reference to the DRC and the RSA.

2. Thirty voluntary respondents to personal interviews are required who will be recruited from different organisations and seven focus groups of 10 people each will be constituted from the communities.
3. A briefing session will be held in which volunteers will be requested to take part in the study.
4. Basic demographic information will be required from you such as age, cellphone number, e-mail address, and the name of your organisation.
5. The duration of this research is two months both in the RSA and the DRC.
6. A feedback about the research project will be given to participants who submit their e-mail addresses.
7. The focus group will be led by a facilitator.
8. There are no right or wrong answers and all opinions will be valued.
9. The focus group setting offers you the opportunity to express your opinion on the subject of climate change mitigation strategies in the DRC and the RSA.
10. Personal interviews will be conducted by the researcher with key informants in their offices both in the DRC and the RSA.
11. You do not need to prepare anything in advance.
12. All participants will be given the opportunity to express an opinion, or agree or disagree with the opinion of other focus group members. The group may debate the opinions of individual members of the group.
13. A suitable place will be prepared to organise the focus group.

NOTIFICATION THAT PHOTOGRAPHIC MATERIAL, TAPE RECORDINGS, ETC WILL BE REQUIRED

The focus group discussions and personal interviews will be tape recorded to ensure that valuable information elicited during the interview is captured and the context of the information can be reviewed in detail. After the focus group interviews, the recorded material will be transcribed. You may peruse the transcription of the recording of the focus group interview in which you participated at any time.

CONFIDENTIALITY

The opinions of the focus group are viewed as strictly confidential, and only members of the research team will have access to the information. No data published in dissertations and journals will contain any information through which focus group members and personal interviews may be identified. Your anonymity is therefore ensured. The informed consent of participation in the research, the information about the purpose of the research and the confidentiality will be taken in account. The researcher will not divulge opinions given by participants during data collection, and participants among themselves will ensure that none of them reveals to outsiders what will be discussed. Participants will have the right to withdraw from or participate in the research process at any point they choose. If one of participants would like to withdraw, the researcher should thank him/her, not become upset. Names of participants should not

also appear on the interview guide and the focus group guide, or in the final report, except for the demographic information.

WITHDRAWAL CLAUSE

I understand that I may withdraw from the focus group or the personal interview at any time. I therefore participate voluntarily until such time as I otherwise request.

POTENTIAL BENEFITS OF THE STUDY

In light of the purpose of this study, government officials, NGOs and communities working on climate change mitigation strategies may be inspired to improve mitigation strategies in the forestry and energy sectors in their respective communities and countries by fighting drivers of deforestation, appreciating more clearly the relevance of REDD and using renewable energy sources in protecting the environment.

INFORMATION (contact information of your supervisor)

If I have any question concerning the study, I can contact Professor Elnour Elsiddig at +249-911439339

CONSENT

I, the undersigned (full names) have read the above information relating to the project and have also heard the verbal version, and declare that I understand it. I have been afforded the opportunity to discuss relevant aspects of the project with the project leader, and hereby declare that I agree voluntarily to participate in the project.

I indemnify the university and any employee or student of the university against any liability that I may incur during the course of the project.

I further undertake to make no claim against the university in respect of damages to my person or reputation that may be incurred as a result of the project/trial or through the fault of other participants, unless resulting from negligence on the part of the university, its employees or students.

I have received a signed copy of this consent form.

Signature of participant

Signed at on

WITNESSES

1

2

APPENDIX D: ETHICAL CLEARANCE APPROVAL



2014-06-12

Ref. Nr.: 2014/CAES/062

To:
Student: MN Mumbere
Supervisor: Prof EA Elsiddig
Department of Environmental Sciences
College of Agriculture and Environmental Sciences

Student nr: 50921533

Dear Prof Elsiddig and Mr Mumbere

Request for Ethical approval for the following research project:

Climate change mitigation strategies within the Southern African Development Community: The Democratic Republic of Congo and the Republic of South Africa as case studies

The application for ethical clearance in respect of the above mentioned research has been reviewed by the Research Ethics Review Committee of the College of Agriculture and Environmental Sciences, Unisa. Ethics clearance for the above mentioned project (Ref. Nr.: 2014/CAES/062) is given after careful consideration of all documentation submitted to the CAES Ethics Committee. Approval is given for the duration of the research project.

The candidate is reminded that permission letters for the execution of this study was received for the DRC and not for South Africa. Therefore, ethical clearance can only be given for the DRC part of the study. Should the study commence in South Africa permission letters should be submitted to the Ethics Committee to enable approval of the South African study.

The candidate is also reminded that the FFN North Kivu entity would like to receive feedback regarding the outcome of the study which should be upheld by the researcher.

Please be advised that should any part of the research methodology change in any way as outlined in the Ethics application (Ref. Nr.: 2014/CAES/062), it is the responsibility of the researcher to inform the CAES Ethics Committee. In this instance a memo should be submitted to the Ethics Committee in which the changes are identified and fully explained.

The Ethics Committee wishes you all the best with this research undertaking.

Kind regards,

Prof E Kempen,
CAES Ethics Review Committee Chair

PLEASE NOTE PERMISSION
LETTERS FOR SA CLEARANCE
& FEEDBACK TO PARTNER
UNISA

Prof MJ Linington
Executive Dean: College of Agriculture and Environmental Sciences



University of South Africa
Pretter Street, Muckleneuk Ridge, City of Tshwane
PO Box 392 UNISA 0003 South Africa
Telephone: +27 12 429 3111 Facsimile: +27 429 12 429 4150
www.unisa.ac.za

APPENDIX E: LETTERS FROM INSTITUTIONS

Republique Démocratique du Congo
Fonds Forestier National



Antenne Provinciale du
Nord-Kivu

Objet : Demande d'autorisation de récolte des données dans votre institution.
Accusé de réception.

Goma, le 22 APR 2014

N° 038.../FFN/ANT-NK/2014

Transmis copie pour information à :

- Monsieur le Chargé de Mission du FFN à **KINSHASA/Gombe.**
- Monsieur le Responsable du Comité d'Ethique du Département des Sciences Environnementales au sein de l'University of South Africa « UNISA » à **PRETORIA.**

A Monsieur MUMBERE MBASA NDEMO, Etudiant à l'University of South Africa « UNISA », département des Sciences Environnementales, présentement à **GOMA.**

Monsieur,

Votre lettre sans numéro m'adressée en date du 08 avril courant m'est bien parvenue ce dont j'en accuse bonne réception.

En effet, après l'avoir exploitée attentivement je trouve qu'il n'y a pas d'inconvénient à mon service pour qu'il vous serve d'espace afin de récolter les éléments dont vous avez besoin.

Etant donné que le sujet de votre thèse, celui de « *Climate change mitigation strategies in relation to the forestry and energy sectors in SADC region with emphasis on DRC and RSA as case studies* » cadre avec le secteur environnemental, mon institution est bien disposée à vous fournir tous les éléments y relatifs à sa disposition et profite de cette occasion pour informer le Responsable du Comité d'éthique du département des Sciences Environnementales de votre université qui me lit en copie que mon avis est favorable à votre requête.

Tout en vous souhaitant plein succès dans vos recherches scientifiques, je vous demande de prendre toutes les dispositions utiles conséquentes.

Sentiments patriotiques.

Le Chef d'Antenne Provinciale du Fonds Forestier National « FFN »/Nord-Kivu a. i,



Jeannot KINIHIRWA MUHIRWA



WWF for a living planet®

WWF Central Africa
Regional Programme Office.
Programme de
Conservation d'Itombwe :
WWFPCI.
Bukavu
South Kivu. DR Congo.

Tel: +243 998272193
Lmubalama@wwfcarpo.org
www.panda.org/carpo

Bukavu, le 21 janvier 2015

N° Réf : 003/WWF-PCKB/ICCN/COORD/Janv./2015

Objet : **Accusé de réception de la lettre de demande d'autorisation de récolte de données**

A Monsieur MUMBERE Mbase
Ndemo, Etudiant à University of
South Africa (UNISA),
tel : +243 998386842

Monsieur,

Nous accusons réception de votre lettre sans référence du 13 janvier relative à l'objet repris en marge et nous tenons à vous remercier pour l'intérêt que vous portez vis-à-vis de notre organisation.

WWF est en effet une organisation internationale de conservation dont la mission principale est de stopper la dégradation de l'environnement de notre planète afin de construire un avenir dans lequel l'homme et la nature vivent en parfaite harmonie.

Pour y arriver, le WWF pense qu'il faut conserver la biodiversité et assurer l'utilisation durable des ressources naturelles renouvelables. C'est pourquoi WWF soutient les études et les publications s'inscrivant dans le cadre de la promotion de la réduction de la surconsommation des ressources et de la pollution dans toutes ses formes.

Pour cette raison le WWF, en tant qu'une organisation avec une approche scientifique et constructive ayant choisi la coopération et le dialogue vous invite à prendre contact avec ses services concernés du Programme de Conservation Itombwe à dessein de vous faciliter la récolte d'informations disponibles utiles pour votre thèse sur les stratégies d'atténuation au changement climatique.

Veillez agréer, Monsieur, l'expression de nos sentiments distingués.

= Dr. Léonard Mubalama :=
Programme Manager



CC : -Secrétaire Général Académique, ULPGL à Goma

FOOD AND TREES FOR AFRICA
94 Bessemer Street
Sandton/South Africa

Pretoria, 23 April 2015

To the Responsible of the UNISA Ethical Committee/
Department of Environmental Sciences

Concern: Authorization of data collection

Dear Sir/Madam

We hereby confirm that we have received the request of MR Mumbere Mbasu, PhD student at UNISA in the department of environmental sciences (Student number : 50921533) for data collection in our institution.

His topic is entitled '*Climate change mitigation strategies in relation to the forestry and energy sectors in SADC region with emphasis on DRC and RSA as case studies.*'

We authorize the student to come for data collection in the Food and Trees for Africa and wish the best for the rest of his studies.


KATE BEZUIDENHOUT

CC: Student Mumbere Mbasu

SunFire Solutions

Johannesburg/ South Africa

Mobile +27 (0) 60 661 0496

Office +27 (0) 11 646 1939

Johannesburg, 28 May 2015

To the Responsible of the UNISA Ethical Committee/

Department of Environmental Sciences


Concern: Authorization of data collection

Dear Sir/Madam

We hereby confirm that we have received the request of Mr Mumbere Mbasu (Student number: 50921533), PhD student at UNISA in the department of environmental sciences to conduct interviews with our institution as part of his PhD program.

His topic is entitled entitled "*Climate change mitigation strategies in relation to the forestry and energy sectors in SADC region with emphasis on DRC and RSA as case studies.*"

We authorize the student to come for data collection in the SunFire Solutions and wish him the best for the rest of his studies.

Zanda van Marren


CC: Student Mumbere Mbasu



environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

Enquiries: Ms Deborah Ramalope
Tel: (012) 399-9160 E-mail: DRamalope@environment.gov.za

To the Responsible of the UNISA Ethical Committee/
Department of Environmental Sciences

Dear Sir/Madam

RE: STUDENT MUMBERE MBASA REQUEST FOR INTERVIEWS AT THE DEPARTMENT OF ENVIRONMENTAL AFFAIRS

We hereby confirm that we have received the request of Mr Mumbere Mbasa (Student number : 50921533), PhD student at UNISA in the department of environmental sciences to conduct interviews with our organization as part of his PhD program.

His topic is entitled '*Climate change mitigation strategies in relation to the forestry and energy sectors in SADC region with emphasis on DRC and RSA as case studies.*'

We confirm that he did two interviews with our two staff members both in the climate change sinks and the Energy climate change mitigation sections. We hope this will provide him with worthwhile information for his topic and we wish him the best for the rest of his studies.

Best regards

Ms Deborah Ramalope

Chief Director: Climate Change Mitigation

19 MAY 2015

CC: Student Mumbere Mbasa



Sustainable Energy & Livelihoods Project
5th Floor, Heerengracht Building
87 De Korte Street
P O Box 32131 • Braamfontein • 2017
Tel: +27 (0)11 339 3662 • Fax: +27 (0)86 686 8434
www.earthlife.org.za

Non Profit Organisation (NPO) No. 004-159 NPO

A project of Earthlife Africa Jhb

To the UNISA Ethical Committee
UNISA
Department of Environmental Sciences

23 April 2015

Dear Sir/ Madam

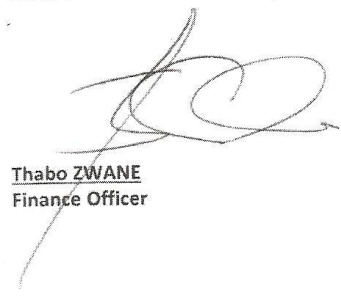
**RE: STUDENT MUMBERE MBASA REQUEST FOR DATA COLLECTION & INTERVIEWS AT
EARTHLIFE AFRICA JOHANNESBURG - SELP**

We hereby confirm that we have received the request of Mr Mumbere MBASA (Student Number 50921533), PhD student at UNISA in the Department of Environmental Sciences to conduct data collection and interviews with our organisation as part of his PhD program.

He has advised us that his topic is entitled "Climate change mitigation strategies in relation to the forestry and energy sectors in the SADC region with emphasis on DRC and RSA as case studies".

We welcome any efforts to discuss, disseminate and advance the need for strategies to counter the effects of climate change in Africa. We therefore invite Mr Mbasa to visit Earthlife Africa Johannesburg - SELP and one of our working sites for the purpose of data collection and interviews. We hope this will provide him with worthwhile information for his topic and we wish him the best for the rest of his studies.

Best regards,
For EARTHLIFE AFRICA JOHANNESBURG



Thabo ZWANE
Finance Officer

Cirrus Group

Cape Town/ South Africa

Cell: +27 834156239

Email: tonyknowles@gmail.com

Cape Town, 17 June 2015

To the Responsible of the UNISA Ethical Committee/
Department of Environmental Sciences

Concern: Authorization of data collection

Dear Sir/Madam

We hereby confirm that we have received the request of Mr Mumbere Mbasa (Student number: 50921533), PhD student at UNISA in the department of environmental sciences to conduct interviews with our institution as part of his PhD program.

His topic is entitled entitled "*Climate change mitigation strategies in relation to the forestry and energy sectors in SADC region with emphasis on DRC and RSA as case studies.*"

We authorize the student to come for data collection in the Cirrus Group South Africa, and wish him the best for the rest of his studies.

A handwritten signature in black ink, appearing to be 'Tony Knowles', is written over a horizontal line.

CC: Student Mumbere Mbasa

Federation for a Sustainable Environment

8 Palladio, c/of Ryk Street and Roux Ave

Beverly Gardens, Rundburg/Johannesburg

Post net Suite 87

Cell phone: (+27) 73231 4893

Email: mariette@pea.org.za

Pretoria, 8 July 2015

To the Responsible of the UNISA Ethical Committee/

Department of Environmental Sciences

Concern: Authorization of data collection

Dear Sir/Madam

We hereby confirm that we have received the request of Mr Mumbere Mbasa (Student number: 50921533), PhD student at UNISA in the department of environmental sciences to conduct interviews with our institution as part of his PhD program.

His topic is entitled entitled "*Climate change mitigation strategies in relation to the forestry and energy sectors in SADC region with emphasis on DRC and RSA as case studies.*"

We authorize the student to come for data collection in the Federation for a Sustainable Environment , and wish him the best for the rest of his studies.



CC: Student Mumbere Mbasa

Energy Research Centre
University of Cape Town
Cape Town/ South Africa
Email: britta.rennkamp@uct.ac.za

Cape Town, 1st July 2015

To the Responsible of the UNISA Ethical Committee/
Department of Environmental Sciences

Concern: Authorization of data collection

Dear Sir/Madam

We hereby confirm that we have received the request of Mr Mumbere Mbasu (Student number: 50921533), PhD student at UNISA in the department of environmental sciences to conduct interviews with our institution as part of his PhD program.

His topic is entitled entitled "*Climate change mitigation strategies in relation to the forestry and energy sectors in SADC region with emphasis on DRC and RSA as case studies.*"

We authorize the student to come for data collection in the Energy Research Centre, and wish him the best for the rest of his studies.



CC: Student Mumbere Mbasu



PLATE FORME DIOBASS AU KIVU

317, Avenue P.E. Lumumba/Nguba

B.P. 1914 Bukavu/ R.D.Congo

E-mail : pdiobass@gmail.com

www.diobasskivu.org

Tél : + 243 81 521 75 72

Centre Energies Renouvelables pour le Développement
« CERD »

N/R : / CERD/DIR/JMM/014
V/R : 089/SM/2014

Bukavu, le 14 janvier 2015

Concerne : Votre demande de collecte des données
de recherche au Centre Energie

A Monsieur Mumbere Mbasu Ndemo,
Etudiant à University of South
Africa (UNISA)

Monsieur Mumbere,

Nous accusons réception et agréons votre demande datant du 13 janvier 2015 portant sur la récolte des données pour vos recherches à notre centre.

En effet, le Centre Energie Renouvelable pour le Développement, en sigle CERD, a entre autre mission de fournir aux chercheurs un cadre de documentation dans le domaine de l'énergie. Ainsi donc, le CERD est ouvert à vous comme aux autres chercheurs présentement et à tout autre moment que c'est nécessaire. Le centre sera ouvert même le vendredi 16 janvier pour un service minimum et vous pouvez en profiter.

Bienvenue au CERD et nos meilleurs vœux pour 2015.

Pour le Centre Energie,

Jean-Marie MUCHEO

Directeur



for a living planet®

WWF/RDC /EST
Programme Virunga

142/02, Avenue Mont Goma

B.P. 106 Goma
République Démocratique du Congo

Tél. +243 816845188

Email Jseve@wwfcarpo.org

Website: www.panda.org/fr

N° Réf : *JL* / COORD/WWF- Est -RDC/ 04/2014

Goma le 22/04/2014

Au responsable du comité d'éthique du des sciences Environnementales
de UNISA (University of South Africa)

Objet : Autorisation de récolte des données dans notre organisation WWF-EST-RDC

Monsieur,

Par la présente, nous confirmons avoir reçu la demande de Monsieur Mumbere Mbasa (Student number : 50921533) étudiant au doctorat dans le département de sciences environnementales à l'University of South Africa (UNISA).

En effet, il sollicite venir organiser des interviews avec nos agents dans le cadre de ses recherches doctorales dont le sujet est << **Climate change mitigation strategies in relation to the forestry and energy sectors in SADC region with emphasis on DRC and RSA as case studies** >>

Nous sommes intéressés par ce sujet, et affirmons que nous accordons à l'étudiant Mumbere Mbasa l'autorisation de passer récolter les données dans notre institution.

Veillez agréer, Monsieur le responsable du comité d'éthique, nos sentiments de franche collaboration

Pour le WWF-EST -RDC

Juan Sève

Coordonnateur WWF -EST-RDC.



- CC :
- Chef de projet EcoMakala
 - Land scape Leader Virunga CAFEC
 - Chargée Ressources Humaines WWF Est RDC
 - Chargé de la logistique WWF Est RDC
 - L'étudiant Mumbere Mbasa

President: Yolanda kakabadse
Director General: James P. Leape
Président Emeritue:
HRH The Duke of Edinburgh
Founder president:
HRH Prince Bernhard of The Netherlands
Also know as World Wildlife Fund

Registered as:
WWF-World Wide Fund For Nature
WWF-Fondo Mondiale per la Nature
WWF-Fondo Mundial para la Naturaleza
WWF-Fonds Mondial pour la Nature
WWF-Welt Natur Fonds

REPUBLIQUE DEMOCRATIQUE DU CONGO
GOVERNEMENT PROVINCIAL DU NORD-KIVU



MINISTRE PROVINCIAL DES RESSOURCES HYDRAULIQUES,
ET ELECTRICITE, MINES, HYDROCARBURES, INDUSTRIE,
PETITES ET MOYENNES ENTREPRISES

Goma, le 23 AVR 2014

Le Ministre

N/Réf.: *MG* /CAB/MINIPRO/RHEMHIPME/NK/2014

TRANSMIS copie pour information à:

- Monsieur le Secrétaire Exécutif du Gouvernement Provincial du Nord-Kivu ;
 - Monsieur le Chef de Division des Ressources Hydrauliques et Electricité.
- (TOUS) à GOMA

Objet : Autorisation de récolte des données dans notre institution

Au Responsable du Comité d'éthique du Département des Sciences Environnementales de UNISA (University of South Africa)

Monsieur,

Par la présente, nous confirmons avoir reçu la demande de Monsieur MUMBERE MBASA (student number : 50921533) doctorand au Département des Sciences Environnementales à Universty of South Africa (UNISA).

Il sollicite l'organisation des interviews avec nos agents dans le cadre de ses recherches doctorales dont le sujet est « Climate change mitigation strategies in relation to the forestry energies sectors in SADEC region with emphasis on DRC and RSA as case studies »

Nous autorisons l'étudiant MUMBERE MABSA à passer récolter les données dans notre institution.

nos sentiments les meilleurs.

Veuillez agréer, *Monsieur*, l'expression de


Jean RUYANGE NJONGO

Coordination provinciale de
REDD
Ville de Goma/ RDC

Goma, le 7 Avril 2014

Objet : Autorisation de récolte
des données dans notre
institution

Au Responsable du comité d'éthique
du département des Sciences Environnementales
de UNISA (University of South Africa)


Par la présente, nous confirmons avoir reçu la demande de Monsieur Mumbere Mbase (student number : 50921533) étudiant au doctorat dans le département de Sciences environnementales à University of South Africa (UNISA).

En effet, il sollicite venir organiser des interviews avec nos agents dans le cadre de ses recherches doctorales dont le sujet est "Climate change mitigation strategies in relation to the forestry and energy sectors in SADC region with emphasis on DRC and RSA as case studies."

Nous sommes intéressés par ce sujet, et affirmons que nous accordons à l'étudiant Mumbere Mbase l'autorisation de passer récolter les données dans notre institution.

Veuillez agréer, Monsieur le Responsable du comité d'éthique, nos sentiments de franche collaboration.

Coordonnateur Provincial de REDD


Raphaël Kasongo Kabusa.H
Point Focal REDD
Nord Kivu



Goma Resource Centre
Avenue du Lac No. 398
Quartier Katindo, Goma
Nord Kivu, République
Démocratique du Congo
Postal Address: B.P.3411, Kigali, Rwanda

M +243 9977 04065
M +243 8085 27820
E henry@gorillas.org
E info@gorillas.org

gorillas.org

Goma le 4 Mai 2014

Objet : Autorisation de récolte des données dans notre Institution

**Au Responsable du Comité d’Ethique du département
Des Sciences Environnementales
de UNISA (University of South Africa)**

Monsieur,

Par la présente, nous confirmons avoir reçu la demande de Monsieur Mumbere Mbasa (Student number: 50921533),étudiant au doctorat dans le département de Sciences Environnementales à University Of South Africa (UNISA).

En effet, il sollicite venir organiser des interviews avec nos agents dans le cadre de ses recherches doctorales dont le sujet est < Climate change mitigation strategies in relation to the forestry and energy sectors in SADC region with emphasis and RSA as case studies.>

Nous sommes intéressés par ce sujet, et affirmons que nous accordons à l’étudiant Mumbere Mbasa l’autorisation de passer récolter les données dans notre organisation.

Veillez agréer, Monsieur le Responsable du comité d’éthique, nos sentiments de franche collaboration.

Pour Gorilla Organization

Henry Cirhuza


Program Manager
the gorilla organization
DRC Programme

Executive Director
Julian Miles

Trustees
Professor Roger J Whitaker OAC FRGS FGS
Martin Hays (USAID)
Sandra Tucker
Dr J E Clarke
Jon Probyn
Sandra Hurley OBE
Stanley Johnson
Dr Gladys Kalemba Zikusoka
Ian Hutchinson OBE
David Rogers

Patrons
Richard Adams
Michael Backus
Professor Richard Dawkins OBE
Lorenzo DiCiccio
David Hareham
Dr Nathan Myhrvold
The Hon M & Caird Ward

Registered Charity No 1142151
Incorporated in the state of the state of Delaware
Re-registered in England 09-06-2011

REPUBLIQUE DEMOCRATIQUE DU CONGO

PROVINCE DU NORD-KIVU



**Ministère Provincial de l'Environnement,
Tourisme, Culture et Arts,
Sports et Loisirs**

Le Ministre

AUTORISATION N° 01...CAB/MIN.PROV-ETCASL/NK/2014

Je soussigné, Prof. Anselme PALUKU KITAKYA, autorise à Monsieur MBASA NDEMO, agent de l'ULPGL et Etudiant à University of South Africa (UNISA), à effectuer la récolte des données relatives à sa recherche au sein de mon Ministère.

Je lui souhaite plein succès dans ses investigations.

Fait à Goma, le 17^e APR 2014



Prof. Anselme KITAKYA

C.C:

- Monsieur le Secrétaire Général
Académique de l'Université Libre des Pays
des Grands Lacs (ULPGL)
à Goma.

Adresse : Hôtel du Gouvernement Provincial du Nord-Kivu/Ex. Centre d'Accueil SHALOM.

Av. du Musée, N°259, Quartier Himbi, Commune de Goma/Ville de Goma/RD. Congo

Contacts :* Tél: (+243) 992432163; (+243) 811703716

* E-mail: minprov_envirtour@yahoo.fr



Université Libre des Pays des Grands Lacs

Secrétariat Général Académique

B.P. 368 / Rép. Dém. du Congo

Site Web : www.Ulpgl.net/ E.mail : sgac_ulpgl@yahoo.fr

ATTESTATION DE RECHERCHE N° 069/014

Nous soussigné, Professeur Lévi NGANGURA MANYANYA, Secrétaire Général Académique de l'Université Libre des Pays des Grands (ULPGL-Goma), atteste par la présente que Monsieur MBASA NDEMO, est agent de l'ULPGL mais poursuit des études doctorales à University of South Africa (UNISA) (Student number : 50921533). Il est actuellement à l'étape de la récolte des données.

Nous demanderions aux organisations auprès desquelles il va récolter les données de bien vouloir lui accorder l'autorisation pour ce faire.

En effet, cette autorisation sera envoyée au comité d'éthique du département des services environnementaux de l'UNISA avant la récolte proprement dite. Nous pensons particulièrement aux organisations ci-après :

- ICCN / Goma.
- Jane Goodall Institute.
- IFDC
- Gorilla Organization.
- AFED.
- UGADEC.

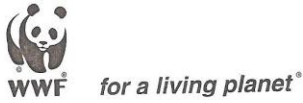
Nous remercions d'avance toutes ces organisations pour tous les services qu'elles pourront rendre à ce chercheur.

Fait à Goma, le 25 Avril 2014

Professeur Lévi NGANGURA MANYANYA




Secrétaire Général Académique



WWF Central Africa
Regional Programme Office.
Programme de
Conservation d'Itombwe :
WWF/PCI.
Bukavu
South Kivu. DR Congo.

Tel: +243 998272193
Lmubalama@wwfcarpo.org
www.panda.org/carpo

Bukavu, le 21 janvier 2015

N° Réf : 003/WWF-PCKB/ICCN/COORD/Janv./2015

Objet : **Accusé de réception de la lettre de demande d'autorisation de récolte de données**

A Monsieur MUMBERE Mbasu
Ndemo, Etudiant à University of
South Africa (UNISA),
tel : +243 998386842

Monsieur,

Nous accusons réception de votre lettre sans référence du 13 janvier relative à l'objet repris en marge et nous tenons à vous remercier pour l'intérêt que vous portez vis-à-vis de notre organisation.

WWF est en effet une organisation internationale de conservation dont la mission principale est de stopper la dégradation de l'environnement de notre planète afin de construire un avenir dans lequel l'homme et la nature vivent en parfaite harmonie.

Pour y arriver, le WWF pense qu'il faut conserver la biodiversité et assurer l'utilisation durable des ressources naturelles renouvelables. C'est pourquoi WWF soutient les études et les publications s'inscrivant dans le cadre de la promotion de la réduction de la surconsommation des ressources et de la pollution dans toutes ses formes.

Pour cette raison le WWF, en tant qu'une organisation avec une approche scientifique et constructive ayant choisi la coopération et le dialogue vous invite à prendre contact avec ses services concernés du Programme de Conservation Itombwe à dessein de vous faciliter la récolte d'informations disponibles utiles pour votre thèse sur les stratégies d'atténuation au changement climatique.

Veuillez agréer, Monsieur, l'expression de nos sentiments distingués.

= Dr. Léonard Mubalama :=
Programme Manager



CC : -Secrétaire Général Académique, ULPGL à Goma

Mumbere Mbasa Ndemo
Etudiant à University of
South Africa (UNISA)
ndemombasa@yahoo.fr
+243998386842

Goma, le 18 Février 2015

REPRESENTATION DELAIRD-ENCOE	
DATE	23 FEV 2015
FAC	
PRO REGION	
PROJETS	
IBCR	
CLASSEMENT	

Objet : Demande d'autorisation de récolte des données dans votre institution

Au Responsable du Bureau National de FAO/
Service de Surveillance de forêts à Kinshasa ;

Monsieur/Madame,

J'ai l'honneur de venir auprès de votre haute compétence en vue de vous demander l'autorisation de récolte des données dans votre institution.

En effet, je suis thésard à University of South Africa (UNISA) au département des Sciences environnementales (Student number : 50921533). La thèse en pleine rédaction porte sur "Climate change mitigation strategies in relation to the forestry and energy sectors in SADC region with emphasis on DRC and RSA as case studies."

La politique de UNISA exige que l'institution ciblée par la recherche donne à l'étudiant une autorisation écrite de récolte des données. C'est pour cela, que nous avons besoin de votre assistance pour faciliter l'avancement de nos recherches.

En attendant de vous une suite favorable, veuillez agréer, Monsieur/ Madame le (la) Responsable du Bureau National de FAO, mes meilleurs sentiments de franche collaboration.

Etudiant Mumbere Mbasa

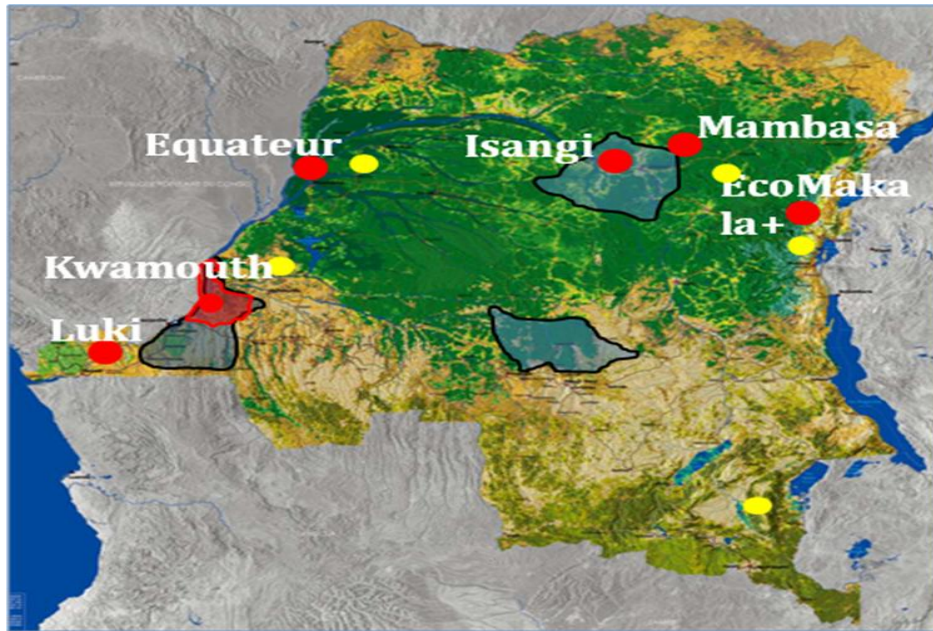
CC :





- Président du Comité d'éthique du département des Sciences environnementales/UNISA



APPENDIX F: MAPS OF SOUTH AFRICA AND THE SIX REDD PILOT PROJECTS

Six REDD Projects in the DRC



- | | | |
|---|--|---|
|  | Projets-pilotes FFBC | - Pilot project CBFF |
|  | Autres projets-pilotes | - Other pilot projects |
|  | Zone de concentration des investissements FIP | - Concentration Zone of FIP investments |
|  | Zone Programme de Réduction d'Emissions de Mai Ndombe | - Program Zone of Mai Ndombe Emission Redaction |

Source : National REDD Directorate

Eco-Makala REDD+ Pilot Project



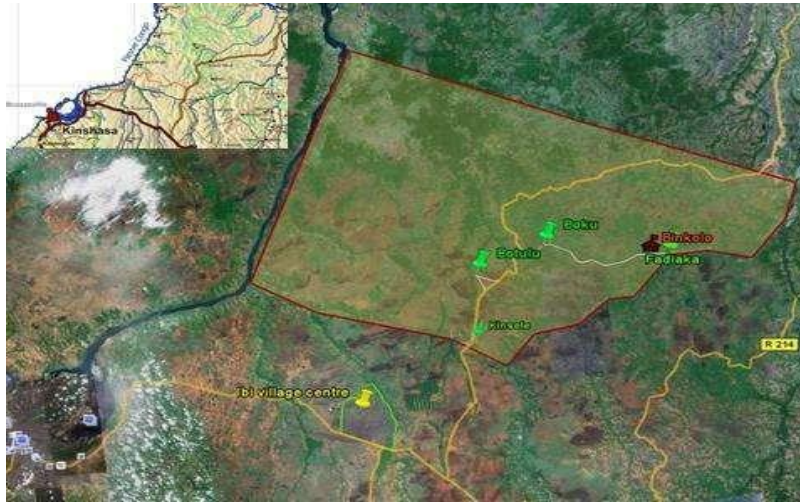
Source: National REDD Directorate

Luki REDD+ pilot project



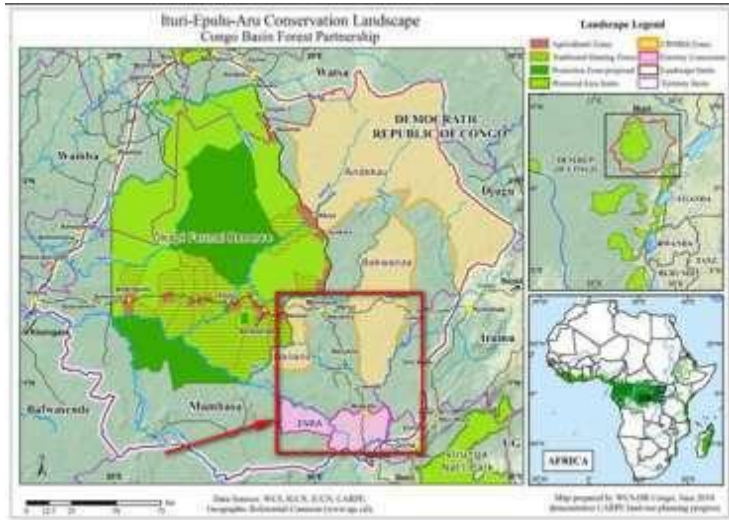
Source: National REDD Directorate

NSK (NOVACEL South Kwamouth REDD+ pilot project)



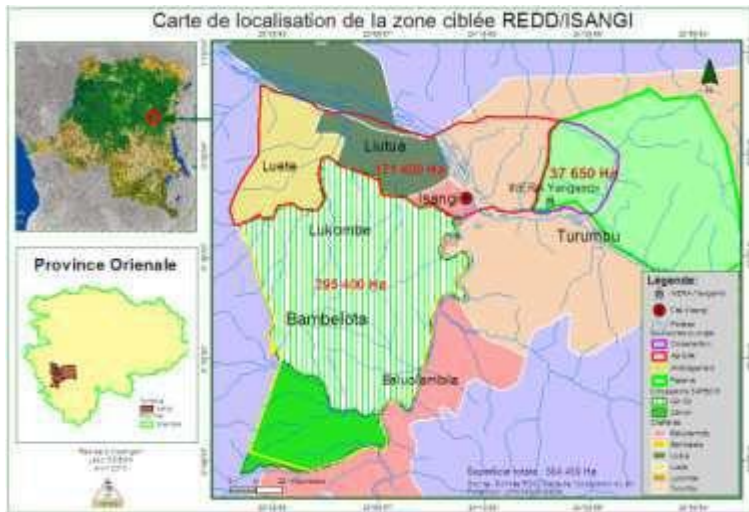
Source: National REDD Directorate

Mambasa Forestry REDD+ Project



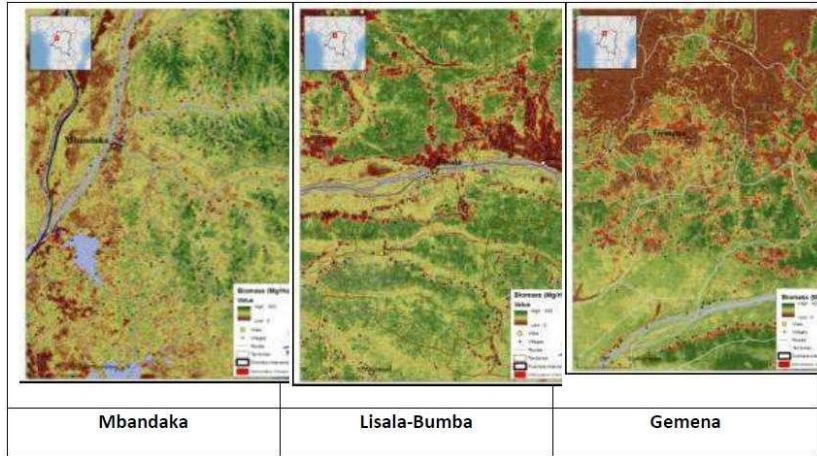
Source: National REDD Directorate

OCEAN Isangi REDD+ project



Source: National REDD Directorate

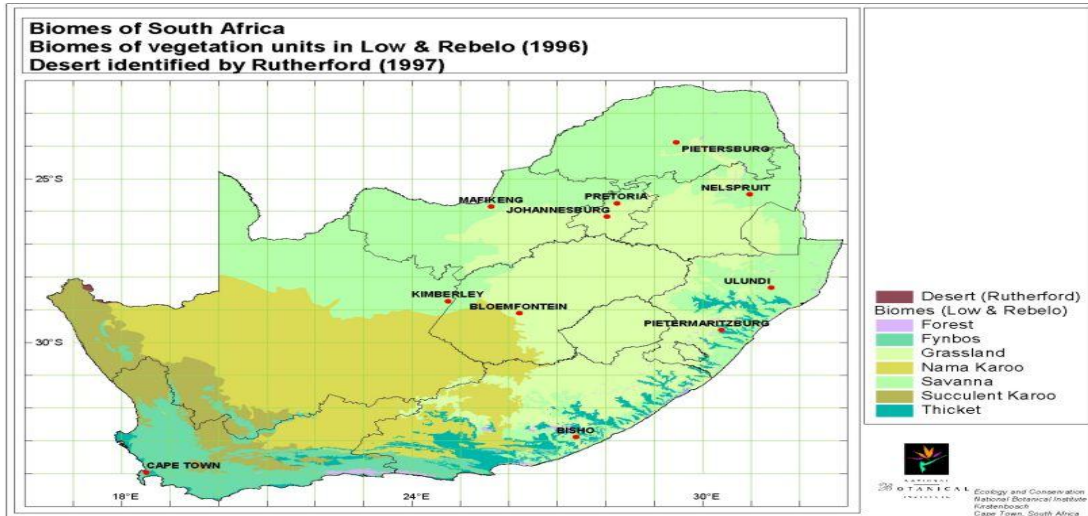
Equatorial REDD+ project



Source: National REDD Directorate

South Africa's Forest Distribution





Source: Department of Environmental Affairs (South Africa)