GOVERNMENT OF ZIMBABWE

ZIMBABWE'S FIRST BIENNIAL TRANSPARENCY AND FIFTH NATIONAL COMMUNICATION REPORT TO THE UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE

2024

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Ministry of Environment, Climate and Wildlife

2024

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FOREWORD

The Government of Zimbabwe views climate change as a significant threat to the economy, environment and the livelihoods of its people. This view made Zimbabwe one of the first countries to sign and ratify the United Nations Framework Convention on Climate Change (UNFCCC) in 1992 and 1994 respectively. In addition, Zimbabwe acceded to the Kyoto Protocol in 2009 and ratified the Paris Agreement in 2017. Since then, the government has made great strides in setting the right policy framework to direct the economy on a low greenhouse gas emission and climate-resilient development pathway.

Zimbabwe recognises the importance of transparency in providing clarity, trust and confidence in the implementation of climate change actions. In accordance with the UNFCCC reporting commitments, the country prepared and submitted its Initial National Communication to the UNFCCC in 1998 and is now concluding the preparation of its Fifth National Communication (NC5). In addition, Zimbabwe submitted its First Biennial Update Report in 2020 which underwent the full cycle of UNFCCC international consultation and analysis process including technical expert review and the facilitative sharing of views. Over the years the country has gained vast experience in the preparation of reports to the UNFCCC and continues to build the capacity of more sector experts to match the reporting demands of the Paris Agreement's Enhanced Transparency Framework (ETF).

This Biennial Transparency Report (BTR1) provides an up-to-date summary of information on climate change issues in Zimbabwe with regards to the Greenhouse Gas (GHG) national inventory, tracking of the country's progress towards achievement of its Nationally Determined Contribution (NDC), progress in adaptation actions and reporting on finance needed and received. The main objective of this report is for Zimbabwe to create a robust framework for transparency, accountability, and trust as it strives to work together with other State Parties to combat climate change. Over and above this, the report also provides information to other processes such as the emissions and finance gap analysis reports and the Global Stocktake.

The report notes that whilst there is a need to reduce greenhouse gas emissions globally, especially in the energy sector, Zimbabwe finds itself in a situation where it urgently needs to address the current energy poverty and power deficit to enable accelerated economic growth and sustainability. While current efforts at boosting economic growth might result in increased emissions in the short term, Zimbabwe is making concerted efforts to invest in renewable energy and energy efficiency to ensure that the country reaches pick emissions in the shortest time possible. International climate finance from the developed State Parties required to support our ambitious Nationally Determined Contribution target remains limited thereby impacting the pace at which climate change mitigation commitments are being turned into real action on the ground.

The report further notes that much support is needed in promoting adaptation actions at the national and local levels and acknowledges the need to have systems that address loss and damage due to the impacts of climate change. In 2024, government completed the development of its National Climate Change Adaptation Plan which identified agriculture, health, biodiversity, tourism, infrastructure, human settlements and water resources management sectors as priorities for adaptation. The plan also includes a robust monitoring and evaluation framework which the government intends to make the core of its adaptation transparency arrangements going into the future. Zimbabwe is also strengthening its institutional and regulatory frameworks for participation in the new carbon market with a view to hosting projects that will contribute towards the achievement of the country's Nationally Determined Contribution. The next cycle of the Biennial Transparency Report will therefore include information on Zimbabwe's carbon market arrangements and any international exchanges of mitigation outcomes.

Kindly note that the chapters of this report were developed by sectoral experts, scientists, academic researchers, government and local authority technical officials. The Ministry of Environment, Climate and Wildlife expresses its gratitude to the authors and editors of the various chapters, members of the National Climate Change Steering Committee, technical support staff, UNEP and the National Communication Support Programme for financial support and technical guidance.

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Hon. Dr. Sithembiso G. G. Nyoni (MP)
Minister of Environment, Climate and Wildlife
Republic of Zimbabwe

ACRONYMS

AD	Activity Data
AFOLU	Agriculture, Forestry and Other Land Use
AGRITEX	Department of Agricultural Technical and Extension Services
ARDA	Agricultural and Rural Development Authority
Avgas	Aviation gasoline
AWMS	Animal Waste Management System
BBR	Bulawayo Beitbridge Railway
BOD	Biochemical Oxygen Demand
CAAZ	Civil Aviation Authority of Zimbabwe
CBM	Coal Bed Methane
CCMD	Climate Change Management Department
CCS	Carbon Capture and Storage
CH4	Methane
CHP	Combined Heat and Power Generation
CLA	Crop and Livestock Assessment
CO2	Carbon dioxide
CO2eq	Carbon dioxide equivalent
COD	Chemical Oxygen Demand
DM	Dry Matter
DOC	Degradable Organic Carbon
EF	Emission Factor
EFDB	Emission Factor Data Base
EMA	Environmental Management Agency
FAO	Food and Agriculture Organisation of the United Nations
FEWSNET	Famine Early Warning Systems Network
FOD	First Order Decay
GDP	Gross Domestic Product
Gg	Gigagrams
GHG	Greenhouse Gas
GoZ	Government of Zimbabwe
GPG	Good Practice Guidelines
GWh	Giga Watt hour
GWP	Global Warming Potential
HAC	High Activity Clay
IEA	International Energy Agency

INC	Initial National Communication
IPCC	Intergovernmental Panel on Climate change
ISIC	International Standard Industrial Classification
Kt	Kiloton
LAC	Low Activity Clay
LPD	Department of Livestock Production and Development
LPG	Liquefied Petroleum Gas
LSC	Large Scale Commercial
LTOs	Landing and Take Offs
MAT	Mean Annual Temperature
MCF	Methane Correction Factor
MDAs	Ministries, Departments and Agencies
MECW	Ministry of Environment, Climate and Wildlife
MIC	Manufacturing Industries and Construction
MJ	Megajoule
MODIS	Moderate-Resolution Imaging Spectroradiometer
MoEPD	Ministry of Energy and Power Development
MoTID	Ministry of Transport and Infrastructure Development
MSWDS	Municipal Solid Waste Disposal Site
MSD	Meteorological Services Department
mt	metric tonne
MW	MegaWatt
NAP	National Adaptation Plan
N2O	Nitrous oxide
NC4	Fourth National Communication
NCVs	Net Calorific Values
NE	Not Estimated
NIR	National Inventory Report
NMVOCs	Non-Methane Volatile Organic Carbons
NO	Not Occurring
NOx	Oxides of nitrogen
NR	Natural Region
NRZ	National Railways of Zimbabwe
ODS	Ozone Depleting Substances
PA	Prescribed Assets

QA	Quality Assurance
QC	Quality Control
SADC	Southern African Development Community
SNC	Second National Communication
SO2	Sulphur Oxide
SSC	Small Scale Commercial
TJ	TeraJoule
TNC	Third National Communication
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNSD	United Nations Statistics Division
USGS	United States Geological Survey
VFS	Department of Veterinary Field Services
WFP	World Food Programme
WWTP	Wastewater Treatment Plant
ZERA	Zimbabwe Energy Regulatory Authority
ZETDC	Zimbabwe Electricity Transmission and Distribution Company
ZIMRA	Zimbabwe Revenue Authority
ZimStat	Zimbabwe National Statistics Agency
ZINWA	Zimbabwe National Water Authority
ZPC	Zimbabwe Power Company

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EXECUTIVE SUMMARY

NATIONAL CIRCUMSTANCES

Zimbabwe's area covers 390,757km^2. The country lies wholly within the tropics with a subtropical climate. The annual rainfall ranges from below 400mm in the south to over 1,000 mm in the eastern parts of the country. Notable changes in the climate include an increase in average temperatures, decrease in annual precipitation, change in spatial extent of the country's Natural Regions, change in the onset and cessation dates of the rainy season and an increase in the duration of the mid-season dry spell. Observed extreme weather events that have increased in intensity include: tropical cyclones; droughts; dry spells; floods and; heat waves.

Zimbabwe's population was 15,178,957 according to the last census in 2022. The National Development Strategy (2021-2025) is the country's blueprint for sustainable and inclusive growth and development towards upper-middle income status by 2030. The major industrial sectors are agriculture; manufacturing; wholesale and retail trade; and mining. Gold and platinum mainly contribute the highest income. Zimbabwe's energy sources are biofuels (mainly firewood), coal, petroleum products and electricity. Fuelwood is the country's primary energy source as 62 percent of the rural population depend on wood for fuel.

Zimbabwe is predominantly serviced by road transport. Agriculture is the backbone of Zimbabwe's economy. The sector provides direct and indirect employment to approximately 60-70% of the population, supplies 60% of the industrial raw materials and contributes approximately 40% towards export earnings. Manufacturing, wholesale and retail trade; repair of motor vehicles and motorcycles, and accommodation and food service activities mainly contribute to industrial GDP. Zimbabwe's total trade has decreased from US$10.4billion in 2013 to US$9.1 billion in 2019. Housing projects have been dominated by residential, largely driven by the rural to urban migration which averaged 4.3 per cent.

MAJOR POLICIES

The main policies under implementation to address climate change include the National Constitution (2013), National Development Strategy (2021-2025), National Climate Policy (2017), Low Greenhouse Gas Emission Development Strategy (2020-2050). National Environmental Policy and Strategy (2009), and the National Climate Change Response Strategy (2014). In the Energy sector the policies relevant for Zimbabwe's climate actions include the National Energy Policy (2012), National Renewable Energy Policy (2020), Biofuels Policy (2020) and the National Transport Master Plan (2018). such, while the Agriculture Food Systems and Rural Transformation strategy (2021) is key in the Agriculture Sector. The Forest Act and Forest Amendment Act (2021) and Environmental Management Act (2002) are key for the Land Use, Land Use Change and Forestry (LULUCF) and Waste sectors, respectively. The main barriers to implementing mitigation priorities include lack of skilled personnel; limited financial resources; low uptake of new technologies and; weak institutional arrangements.

INSTITUTIONAL ARRANGEMENTS

The High-Level Committee in the Office of the President and Cabinet (OPC) is responsible for oversight of all climate change activities at national level. The Committee comprises Permanent Secretaries for all Government

ministries and is chaired by the OPC. The Ministry of Environment, Climate and Wildlife (MECW) is responsible for coordinating environmental issues in the country including climate change. The Climate Change Management Department is mandated with coordinating and implementing national climate change programmes.

The MRV system is not yet fully developed. The GHG Inventory System is currently under development. The elements that are already in place include the designation of a focal point to the United Nations Framework Convention on Climate Change (UNFCCC); and appointment of the coordinator of the National Communication (NC) and Biennial Transparency Report (BTR). The government appointed a team leader of the Greenhouse Gas (GHG) Inventory and has engaged sectoral experts. The mapping of stakeholders was also completed. An MRV for the NDCs was developed focusing on solar water pumping systems to assist the Government of Zimbabwe in its Nationally Determined Contribution (NDC) implementation framework. An MRV for support needed and support received is not yet in place. The Ministry of Finance and Economic Development as the Aid Coordination Agency is in the process of developing the Development Projects Management Information System (DevProMIS).

National Greenhouse Gas Inventory Report for 1990-2022Zimbabwe's greenhouse gas (GHG) inventory in the BTR1 and Fifth National Communication (NC5) covers carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs). The GHG inventory covered five sectors, namely: (1) Energy, (2) Industrial Processes and Product Use (IPPU), (3) Agriculture, (4) Land Use, Land Use Change and Forestry (LULUCF), and (5) Waste sectors for the reporting year 2022 for all identified sources and sinks. The reporting cycle was coordinated by the National Technical Coordinator (NTC) reporting to the PMU in the CCMD under the Ministry of Environment, Climate and Wildlife. A team of national consultants covering each sector compiled the inventory under the technical lead reporting to the NTC.

The 2006 IPCC Guidelines and their 2019 Refinements were used to compile the GHG inventory. The methodological approach was largely Tier 1 due to lack of disaggregated activity data and country specific emission factors, except for selected categories within the Energy, IPPU and LULUCF sectors. The IPCC GHG Software (Version 2.93 of August 2024) was used for computation.

The activity data and their uncertainty levels were provided by data providers, most of whom were government agencies, government departments, local authorities and individual private companies. Default IPCC Emission Factors and their uncertainties were obtained from the 2006 IPCC Guidelines and the online Emission Factor Database. The data were archived in the GHG database developed under the same project. For computation of CO2eq, Global Warming Potential (GWP) of CO2, CH4 and N2O were obtained from the IPCC Fifth Assessment Report (AR5). The previous inventory cycle for NC4 used the Second Assessment Report (SAR) GWPs, hence recalculations were performed in the current inventory. Carbon monoxide (CO), nitrous oxide (NOx), sulphur dioxide (SO2) and non-methane volatile organic compounds (NMVOCs) emissions were estimated using the Low Emissions Analysis Platform (LEAP). The emission factors for the pre-cursor gases were obtained from the 2019 EMEP/EEA emission inventory guidebook and the 2006 IPCC Guidelines.

Table ES1 shows the national GHG inventory for Zimbabwe by gas for the report year 2010. The total national GHG emissions in 2022 was

83,118.72 Gg CO2 eq., while total national GHG removals in the same year was 201.97 Gg CO2 eq., giving a net total of 82,916.75 Gg CO2 eq. Thus, country was able to remove <1% of its total GHG emissions through the Harvested Wood Products (HWPs). Land Converted to Forest Land removed only 3,573.74 Gg CO2 and all CO2 removed by Forest Land Remaining Forest Land as well as other land conversions into categories with higher soil and biomass carbon stocks could not offset the total CO2 emissions from Forest land (59,399.66 Gg CO2) nor the CO2 from other land categories within the LULUCF sector (26,263.99 Gg CO2) in 2022. The inability of the LULUCF sector to remove any CO2 was attributed to biomass burning, especially in the Forest land and Grassland categories of the LULUCF sector. In 2022 area burnt amounted to over 860,000 ha in Natural Forest, over 3,000 ha in Plantation Forest and over 222,000 ha in Cropland, presenting a historical record since the combined area burnt did not exceed 630,000 ha in the previous year.

EST 1: National GHG Emissions for Zimbabwe in 2010 2022

SECTOR	GHG (GG CO2EQ.)
Energy	11,332.96
Transport	1,444.93
Industrial processes and product use	3,725.41
Agriculture	19,400.58
Forestry/LULUCF	43,992.21
Waste management/waste	3,020.67
Other (specify)	
Gas	
CO2 emissions including net CO2 from LULUCF	56,429.05
CO2 emissions excluding net CO2 from LULUCF	12,436.84
CH4 emissions including CH4 from LULUCF	18,575.07
CH4 emissions excluding CH4 from LULUCF	18,575.07
N2O emissions including N2O from LULUCF	4,831.01
N2O emissions excluding N2O from LULUCF	4,831.01
HFCs	3,081.33
PFCs	0.29
SF6	NE
NF3	NE
Other (specify)	NO
Total with LULUCF	82,916.75
Total without LULUCF	38,924.54

COMPLETENESS OF DATA

There was an improvement in the data completeness between the current and the previous reporting period.

QUALITY ASSURANCE AND QUALITY CONTROL

The Zimbabwe National Greenhouse Gas Inventory Improvement Plan Guidance Document (MEWC, 2023) and the Quality Assurance and Quality Control (QA/QC) Plan for Zimbabwe's GHG Inventory System (MECW, 2023) were used to in the current cycle of the inventory compilation.

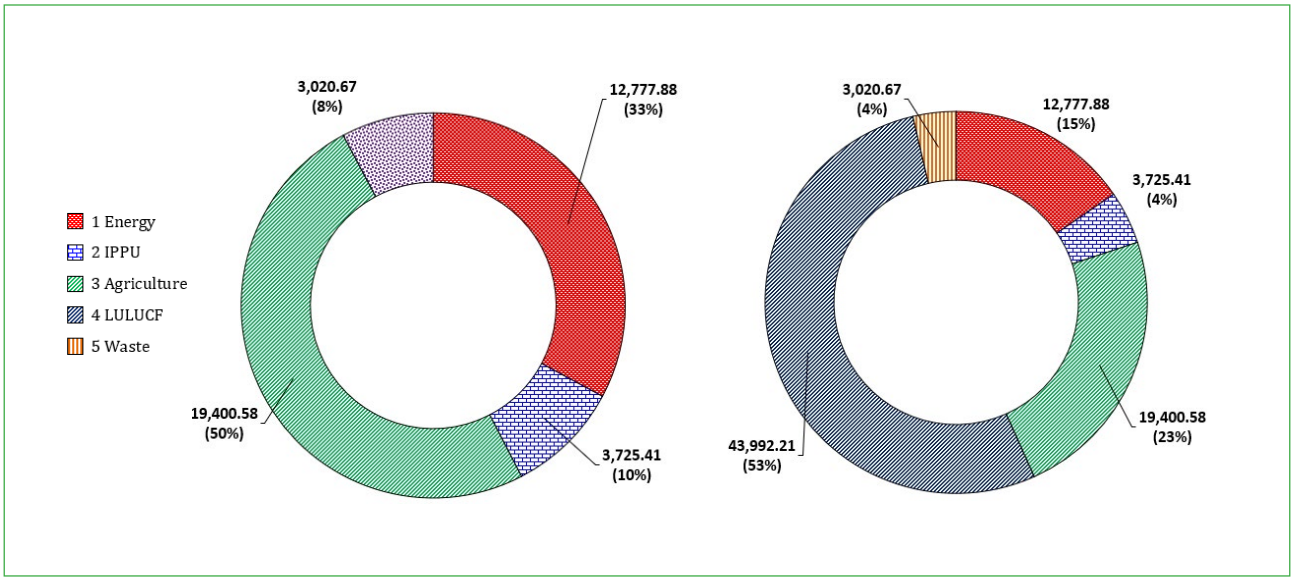
Peer reviews were conducted to improve on the Transparency, Accuracy, Completeness, Comparability and Consistency (TACCC).

Results of calculations were compared with international sources such as FAOSTAT and the International Energy Agency (IEA) for verification. For the energy sector CO2 emissions from fuel combustion were calculated using both the sectoral reference approaches. Data for the sectoral approach was obtained from the Ministry of Energy and Power Development (MoEPD) while that for the reference approach was obtained from the energy balances compiled by the International Energy Agency (IEA).

GHG EMISSIONS AND REMOVAL

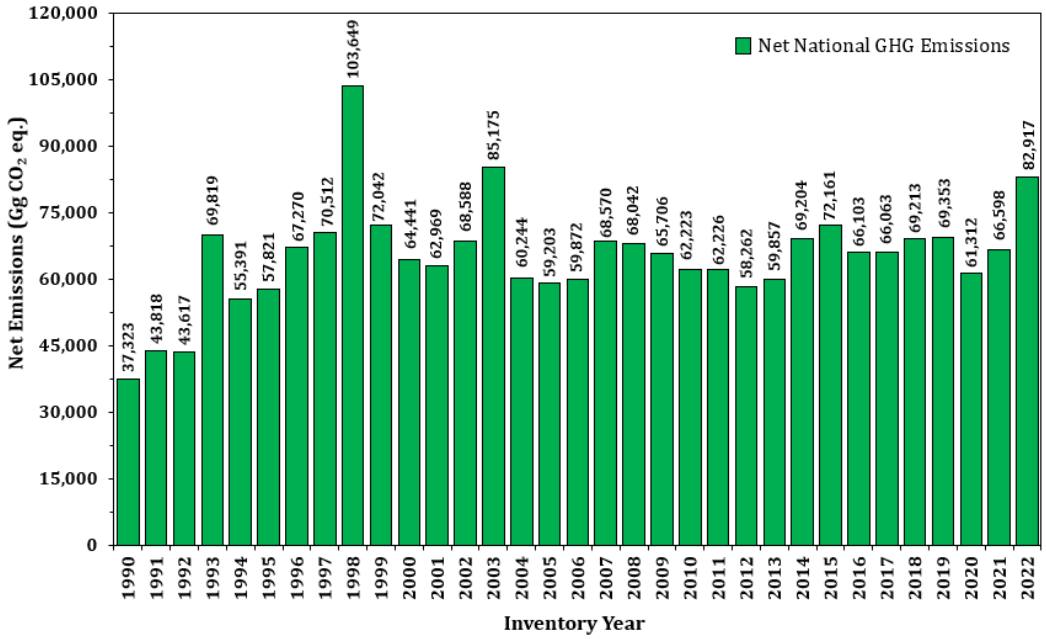
The total net GHG in 2022 including LULUCF were 82,916.75CO2eq.

ESF 1: Total 2022 GHG emissions with and without LULUCF



The net GHG emissions ranged from a minimum of 37,323 GgCO2eq. in 1990 to a maximum of 103,649 Gg CO2eq. in 1998.

ESF 2: Net GHG Emission Trend for the Period 1990 to 2022



Changes in GHG emissions and removals

The total GHG emissions for selected reporting years are presented in Table EST 2.

EST 2: Total aggregate GHG Emissions and Removals by Year and Gas (Gg)

SECTOR/ GAS	GHG EMISSIONS/REMOVALS BY SELECTED YEARS (GG CO2EQ.)								%CHANGE		
	-	NC1	NC2	NC3	NC4	NC5	BUR1	BTR1			
	1990	1994	2000	2006	2010	2014	2017	2022	1990-2022	1990-2010	2010-2022
Total emissions and Removals											
Removals	-17,019.76	-233.76	-167.18	-126.18	0.00	-27.52	-58.53	-201.97	-99	-100	NA
Emissions	54,343.19	55,624.41	64,608.46	59,997.96	62,223.26	69,231.46	66,121.85	83,118.72	53	15	34
Net Emissions	37,323.44	55,390.65	64,441.28	59,871.77	62,223.26	69,203.94	66,063.32	82,916.75	122	67	33
Net emissions by sector											
1 Energy	9,137.45	10,272.30	8,912.45	9,793.49	9,478.77	12,878.47	11,416.62	12,777.88	40	4	35
2 IPPU	801.74	1,724.85	4,176.12	4,346.94	5,331.28	4,444.37	4,445.35	3,725.41	365	565	-30
3 Agriculture	17,963.67	16,161.89	18,143.86	16,214.06	16,945.09	16,852.67	17,005.11	19,400.58	8	-6	14
4 LULUCF	8,451.95	26,005.99	31,671.10	27,781.63	28,583.62	32,808.76	30,702.29	43,992.21	420	238	54
5 Waste	968.63	1,225.62	1,537.75	1,735.66	1,884.49	2,219.67	2,493.94	3,020.67	212	95	60
Total	37,323.44	55,390.65	64,441.28	59,871.77	62,223.26	69,203.94	66,063.32	82,916.75	122	67	33
Net emissions by gas											
CO2	16,663.18	35,308.41	40,477.69	36,614.70	37,017.28	44,767.10	41,426.61	56,429.05	239	122	52
CH4	15,901.03	14,628.67	16,404.90	15,626.82	16,259.25	16,362.74	16,795.06	18,575.07	17	2	14
N2O	4,759.19	4,498.22	4,988.69	4,137.26	4,318.58	4,417.65	4,289.20	4,831.01	2	-9	12
HFCs	0.00	955.20	2,569.80	3,492.65	4,627.91	3,656.24	3,552.24	3,081.33	NA	NA	-33
PFCs	0.04	0.14	0.21	0.35	0.23	0.21	0.21	0.29	678	530	24
Total	37,323.4	55,390.7	64,441.3	59,871.77	62,223.26	69,203.94	66,063.32	82,916.75	122	67	33

Key Category Analysis with LULUCF

Key category analysis was carried out using both approaches 1 (level analysis) and 2 (trend analysis). Key categories for level were largely dominated by CO2 emissions from LULUCF accounting for over 60 per cent of the GHG emissions (Table EST 4).

EST 4: Key Categories with LULUCF-Level Assessment 2022

IPCC CATEGORY	GREENHOUSE GAS	|EX,T| (GG CO2 EQ)	% CONTRIBUTION	CUMULATIVE TOTAL OF %
Forest land Remaining Forest land	CO2	130,790.30	61.06%	61.06%
Land Converted to Forest land	CO2	16,364.07	7.64%	68.70%
Land Converted to Cropland	CO2	12,415.55	5.80%	74.49%
Land Converted to Grassland	CO2	9,079.85	4.24%	78.73%
Enteric Fermentation	CH4	9,067.03	4.23%	82.97%
Burning	CH4	5,800.69	2.71%	85.67%
Grassland Remaining Grassland	CO2	5,390.70	2.52%	88.19%
Energy Industries - Solid Fuels	CO2	3,810.64	1.78%	89.97%
Refrigeration and Air Conditioning	HFCs	3,081.62	1.44%	91.41%
Other Sectors - Liquid Fuels	CO2	2,875.48	1.34%	92.75%
Burning	N2O	2,068.80	0.97%	93.72%
Energy Industries - Liquid Fuels	CO2	1,861.34	0.87%	94.58%
Other Sectors - Biomass - solid	CH4	1,296.91	0.61%	95.19%

The key categories in terms of trend analysis were dominated by land conversions between forestland, grassland and cropland, contributing over 70%. The other sectors that were significant in terms of trend include emissions from: Biomass burning; energy industries - solid fuels; other sectors – biomass burning; enteric fermentation; road transportation manufacturing industries and construction - solid fuels and other sectors - solid fuels (EST 5).

EST 4: Key Categories without LULUCF-Level Assessment

2022

IPCC CATEGORY CODE	IPCC CATEGORY	GREENHOUSE GAS	LEVEL WITH LULUCF	% CONTRIBUTION	CUMULATIVE TOTAL
3.A.1	Enteric Fermentation	CH4	9,067.03	23.29%	23.29%
3.C.1	Burning	CH4	5,800.69	14.90%	38.20%
1.A.1	Energy Industries - Solid Fuels	CO2	3,810.64	9.79%	47.99%
2.F.1	Refrigeration and Air Conditioning	HFCs, PFCs	3,081.62	7.92%	55.90%
1.A.4	Other Sectors - Liquid Fuels	CO2	2,875.48	7.39%	63.29%
3.C.1	Burning	N2O	2,068.80	5.31%	68.61%
1.A.1	Energy Industries - Liquid Fuels	CO2	1,861.34	4.78%	73.39%
1.A.4	Other Sectors - Biomass - solid	CH4	1,296.91	3.33%	76.72%
1.A.3.b	Road Transportation - Liquid Fuels	CO2	1,105.42	2.84%	79.56%
4.A	Solid Waste Disposal	CH4	1,010.10	2.60%	82.15%
3.C.4	Direct N2O Emissions from managed soils	N2O	916.54	2.35%	84.51%
4.D	Wastewater Treatment and Discharge	CH4	834.80	2.14%	86.65%
3.A.2	Manure Management	N2O	679.96	1.75%	88.40%
4.C	Incineration and Open Burning of Waste	CO2	655.15	1.68%	90.08%
1.A.2	Manufacturing Industries and Construction - Solid Fuels	CO2	554.05	1.42%	91.51%
3.C.5	Indirect N2O Emissions from managed soils	N2O	484.74	1.25%	92.75%
1.A.2	Manufacturing Industries and Construction - Liquid Fuels	CO2	404.68	1.04%	93.79%
2.A.1	Cement production	CO2	363.11	0.93%	94.72%
1.A.3.c	Railways - Liquid Fuels	CO2	286.77	0.74%	95.46%

EST 5: Key Category due to Trend Analysis -2000 to 2017

Key categories by trend were:

- 3.B.1.a: Forest land Remaining Forest land-CO_2
- 3.B.2.b: Land Converted to Cropland-CO_2
- 3.A.1 Enteric Fermentation-CH_4
- 3.B.1.b: Land Converted to Forest land-CO_2
- 3.B.3.b: Land Converted to Grassland-CO_2
- 1.A.1: Energy Industries - Solid Fuels-CO_2
- 3.B.3.a: Grassland Remaining Grassland-CO_2
- 3.C.1: Burning-CH_4
- 2.F.1: Refrigeration and Air Conditioning-HFCs
- 3.C.1: Burning-N_2O
- 1.A.3.b: Road Transportation - Liquid Fuels-CO_2
- 3.C.4: Direct N_2O Emissions from managed soils-N_2O

UNCERTAINTY ANALYSIS

Uncertainties analysis was performed in the IPCC Inventory Software Version 2.93. of August 2024 employing error propagation approach.

RECALCULATIONS

All sectors performed recalculations since in the GWPs from the AR5 were used. Data quality improvements, especially in Energy, and Waste , also resulted in recalculations.

PLANNED IMPROVEMENTS

The main planned improved relate to;

- Strengthening the institutional and procedural arrangements for the GHG system,
- Capacity building on uncertainty analysis,
- Strengthening the QA/QC system,
- Establishing an archiving system and;
- Addressing identified data gaps

INFORMATION NECESSARY TO TRACK PROGRESS MADE IN IMPLEMENTING AND ACHIEVING NATIONALLY DETERMINED CONTRIBUTIONS UNDER ARTICLE 4 OF THE PARIS AGREEMENT

NATIONAL CIRCUMSTANCES AND INSTITUTIONAL ARRANGEMENTS

Zimbabwe's vision towards a knowledge driven and industrialised upper-middle income economy by 2030 acknowledges climate change, not only as a real phenomenon, but also a business case. The climate change risks and impacts in the country have stimulated the necessity for adaptation and resilience building in all sectors of the economy. National Circumstances have been described earlier in the summary. Institutional Arrangements for NDC tracking comprises of institutions that are implementing the measures and providing update either directly to the CCMD or the Technical Working Groups (TWG) under each sector. The experts responsible for NDC tracking are part of the TWG that produced the schedule of activities, templates for data collection and reported progress to the Technical Lead under tracking, who in-tern reports to the National Technical Coordinator. The NTC is responsible for the overall progress and making sure that the QA/QC procedures are scheduled and followed.

DESCRIPTION OF ZIMBABWE'S NDC UNDER ARTICLE 4 OF THE PARIS AGREEMENT

Zimbabwe's projected net GHG emissions were estimated in the margin of 75,000 Gg CO_2eq. in 2030 under the Business-as-Usual (BAU) Scenario. However, the country

made commitments to reduce the projected emissions to about 45,000 Gg CO_2eq in 2030 through 17 mitigation actions (described later in Section 2.2). The GHG emissions reduction target under the Paris Agreement is a 40% reduction in economy-wide GHG emissions per capita compared to BAU by 2030, all conditional on international support. In the mitigation scenario, economy-wide emissions per capita are projected to be 2.3 tCO2eq in 2030. The emissions baseline and mitigation measures cover the following IPCC sectors: Energy, Industrial Processes and Product Use (IPPU), Agriculture, Land Use, Land Use Change and Forestry (LULUCF) and Waste.

INFORMATION NECESSARY TO TRACK PROGRESS

A combination of GHG and non-GHG indicators were used in tracking progress towards the implementation of Zimbabwe's NDC for the year 2022. The total national GHG emissions in 2022 were estimated at 83,118.72Gg CO2eq, while removals were estimated at 201.97 Gg CO2eq, giving a net emission position of 82,916.75 Gg CO2eq. Detailed analysis of the GHG and non-GHG indicators and other information necessary to track progress are given in

Table ES6: Progress towards NDC Implementation: GHG Indicators

NO.	MITIGATION MEASURE	GHG REDUCTIONS VS 2030 BASELINE (%)	ESTIMATED GHG EMISSIONS IN 2022 (GG CO2EQ)		GHG REDUCTION VS 2022 BAU (%)
			WITHOUT MEASURE IN 2022 (BAU)	WITH MEASURE IN 2022	
	Transmission and Distribution losses reduced from 18% in 2020 to 11% in 2025	1.01	6543.98 from Electricity generation (1.A.1.a.i)	5671.98 from Electricity generation (1.A.1.a.i)	13.31
	Expansion of Solar: 300 MW in 2025	0.61			
	Expansion of microgrids: Additional of 2.098 MW of capacity added through microgrids by 2028	0.004		No grid-tied solar plants yet	N/A
	4.1 MW biogas capacity added in 2024	0.01		No measure yet	N/A
	Energy Efficiency Improvements: Agriculture: 12% savings (2030 compared to baseline scenario) Commercial: 16% savings Domestic: 22.08% savings Manufacturing: 18.63% savings Mining: 8% savings	2.72	4,092.79 from MIC (1.A.2) and Other Sectors (1.A.4)	No measure yet	N/A
	2% biodiesel in fuel by 2030	0.25	1,105.42 from Road Transport (1.A.3.b)	No measure yet	N/A
	Fuel economy policy: Fuel efficiency improvement 2025-2030: Motorcycles: 2.2% per year, Light Duty Vehicles (LDVs): 2.9%/year Buses: 2.6%/year, Heavy Duty Vehicles (HDVs): 2.5%/year	0.73		No measure yet	N/A
	Public transport (modal shift). 5% shift from private car to public transport in 2030	0.23		No measure yet	N/A

NO.	MITIGATION MEASURE	GHG REDUCTIONS VS 2030 BASELINE (%)	ESTIMATED GHG EMISSIONS IN 2022 (GG CO2EQ)		GHG REDUCTION VS 2022 BAU (%)
			WITHOUT MEASURE IN 2022 (BAU)	WITH MEASURE IN 2022	
	Increased clinker substitution with fly ash (up to 16% by 2030, 20% by 2050).	0.04	424.79 from Cement production (2.A.1)	363.11 from Cement production (2.A.1)	14.52%
	Increased clinker substitution with BFS (up to 16% by 2030, 20% by 2050).	0.04			
	Decomposition of N2O emissions through use of a secondary catalyst. Selective De-N2O catalyst results in abatement of approximately 75% of all N2O emissions produced during nitric acid production. Implementation by 2023	0.11	32.97 from Nitric acid production (2.B.2)	No N2O decomposition yet	N/A
	HFC Phasedown schedule Kigali Amendment (Freeze 2024, 2029, 10% reduction)	0.44	3168.44 from Refrigeration and Air Conditioning (2.F.1)	3081.62 from Refrigeration and Air Conditioning (2.F.1)	-2.74%
	Increase area of forest land from 9.9 million hectares to 10.4 million hectares by 2025: Add 100,000 hectares of natural forest land per year between 2021 and 2025	12.73	Not assessed	xxx	N/A
	Increase area of forest plantation from 68848 hectares to 118848 hectares by 2025: Add 10,000 hectares of plantation forest land per year between 2021 and 2025	1.33	Not assessed	44,194.17 from Land (3.B)	N/A
	Reduce area burned by 500,000 hectares between 2020 and 2025	27.75	7869.49 from Burning (3.C.1)	No measure yet	N/A
	Waste to Energy: It was assumed that 42% of the methane generated would be collected and used for energy production through waste to energy projects in Harare, Bulawayo, Mutare and Gweru	1.26	1,010.19 from Solid waste disposal (4.A)	No measure yet	N/A
	20% of organic matter composted in the long term	0.45		1,010.10 from Solid waste disposal (4.A)	-0.009%

MITIGATION POLICIES AND MEASURES, ACTIONS AND PLANS

Energy Sector

The measures in the energy sector are equally divided between complementing non-renewable energy sources with green energy sources (E2, E3, E4 and E6) and efficiency improvement-related innovations (E1, E5, E7 and E8) (Section 2.1.3). Measure E1 is supported by the National Development Strategy (NDS1), while measures E2, E3, E4, E5 and E6 are backed by the ZESA System Development Plan of 2017, Renewable Energy Policy and the Renewable Energy Fund. The Low Emissions Development Strategy (LEDS) 2020-50 supports measures E6, E7 and E8.

IPPU Sector

For the IPPU sectors measures are targeted towards the production of cement (I1 and I2) and nitric acid (I3), as well as use of product uses as substitutes for ozone depleting substances (I4) (Section 2.1.3). Measure I4 is supported by the HFC Phasedown Schedule under the Kigali Amendment to the Montreal Protocol. The LEDS 2020-50 supports measures I1 to I3.

Agriculture Sector

Under the agricultural sector reducing biomass burning on cropland is the only measure collectively included with measures to reduce burning in forest land and grasslands (A3; Section 2.1.3). The measure is supported by the National Development Strategy (NDS1) and the LEDS.

Forestry Sector

The government put significant value to forests as essential components of the economy, directly supporting livelihoods and biodiversity conservation. Zimbabwe's forests face pressures from agricultural expansion, settlement expansion, veld fires and other factors. In tobacco-growing regions, substantial deforestation occurs due to tobacco curing processes. Consequently, the government has developed a tobacco wood energy programme that promotes the growing of fast-growing trees as a source of firewood. Numerous initiatives are being implemented at the sub-national level, including Global Environmental Facility funded projects that support the rehabilitation of degraded forests. The Government of Zimbabwe has identified REDD+ as a critical mechanism for fostering atmospheric carbon sequestration and providing alternative livelihoods to communities heavily dependent on forests. In 2013, Zimbabwe submitted a country-level REDD+ country needs assessment (CNA) report to the UN-REDD programme as part of the preparation for REDD+ and the associated Monitoring, Reporting, and Verification (MRV). The CNA focused on the identification of national and sub-national stakeholders and their various roles in REDD+ issues, as well as gaps and capacity development needs in institutional roles and mandates regarding REDD+. The CNA noted two critical impediments to the development of REDD+ in Zimbabwe: (1) lack of finance and (2) lack of technical capacity.

Waste Sector

With solid waste disposal being the key category in the waste sector, the composting and waste to energy projects aim to reduce the amount of waste disposed at solid waste disposal sites and by extension emissions. The implementation of these actions is supported by a number of national policies and plans such as the Zimbabwe Integrated Solid Waste Management Plan and the LEDS as well as Local Authority by-laws.

Summary of Greenhouse Gas Emissions and Removals

Refer to Table ES1

Projections of GHG Emissions and Removals

Due to capacity constraints the projections of GHG emissions and removals could not be completed in accordance with Annex 3 Paragraph 92 of the MPGs. However, Zimbabwe envisages to conduct the projections in the next cycle of reporting (due December 2026).

VULNERABILITY AND ADAPTATION ASSESSMENT

There is differential vulnerability to climate change among livelihood groups and sectors such as agriculture, water, infrastructure, health, ecosystems and wildlife due to differences in exposure, sensitivity and adaptive capacity. In addition, infrastructure such as roads, schools, dams, power and communication lines are adversely affected annually by the impacts of reoccurring floods and droughts countrywide. The vulnerability of communities is worsened by over-reliance on natural resources, limited technology, high levels of poverty, inadequate infrastructural and institutional capacity and poor health service and delivery.

A vulnerability and adaptation assessment study was carried out in Muzarabani District to determine vulnerability to the impacts of Climate Change. The majority of the population in the district depend on rain-fed agriculture in an area predominantly semiarid. Sodic soils dominate the district with rich alluvial soils along flood plains in Lower Muzarabani District.

The high overall vulnerability in terms of agriculture is attributed to low adaptive capacity. This shows that much of the vulnerability to climate change in Lower Muzarabani District does not necessarily emanate from exposure to drought but other factors on the ground. Thus, policy interventions that result in use of improved agricultural technologies are critical to build resilience in a variable climate. Irrigation development is key to build adaptive capacity in smallholder farming systems in Lower Muzarabani District since drought is the major agricultural risk. In this regard, government has prioritized the construction of Silverstroom Dam, which is envisaged to support about 2,000 hectares of irrigable land in the district in an effort to build resilience against climate change impacts, especially droughts.

Extension services to train farmers on good agronomic practices and crop selection are crucial to increase the viability of the crop. In addition, more support is required on crop value addition and exploring the dynamics of high valued markets. Increased product quality and productivity is however crucial in all this and is clearly missing in the District.

Normalised Water Vulnerability Index (WVI) analysis showed that wards in the Lower Muzarabani District more vulnerable to climate change than those in the upper part. The Lower part of the district has a WVI more than twice that of the upper district for all projections. There is a marginal increase of water vulnerability in some of the upper parts of the district for projections to 2030 and 2040. The general increase in vulnerability in the district especially in the Lower part supports the need to develop more water resources in the district. More boreholes and other water harvesting techniques can be developed in the lower part of the district where the terrain is generally flat, making it unfeasible to develop medium to large dams.

In addition, to water resources development, the district needs investments in groundwater and meteorological monitoring points in addition to the existing thin hydrological monitoring network. The complete data set obtained will assist in the downscaling of the models with better ground truthing.

Climate change is expected to result in

changes in transmission of vector-borne diseases. It was observed that the upper part of the district is characterised by free to low or sporadic malaria patterns while the lower part is classified as having high and perennial malaria cases. Results of health impacts show that most people do not seek treatment at health centres because of the long distances they have to travel to access the services. As a result, they end up using alternative medicines to treat common diseases such as malaria. In the process, compromised health leads to incapacitation in attending to productive activities such as farming and, hence, affects food security efforts.

Using future climate scenarios, the distribution of dominant woody species in Muzarabani district shows mixed results. For instance, under RCP 4.5 *B.boehmii* is projected to dominate the central and upper parts of the district while the range of *C.apiculatum* shows marginal changes. Under the same climate scenario, the suitable habitat for *C. mopane* is expected to decrease and will be mostly confined to the lower parts of the district

.

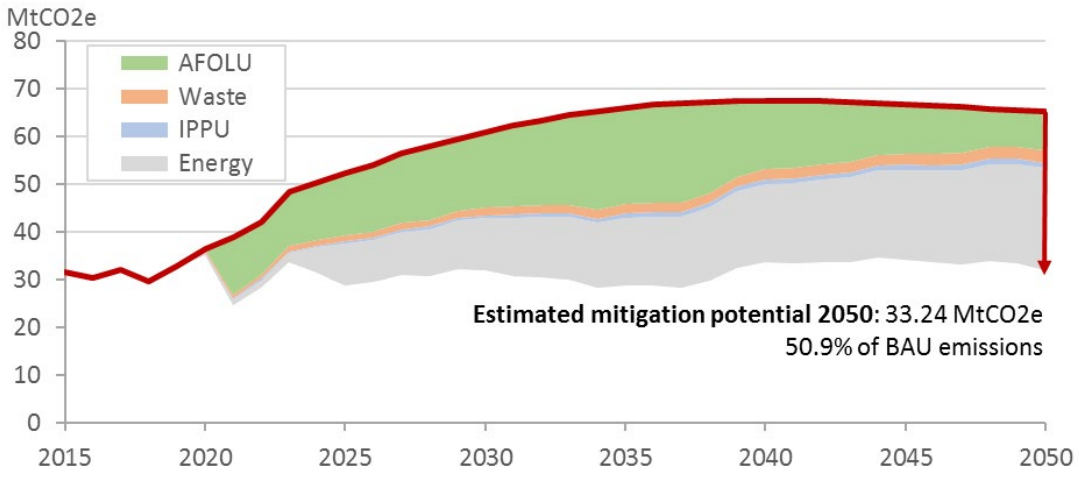
On the wildlife sector climate change is likely to affect wildlife distribution and survival in semi-arid savannas. It was noted that the main effects of climate change on wildlife includes contraction of monthly range due to low rainfall, animal deaths due to heat waves, decrease in water supply and forage, destruction of forests and extinction of certain species. The negative effects of climate change are also being exacerbated by habitat fragmentation and increase in human wildlife conflicts. Out of the dominant species in the area, baboons, bucks, hyenas, monkeys, elephants and warthogs were identified as responsible for destroying people's crops leading to human-wildlife conflicts. The shortage of food for the animals is also made worse by the frequent fires.

The frequent flooding resulting from excessive rains also damages bridges which link the different wards in the district making the communities even more vulnerable as access to some places is cut-off. The destruction of critical infrastructure such as houses, roads, schools, boreholes and clinics weakens the community's social, economic and human systems. The disruption of water and sanitation services results in frequent illness, malnutrition and overall discomfort that lower earning potential among adults. Development and implementation of climate proofed building codes and standards, and mobilisation of resources for infrastructure development through private-public-partnerships in addition to government funds must be prioritised.

CLIMATE CHANGE MITIGATION

Zimbabwe conducted economy-wide mitigation analyses during the preparation of the Low Emission Development Strategy (2020) and in 2021 during the preparation of the country's revised Nationally Determined Contribution (NDC). In the LEDS (2020-2050), Zimbabwe identified 38 economy-wide mitigation measures. These mitigation measures projected a 50% reduction of Zimbabwe's GHG emissions, amounting to 33.2 MtCO2eq below the BAU scenario by 2050. In the LEDS, the largest abatement potential is expected to come from the AFOLU sector (46.9%), followed by the energy sector (44.4%), waste (6.1%), and the IPPU (2.7%) as presented in Figure ESF 3.

ESF 3: Economy wide mitigation scenario in the LEDS (2020-2050)



The updated mitigation contribution of Zimbabwe's Revised NDC draws on an economy-wide GHG mitigation assessment. A total of 17 mitigation measures were selected for inclusion in the Revised NDC. The mitigation analysis covered Energy, Industrial Processes and Product Use (IPPU), Agriculture, Forestry and Other Land use (AFOLU) and Waste sectors. The analysis was mainly informed by the Zimbabwe National Climate Policy, National Climate Change Response Strategy (NCCRS), LEDS and the National Development Strategy 1 (NDS1). Zimbabwe used a multi-criteria analysis to prioritise the sectorial mitigation policies and measures eligible for use in the mitigation assessment based on:

- Existence of a local implementing agent
- Clear emission reduction/sink enhancement target/ mitigation potential
- Definite and current medium to long-term timeline
- Alignment with national development goals and targets
- Responsiveness to available Measurement, Reporting and Verification (MRV) methods/ frameworks

The analysis determined the baseline emission growth, expected emission targets, and emission reduction measures. The mitigation measures were analysed using the Low Emissions Analysis Platform (LEAP) model. Three scenarios were developed, that is, a) historical emissions between 2010 and 2017, b) baseline projections of emissions from 2018 and 2030, and c) mitigation analysis through 2030.The direct GHG gases covered, include Carbon dioxide (CO2), Methane (CH4), Nitrous oxide (N2O) and Hydrofluorocarbons (HFCs). The biggest reduction in emissions from the BAU in 2030 comes from the AFOLU sector (25.35 MtCO2eq), followed by the energy sector (4.2 MtCO2eq), with smaller reductions from waste (0.65 MtCO2eq) and IPPU (0.45 MtCO2eq) sectors. The economy-wide GHG abatement potential is 30.65 MtCO2eq which corresponds to around 41% of BAU GHG emissions in the same year as shown in Table EST 6.

EST 6: Sectoral reductions in GHGs in 2030 compared to a baseline scenario

SECTOR	2030 BASELINE GHG EMISSIONS (106 TONNES CO2-EQ)	2030 GHG EMISSIONS (106 TONNES CO2-EQ)- WITH MITIGATION ACTIONS	ABSOLUTE REDUCTION (106 TONNES CO2-EQ)	PERCENTAGE REDUCTION
Energy	26.62	22.42	4.20	14
IPPU	4.20	3.75	0.45	2
Agriculture, Forestry & Other Land Use	41.57	16.22	24.35	82
Waste	3.00	2.35	0.65	2
Overall	75.39	44.74	29.65	100

Challenges in Emissions Reduction in the Different Sectors
Some cross cutting barriers were identified that would affect the effectiveness of implementing the mitigation measures. These include;

- Lack of a national climate change mitigation MRV framework.
- Inadequate financial capacity to implement the mitigation measures.
- Inadequate trained mitigation experts and key stakeholders such as data providers and implementing entities.
- Low stakeholder involvement in relevant inter-sectoral planning processes & implementation of mitigation measures due to limited knowledge of the subject

RESEARCH AND SYSTEMATIC OBSERVATIONS

Zimbabwe participates in systematic observations of the climate and the environment through a number of government departments such as the Meteorological Services Department (MSD) and the Zimbabwe National Water Authority (ZINWA) both under the Ministry of Environment, Climate Change, Tourism and Hospitality Industry and the Department of Agriculture, Research and Extension (AGRITEX). These departments cooperate with research and academic institutions to provide the research component for the various fields. Since the submission of the Third National Communication (NC), a number of developments have taken place in systematic observations. The Zimbabwe National Geospatial and Space Agency was established to complement earth and atmosphere observations and to support research in terms of data provision, the purchase of automatic weather stations and the data rescue program aimed at improving data quality and completeness.

To support the Global Climate Observation Systems (GCOS), Zimbabwe has 47 operation synoptic stations and at least 300 rainfall stations. However none of the upper air stations is providing data due to the absence of radiosondes and hydrogen. All meteorological data are hosted by the MSD in a Climsoft based database management system. The

32 stations which are supposed to provide agroclimatic data however, there is no full datasets exist following the absence of a proper monitoring system. The establishment of the National Framework for Climate Services (NFCS) is envisaged to improve data availability and utilisation as AGRITEX takes part in co-generation of products. The ZINWA has at least 240 gauging stations for monitoring surface water runoff and siltation. Additional resources to compliment observing stations have been provided from several projects which include the Green Climate Fund (GCF), Global Environment Facility (GEF) and the African Development Bank (AfDB) among others. The Environmental Management Agency (EMA) monitors the air quality and provides an Air Quality Index (AQI), using data from the Plume Labs, however the use of the index remains low. Each of the institution archives its own data set, and therefore access of a composite data set remains a challenge. Limitation arises from data in different formats and availability of incomplete data sets.

Systematic observations are the main source of activity data for scientific analysis of climate and climate change. Therefore the data play a pivotal role in research and the absence or paucity of data limits the levels to which research can be carried out. In Zimbabwe research remain suboptimal as the incomplete data sets reduce the scale to which research may be carried out. Current research has focused on the use of indigenous knowledge systems in weather and climate forecasting, future climate change scenarios as a contribution to the National Adaptation Plan (NAP) Readiness project, greenhouse gas (GHG) emissions from agriculture and agroecological zoning which led to the development and commissioning of a new Agro-ecological zone map for Zimbabwe. The Research Council of Zimbabwe (RCZ) hosts a yearly symposium focusing on a variety of climate change related themes. Research on climate change impacts is available however the focus has been on agriculture and water resources. Research in other sectors such as forestry, transportation and energy among others, remain limited. On climate science aspects, institution of higher learning are doing research on past trends in climate indices. Future research should include environmental quality monitoring, inclusion of several other global circulation models apart from CSIRO MK3 model and parameterization of indigenous knowledge systems.

CONSTRAINTS AND GAPS

Various constraints, gaps as well as needs were noted in as far related to Vulnerability Assessment and Adaptation, Systematic Observation and EAT are concerned. The constrains and gaps identified include low adoption of climate smart agriculture practices; limited real time data availability, backup, data quality and gaps and communication network; inadequate climate resilient infrastructure; Poor water resources development and limited de-risking instruments and guarantees to support private sector investment in Agri business markets. In order to close this identified gap, technical, capacity and financial needs identified include training farmers on scaling up climate smart agriculture and climate risk management accompanied by corresponding technologies, enabling policies and infrastructure; developing an integrated early warning systems which includes, health, agriculture, water, energy and disaster risk reduction sectors; designing climate resilient infrastructure accompanied by improved building codes.

In the mitigation sector, constraints, gaps as well as needs identified include limited presence of large-scale renewable energy and grid connected solar PV projects. Furthermore, there is low capacity for tracking mitigation actions;

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PREAMBLE - NATIONAL CIRCUMSTANCES, INSTITUTIONAL ARRANGEMENTS, POLICY & LEGISLATIVE FRAMEWORK

NATIONAL CIRCUMSTANCES

The country's national circumstances, inform and influence climate action policies as well as determine how it responds to climate change. The geographic characteristics, population, governance systems, and socioeconomic status are highlighted in this section.

Geography

Zimbabwe is a landlocked country covering an area of approximately 390,757km^2. The altitude across the country ranges from less than 200m above sea level in the southern parts to above 2,000m in the Eastern Highlands. The country is in a subtropical climate belt characterised by seasonal rainfall whose spatial distribution is mostly controlled by topography. There are seven river catchments in the country, namely Gwayi, Manyame, Mazowe, Mzingwane, Runde, Sanyati and Save. The country has more than 10,000 dams built for various purposes including power generation, irrigation, livestock and household use. In addition to these dams, Zimbabwe has wetlands which make about 3% of the total land area. The low-lying areas in the country such as Beitbridge, Chicualacuala, Gokwe, Gwayi, Mbire, Middle Sabi, Malipati, Muzarabani and Tsholotsho, are prone to flooding.

Demography

Zimbabwe has a total population of 15,178,979 (52% female and 48% male). The proportion of people living in urban and rural areas is 38.6% and 61.4%, respectively. The average life expectancy is 61.89 years while the birth rate is 3.38. With 41.9% of the population under 15 years old, 54.3% between 15 and 64 years old, and 3.8% beyond 65, the population's overall dependency ratio is 84.1 %. Zimbabwe's human development index (HDI) increased by 14.8% from 0.479 in 1990 to 0.550 in 2022.

Administrative Structure

Zimbabwe has ten administrative provinces namely Bulawayo, Harare, Manicaland, Mashonaland East, Mashonaland Central, Mashonaland West, Masvingo, Matabeleland North, Matabeleland South, and Midlands. These provinces are further divided into sixty administrative districts. Bulawayo and Harare are metropolitan provinces while the remaining eight provinces are mostly rural and intermingled with a few towns and growth centres (Figure 0.1). Zimbabwe has embraced a devolution of powers in its governance system in which power has been transferred from central government to local government, as enshrined in the Zimbabwe Constitution. This devolution of powers provides a strong foundation for

local government to respond to climate change through a consultative, fully participatory, and transparent process that leaves no-one and no place behind, a central principle of the Sustainable Development Goals.

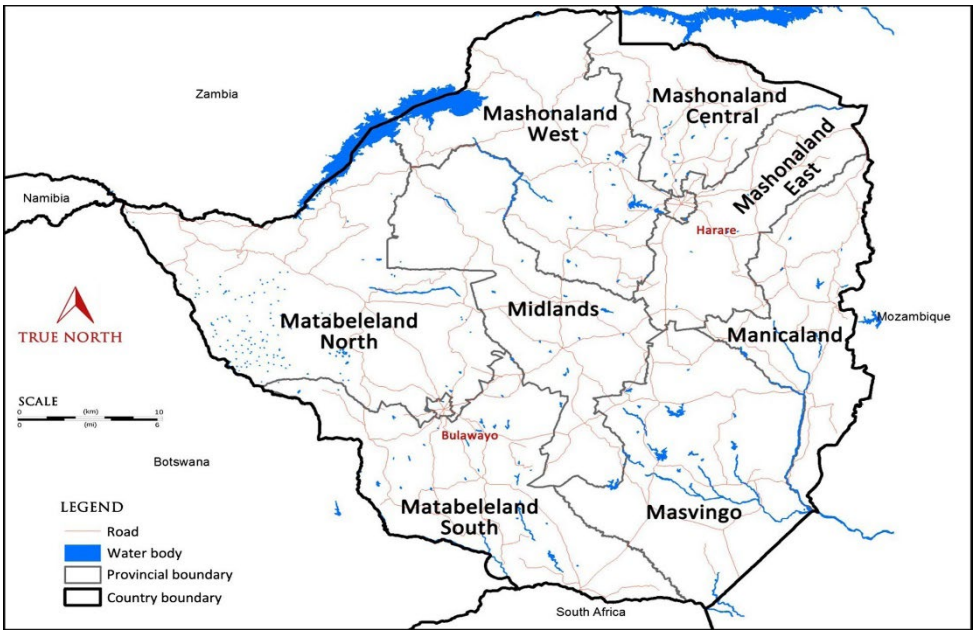


Figure 0.1: Provincial Boundaries of Zimbabwe

Climate

Zimbabwe has a sub-tropical climate that is influenced by altitude. The cool season spans from mid-May to mid-August; hot season from mid-August to mid-November. The mean monthly temperature ranges from 15ºC in winter (May-July) to 24°C in summer (October-December). Between 1900 and 2019, the annual mean surface temperature increased by about 0.9°C, with the 1980s experiencing the largest increase. The rainfall season in Zimbabwe is unimodal and occurs from October to March. The average annual rainfall varies from less than 400 mm in the southern parts of the country to over 1,000 mm in the eastern highlands. Meteorological observations show that the climate has been changing since the 1900s. Significant alterations include rising average temperatures, falling annual precipitation, shift in the start and end dates of the rainy season, and lengthening the mid-season dry spell. The changes in climate have also resulted in shifting of the country's Agro-Ecological Zones. Extreme weather events such as heat waves, droughts, hailstorms, floods, and tropical cyclones have become more frequent and more intense across the country.

Zimbabwe's Economy

The country's economy is anchored on agriculture, mining, tourism, manufacturing and trade. Zimbabwe's gross domestic product (GDP) was valued at USD 27.37 and 26.54 billion in 2022 and 2023, respectively. Zimbabwe's economy grew by 6.5% in 2022 and 5.5% in 2023. In 2022, the growth was largely driven by mining, agriculture and manufacturing in that order. In 2023, the growth was largely driven by the agricultural sector owing to better performance of the cotton, wheat and tobacco crop sub sectors. Nonetheless, in 2024, Zimbabwe's economy is projected to decelerate by 3.5% primarily due to poor performance of the agricultural sector as a result of the El Niño-

induced drought conditions along with general declining global mineral commodity prices.

Agriculture

Agriculture is one of the focal pillars of the National Development Strategy (NDS1). The agriculture sector in the country is diverse and consists of livestock, food crops and cash crops. There are more than 23 types of food and cash crops which include maize, future grains (sorghum, pearl millet, finger millet) wheat, groundnuts and beans. The main cash crops include tobacco, cotton, sugarcane, soya bean, tea, coffee and horticultural crops. Maize is the most extensively grown grain despite its high-water requirement, and high production risk across most parts of the country. The area under small grains is on the increase due to multiple promotional initiatives and agro-tailoring by GoZ and development partners. About 6,000ha is under citrus production (irrigated) and the main cultivars are oranges, nartjies, nectarines, lemons and grapefruits.

The main livestock species are cattle, goats and poultry. The average national calving rate stands at 39%, the off-take rate is 6% while the mortality rate is at 9% (FAO, 2024). The main barriers to livestock production are climate change-related e.g. droughts and prolonged dry spells, shifts in rainfall seasons and changes in temperatures. This usually leads to poor nutrition, inadequate dry season feed, expensive stock feed and trans-boundary pests and diseases.

The country's economy is predominantly agro-based with the sector contributing an average of 17% to the country's GDP. It is a source of livelihood to 70% of the population, provides approximately 60% of raw materials for industry and generates about 45% of the export earnings (Ministry of Finance and Economic Development, 2024). The agricultural sector supports the meat, dairy, cotton and horticulture value chains. The agriculture sector is mainly rain-fed and hence vulnerable to erratic rainfall, recurrent droughts and mid-season dry spells. Approximately 42% of the total land area is under rainfed and irrigated agriculture. Only 34% of the potential irrigable land (365,000ha) is irrigated with the greater proportion under commercial farming and government supported irrigation. Climate change is one of the major threats to agricultural production. This is exacerbated by soil degradation, limited adoption of climate smart agricultural technologies and constrained access to agricultural credit financing. Small holder farmers with limited access to modern agricultural technologies are the worst affected. Recurrent droughts significantly reduce crop and livestock production. To ameliorate this challenge, the GoZ introduced the Climate Proofed Presidential Agricultural Input Scheme (*Pfumvudza/Intwasa*). In addition, the government introduced the Ward Drought Mitigation Centres in response to the devastating effects of the 2023/24 El Niño induced drought.

Water Resources

Zimbabwe's long term average annual surface run-off is estimated to be 23.7 x $10^9 m^3$. The distribution of average runoff varies from 21mm per year in the Gwayi Catchment to 126mm per year in the Mazowe and parts of the Save Catchment. Water can be accessed from direct river abstractions or through storage works. The country also has groundwater reserves grouped into 10 hydro-geological units yielding approximately 1.8 x $10^9 m^3$ from registered and monitored uses. Zimbabwe adopted a decentralized approach on water governance, managing water resources at grassroots level utilizing Integrated Water Resources Management (IWRM) principles. The system of water permits is managed at sub-catchment and catchment levels by the stakeholders and

the national authority to ensure marginalized communities are also part of the system.

The country has invested in dam development through government, cooperating partners and private players. The largest inland dam, Tugwi Mukosi with a capacity of 1.8 x $10^9 m^3$ was commissioned in 2017. According to NDS1 and in line with SDG 6, the country is targeting to increase access to portable water from 77.3% to at least 90% and water storage capacity from the current 10.615 to 11.453x $10^9 m^3$ by 2025.

The water targets will be achieved through the construction of medium to large dams, water supply stations (including rehabilitation) and development of 35,000 boreholes through government and cooperating partners. The government completed Chivhu, Muchekeranwa and Marovanyati dams and upgraded Beitbridge water supply infrastructure. ZINWA is constructing Kunzvi dam, dam pipeline and treatment works (augment Harare), Gwayi Shangani dam (Bulawayo Matabeleland water supply), Bindura dam, Dande dam and tunnel, Semwa dam, Tuli-Manyange dam, Gwayi-Shangani Bulawayo pipeline, Mbada dam, Ziminya dam, Vungu dam and Defe Dopota dam. The projects are at various stages of completion ranging from 10 to 90%.

Land-Use and Land Cover

In Zimbabwe, forested land covers 61.55% of the area, followed by agriculture at 30.83% and other land uses at 7.62%. Forested areas include plantations, natural woodlands, and bushland. Agricultural land consists of crops, perennial plants and pastures. Built-up areas fall under other land uses. Over 67% of forests and woodlands are in communal and resettlement areas. Less than 20% of the area is protected. The Eastern Highlands host moist forests and a variety of exotic plantations. These forests offer timber, non-timber products, and ecosystem services. They support wildlife and biodiversity. They are vital for urban and rural livelihoods. They uphold social and cultural values.

Public Health

Zimbabwe acknowledges that both human and animal health are a key pillar for economic development and attaining Vision 2030. The country's health sector is mainly funded by treasury and supported by development partners. HIV and AIDS with a prevalence of 12.8% among adults (15.4% in females and 10.1% in males), remains a major burden affecting the country. Malaria remains a major driver of human morbidity and mortality in the country. The transmission of malaria is seasonal, correlating with the rainfall trends and topography. It is more prevalent in the northern and the eastern borders with limited transmission in the central and south-western parts of the country. The country's health system has a five-tier referral architecture namely; the Primary Care Level; Secondary Care level, Tertiary level, Quaternary level and the Quinary level. In Zimbabwe each province has provincial province while each district has a district hospital. The primary health care varies within wards.

INSTITUTIONAL ARRANGEMENTS

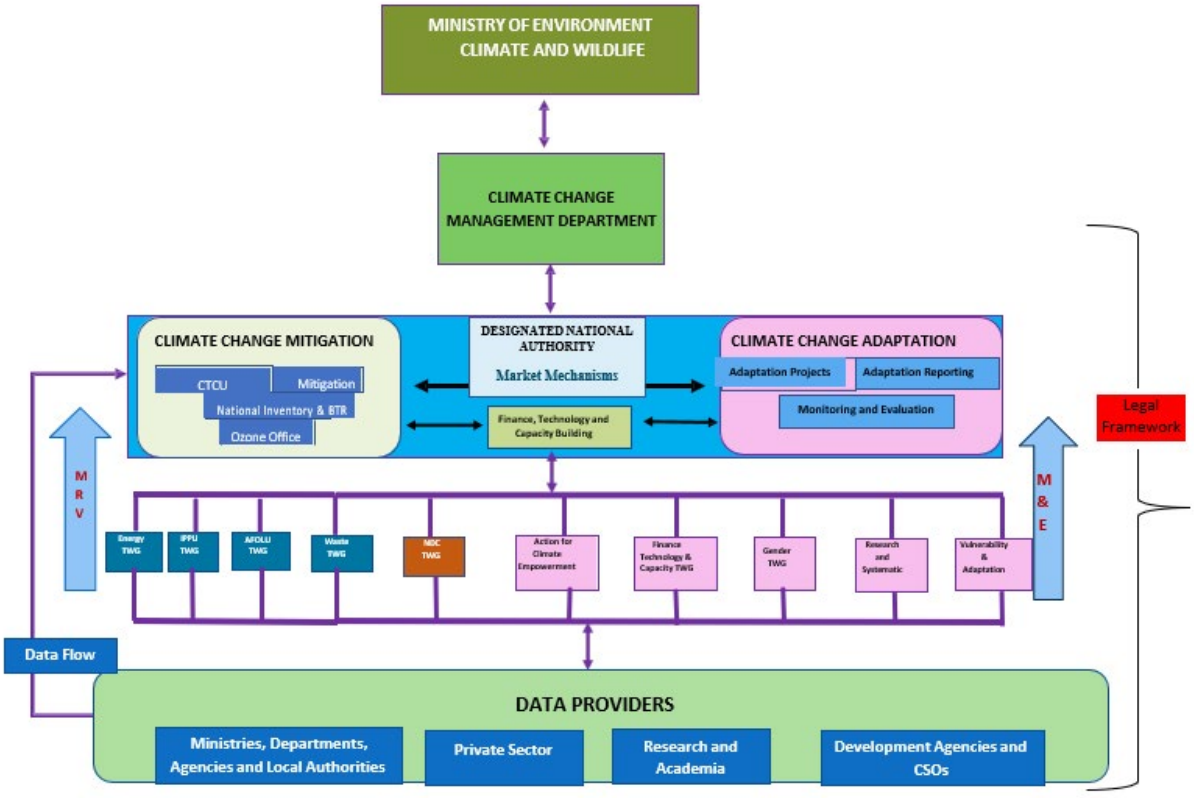
All climate change activities in Zimbabwe are coordinated by the High-Level Committee in the Office of the President and Cabinet (OPC) (Figure 0.2). The High -Level committee is chaired by the OPC and composed of Permanent Secretaries for all government ministries. The Climate Change Management Department (CCMD), established in 2013 and housed in the Ministry of Environment, Climate and Wildlife, has the mandate to coordinate and implement national climate action in a whole-of-government and whole-of-society approach to ensure a climate resilient and low carbon Zimbabwe.

Specifically, the mandate of CCMD is to:

i. Develop climate related policies and strategies.
ii. Coordinate climate research, carry out climate change education, public awareness and training;
iii Promote greening of the economy (promoting energy efficiency, creating green jobs etc);
iv. Carry out climate change negotiations;
v. Develop and coordinate climate change mitigation and adaptation projects;
vi. Provide guidance and ensure implementation of national policies on climate issues.
vii. Reporting and archiving of information and stakeholder engagement related to the implementation and achievement of Zimbabwe's NDC.

The CCMD is thus the Designated National Authority (DNA) for coordinating and providing technical leadership for the country's international engagement with the United Nations Framework Convention on Climate Change (UNFCCC) and other international reporting and commitments, including participating in the Conference of Parties (COP). The DNA is also responsible for reviewing and approval of national climate change projects. The country has a designated National Focal Point person to the UNFCCC. The CCMD is responsible for the development of the National Communications (NCs) and Biennial Transparency Reports (BTRs). The NCs and BTRs are coordinated by the National Coordinator who reports to the Director in the CCMD.

Figure 0.2: Climate Change Institutional Arrangements for Transparency in Zimbabwe



Please note: links are bi-directional

Key to Figure 0.2:

AFOLU Agriculture Forestry and Other Land Use
BTR Biennial Transparency Report
CCMD Climate Change Management Department
CSO Civil Society Organisation
CTCU Climate Transparency and Compliance Unit
IPPU Industrial Processes and Product Use
MRV Measurement Reporting and Verification
TWG Technical Working Group

INSTITUTIONAL ARRANGEMENTS

MRV lead: CTCU Climate Change Management Department
TWG leads
Mitigation Sector
AFOLU: Ministry of Agriculture and Forestry Commission
ENERGY: Zimbabwe Energy Regulatory Authority
IPPU: Ministry of Industry and Commerce
WASTE: Environmental Management Agency
Legal Framework: AG's office

b. Adaptation Sector
Adaptation
Mitigation
Capacity Building
Resource Mobilisation
Legal and Transparency
Advocacy and Awareness

LEGISLATIVE AND POLICY FRAMEWORK AND REGULATIONS

Legislation

The constitution of Zimbabwe (2013) states that every person has the right to:

a. To an environment that is not harmful to their health or well-being;
b. To have the environment protected for the benefit of present and future generations, through reasonable legislative and other measures that—
   i. prevent pollution and ecological degradation;
   ii. promote conservation; and
   siii. ecure ecologically sustainable development and use of natural resources while promoting economic and social development.

Further, the Constitution states that the country must take reasonable legislative and other measures, within the limits of the resources available to it, to achieve the progressive realization of the rights set out in that section. The Environmental Management Act (Chapter 20:27) provides the legislative framework for the implementation of environmental rights set out in the Constitution of Zimbabwe. The EMA Act seeks "to provide for the sustainable management natural resources and protection of the environment; the prevention of pollution and environmental degradation; the preparation of a National Environmental Plan and other plans for the management and protection of the environment; the establishment of an Environmental Management Agency and an Environment Fund" among other issues.

Policy, Plans and Strategies

Zimbabwe has made significant strides in developing policies, strategies and frameworks for climate adaptation and mitigation and mainstreaming climate change into development planning. Since submitting the Fourth National Communication (NC4), Zimbabwe has made sustained efforts to mainstream climate change into sectoral planning and development. Zimbabwe has submitted National Adaptation Plan and Adaptation Communication to the UNFCCC

Further, Zimbabwe has drafted the Climate Change Management Bill which seeks to provide a framework for adoption and implementation of measures for climate change adaptation and mitigation for achieving low Greenhouse

Gas Emissions (GHG), including the need to balance economic and social development and the protection of the climate system in a manner which supports the realization of the right of all human beings to an adequate living standard and the equitable distribution of the benefits thereof. The Government approved the principles of the bill in 2023. Public consultation of the bill was completed in all the ten provinces.

Zimbabwe's commitment to climate adaptation and mitigation is evident through several climate related policies, frameworks and strategies *Table* 0.1 summarizes the Policies, Strategies and Plans for climate adaptation and mitigation in the country.

Table 0.1: Policies, Strategies and Plans for Climate Change Adaptation & Mitigation

POLICY OR LEGISLATION	RELEVANCE TO CLIMATE CHANGE ADAPTATION AND MITIGATION
Agriculture Recovery Plan [2021-25]	Promotes sustainable agriculture practices Promotes dam construction to support irrigation development projects and creation of green belts
Agriculture Education Extension and Research and Modernization Plan	Promotion of a resilient and diverse agriculture sector Promotes the development of climate smart agriculture innovations
National Food Biofortification Strategy	Promotion of diversified crops and livestock production Promotes production of traditional grains that are resilient to climate change
Agrobiodiversity Policy Framework [Draft]	Promotes sound management of pesticides Encourages adoption of ecosystems based agricultural practices Promotes adoption of bio pesticides and fertilizers
Accelerated Irrigation Rehabilitation and Development Plan [2021-25]	Promotes upscaling of irrigated agriculture through rehabilitation of smallholder irrigation schemes and development of new schemes promotes dam construction and creation of green zones
National Biodiversity Strategy and Action Plan	Promotes the sustainable use of biodiversity Enhances genetic diversity Promotion for development of renewable energy and energy saving alternatives Integrates the implementation of conventions e.g. the Ramsar Convention and the UNFCCC
Plant Genetic Resources for Food and Agriculture Strategy and Action Plan [2022-2027]	Operationalize Pillar VIII (Resilient, Sustainable Agriculture) of the draft National Agriculture Policy Framework
Agroecology Promotion Policy and Strategy [2024-2030]	Promotes maintenance of traditional crop varieties and animal breeds that are drought resilient
Horticulture Recovery and Growth Plan [2021-25]	Promotes mainstreaming of indigenous vegetables and fruits Promotes water development to support horticulture production
Livestock Recovery and Growth Plan [2021-25]	The plan addresses climate change impacts that affect livestock production

POLICY OR LEGISLATION	RELEVANCE TO CLIMATE CHANGE ADAPTATION AND MITIGATION
Multisectoral Food and Nutrition security Strategy [2023-25]	Encourages the adoption of climate-smart agriculture practices. Mainstreaming household hygiene, sanitation and waste management in all food and nutrition programmes Promotes provision of timely climate early warning information
Agriculture Food Systems and Rural Transformation strategy [2021-25]	Promoting of water resources and irrigation development and the intensification of forage and fodder production Promotes provision of timely climate early warning information
Renewable energy policy	Promotion of off-grid technologies for agriculture which are RE. Off-grid renewables to support productive activity at all stages of the agriculture food chain. Use of RE to support irrigation (water pumping) and post-harvest activities including agro-processing and food preservation.
National energy efficiency policy	The policy focuses on energy efficiency interventions in the agriculture sector and its value chains to lower GHG emissions
Revised Nationally Determined Contribution (NDC 2021)	Develop, implement and scale up climate-smart agriculture solutions and strengthen the resilience of agricultural value chains and markets
The Zimbabwe Drought Risk Management Strategy and Action Plan (2017–2025)	Provides a framework and guidance to support the implementation of suitable drought response practices and interventions.
Meteorological Services Act [Chapter 13:21]	Provision of early warning information for informed decision-making to the public/ end-users.
National gender policy	Mainstreaming of gender issues in climate change programming
The National Water Policy (2013)	Recognizes climate change as a cross-cutting issue in water resources management. It also recognizes the potential impact of climate change on planning for future investments and ensuring the resilience of existing investments. It mentions how research and analytical work needs to be carried out to understand the effects of climate change on water resources. It states that the Zimbabwe National Water Authority and Catchment Councils will integrate climate change into all water resource planning and design activities.
National Climate Change Response Strategy (2015)	Sets out strategies to implement climate change initiatives which also includes water resources management and development
Revised Nationally Determined Contribution (NDC 2021)	Develop and promote resilient water resources management and promote mitigation through increased renewable hydropower supply and increased crop and pasture productivity, thus soil carbon sequestration.
The Water Act [Chapter 20:24]	The Act acknowledges the impacts of climate change on water resources. However, it is silent on climate change effects and responses.
The Zimbabwe National Water Authority Act [Chapter 20:25]	Establishes catchment and sub-catchment councils which can be utilized to advance water and climate change related programming.
The Public Health Act [Chapter 15:17]	Provides standards for potable water

POLICY OR LEGISLATION	RELEVANCE TO CLIMATE CHANGE ADAPTATION AND MITIGATION
Environmental Management Act [20:27] (2002)	Sets out wastewater disposal requirements to the environment
Urban Councils Act [29:15]	Have mandate to develop water resources and supply water in its area
Rural District Act [29:13]	Supply of water to its residence
Zambezi River Authority Act [20:23]	Also enacted in Zambia Provides a legal instrument Zambia and Zimbabwe for sharing water resources along the Zambezi River
The Public Health Act [Chapter 15:17]	Creates a legal framework for the protection of public health in Zimbabwe. Whilst the Act broadly covers all public health related issues, it does not link these issues such as malaria prevalence to climate change.
The Forest Act [Chapter 19:05] and the Forest Amendment Act No 4 of 2021.	Recognizes the role of forests and trees in climate change and highlights their unique ability to contribute to both climate change adaptation and mitigation.
The National Forest Policy (2023)	Seeks to strengthen sustainable utilization of forest thereby enhancing carbon sinks and resilience of communities.
The Wildlife Policy (1999)	Promotes climate change adaptation programmes through CAMPFIRE.
The Energy Policy (2012)	Focuses on sustainable energy issues and incorporates climate change related issues in energy, the environment and agriculture.
Revised Nationally Determined Contribution (NDC 2021)	Ensure climate-resilient infrastructure and design. This may increase energy efficiency, thus delivering mitigation co-benefits.
The Renewable Energy Policy (2019)	Recognizes the growing threat of water shortages on hydropower potential and the need to adapt. Provides an enabling environment for the implementation of the NDCs, time bound targets for development of renewable energy alternatives, promotes incentives for renewable energy adoption.
Biofuel Policy of Zimbabwe (2019)	Its scope is limited to liquid biofuels in the transport sector such as ethanol from sugarcane and biodiesel from jatropha; which reduce GHG emissions.
Zimbabwe's Low Emissions Development Strategy (2020-2050)	Outlines emissions reduction options across four IPCC reporting sectors. Provides an opportunity to mobilize climate finance for adaptation by integrating adaptation into LEDS.
The Draft Disaster Risk Management Policy	Recognizes the need to incorporate disaster preparedness and Disaster Risk Reduction and Management as a priority issue in climate change adaptation.
The Civil Protection Act [Chapter 10:06]	Provides an institutional framework for disaster risk management.
The Rural District Councils Act [Chapter 29:13]	Provides for sustainable management of the environment within the district by the local authorities including environmental protection.
Environmental Management Act [20:27] (2002)	The Act provides for the Environmental Impact Assessment. This is critical to reduce the environmental impact of the project on the environment (mitigation) and reducing negative impacts on systems (adaptation).

POLICY OR LEGISLATION	RELEVANCE TO CLIMATE CHANGE ADAPTATION AND MITIGATION
Zimbabwe Wetland Policy and Guidelines (2021)	The Policy provides guiding principles to inform sustainable wetland management. This is critical to ensure wetlands continue to provide adaptation and mitigation benefits.
Human Settlements Policy (2021)	The Policy promotes sustainable and climate-resilient settlements and wetlands protection. Important for adaptation and mitigation.

NATIONAL INVENTORY REPORT OF ANTHROPOGENIC EMISSIONS BY SOURCES AND REMOVALS BY SINKS OF GREENHOUSE GASES OF ZIMBABWE

1.1 INTRODUCTION

This chapter provides information on GHG emissions and removals in Zimbabwe from 1990 to 2022. The country compiled this report in accordance with Articles 4 and 12 of the UNFCCC and Article 13 of the Paris Agreement. Zimbabwe submitted a stand-alone National Inventory Report (NIR) as in accordance with the modalities, procedures and guidelines (MPGs) for the transparency framework for action and support referred to in Article 13 of the Paris Agreement (Annex to Decision 18/CMA.1 and Dec 5/CMA3).

The report covers seven gases namely, carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride (SF_6) and nitrogen trifluoride (NF_3). These emissions are estimated for the five Intergovernmental Panel on Climate Change (IPCC) sectors, namely Energy: Industrial Processes and Product Use (IPPU); Agriculture; Land Use, Land-Use Change, Forestry (LULUCF); and Waste.

Zimbabwe aims to enhance the transparency, consistency, comparability, completeness, and accuracy of the inventory. In estimation the GHGs, Zimbabwe used the 2006 IPCC Guidelines for National Greenhouse Gas Inventories (2006 IPCC Guidelines), and the 2019 Refinements to the 2006 IPCC Guidelines. To calculate the precursors, Zimbabwe used the Joint European Monitoring and Evaluation Programme and the European Environment Agency (EMEP/EEA) air pollutant emission inventory guidebook of 2023. Zimbabwe's national inventory was reported in accordance with the MPGs decided by the Conference of Parties (COP). Zimbabwe mostly used the default values given in the 2006 IPCC Guidelines and 2019 Refinements to the 2006 IPCC Guidelines. Country-specific methodologies are also used for some source/sink categories to more accurately reflect the actual emission status in Zimbabwe.

The CCMD is responsible for the overall coordination of the quality assurance and quality control (QA/QC) of the inventory, reviewing of results and implementation of the planned improvements. Technical expert reviews are conducted before the inventory is submitted to the Minister responsible for climate change for final government approval in line with the country's National QA/QC Plan.

1.2 INVENTORY PREPARATION PROCESS

The steps and responsibilities for the inventory preparation and approval processes are presented in Table 1.1. Roles of the institutions involved in the process are presented in Figure 0.2

Table 1.1: Inventory Preparation and Approval Process

TASK	LEAD RESPONSIBILITY	COLLABORATORS
Inception workshop – CCMD, GHG inventory team, data providers, key stakeholders	CCMD	None
Conducting Capacity trainings and/or refreshing general issues, sector-specific topics, QC activities	CCMD	None
Identify key categories	Inventory Team lead	Sector experts
Select methods while considering data collection, uncertainty and time series consistency good practice	Inventory Team lead	Sector experts
QC Checking & Documentation, updating Inventory improvement plan	Inventory Team lead	Sector experts
Collection of activity data and relevant parameters ensuring adequate QC Checking (completeness, transparency, accuracy) time series consistency documentation (if discrepancies, delay, etc.)	Inventory sector lead	Sector experts Enumerators
Preparation/Updating of calculation sheets adding new year modification if higher TIER methodology will be applied updating NIR tables templates updating graphs	Inventory sector lead	Sector experts
Estimate emissions/removals ensuring adequate QA/QC and time series consistency	Inventory sector lead	Sector experts
QC Checking & Documentation, updating Inventory improvement plan	Inventory Team lead	Inventory sector lead
Preparation/Updating of Inventory file adding new years adding new calculation file, if needed updating graphs	Inventory sector lead	Sector experts

TASK	LEAD RESPONSIBILITY	COLLABORATORS
Compile inventory considering time series consistency and QA/QC: update links of all calculation sheets	Inventory sector lead	Sector experts
Conduct uncertainty analysis (UA): assessment of overall inventory uncertainty.	Inventory Team Leader	Inventory sector leads
QC Checking & Documentation, updating Inventory improvement plan	Inventory Team Leader	Inventory sector lead
Conduct key category analysis (KCA) Update formula for new inventory year Update link with CRT-CommonReportingTables_ZW.xlsx	Inventory Team Leader	Inventory sector lead
Update National Inventory Document (NID)	Inventory Team Leader	Inventory sector leads
QC Checking & Documentation, Cross-checking with Inventory improvement plan	Inventory Team Leader	Inventory sector leads
Make necessary revisions of emission estimation and /or NIR based on findings and recommendations of QA (if any)	Inventory Team Leader	Inventory sector leads
Finalize National GHG Inventory and National Inventory Document (NID) for approval	Technical Coordinator	Inventory Team Leader Sector leads Sector experts
Technical validation of NID and NIR	Technical coordinator	Data providers Sectors experts (not involved in inventory compilation) Sectoral stakeholders and experts Inventory Team Leader Sector inventory experts
Validate NID	CCMD	Inventory Team Leader Sectoral stakeholders and experts
Government approval	Minister responsible for climate change	CCMD
Archiving calculations files, Inventory files, KCA & UA file, NIR, QC documents, QA documents, Inventory Improvement Plan	Technical Coordinator	Archiving coordinator

1.3 GREENHOUSE GAS PROFILE

Net GHG emissions in 2022 (including LULUCF) were 82,916.75 gigagrammes carbon dioxide equivalent (GgCO2eq), representing 122% increase compared to the emissions in 1990 and by 33% compared to 2010, the base year of Zimbabwe's emission reduction target for 2030 in the country's revised NDCs. The changes in GHGs are as follows.

- Total GHG emissions without LULUCF were 38,924.54 Gg CO_2eq.
- CO_2 emissions (including LULUCF) increased from 16,663.18 Gg in 1990 to 56,429.05 Gg in 2022, representing a 239% and increase of 52% from the 2010 figure of 37,017.28 Gg.
- CH_4 emissions (excluding LULUCF) increased by 17% from 567.89 Gg in 1990 to 663.40 Gg in 2022. The increase from the 2010 figure of 580.69 Gg was 14%.
- N_2O emissions increased by 2% from 17.96Gg in 1990 to 18.23Gg in 2022, while the increase from 16.30Gg in 2010 was 1%.
- HFC emissions increased by 7,979% from 38.14 Gg CO_2eq in 1990 to 3,081.33Gg CO_2eq in 2022, but declined by 33% from the 2010 figure of 4,627.91 Gg CO_2eq
- PFC emissions increased creased by 678% from 0.04GgCO_2eq in 1990 to 0.29 Gg CO_2eq in 2022. The increase from 0.23 GgCO_2eq in 2010 was 24%.
- SF_6 emissions were not estimated in BTR1
- NF_3 emissions were not estimated in BTR1

As for contribution by gas, in 2022, CO2 emissions accounted for 84.03% of Zimbabwe's total GHG emissions including LULUCF, followed by CH4 with 11.90%, and then N2O with 2.89%. The main source of CO2 emissions was Land (3B), accounting for 51.65%, followed by Electricity Generation (1.A.1) accounting for 3.39%.

1.3.1 Trends in GHG emissions and Removals by Sector

The breakdown of GHG emissions and removals in 2022 by sector showed that the highest GHG emissions came from LULUCF with 43,992.2 GgCO2eq (53.06%), followed by agriculture with 9,400.58 GgCO2eq (23.40%), and then energy with 12,874.51 GgCO2eq accounting for 15.4% of total GHG emissions. IPPU contributed for 3,725.41 GgCO2eq, representing 4.5%, with the least emissions coming from the waste sector 3,173.80 GgCO2eq (3.6%) (Table 1.2).

Table 1.2: GHG contribution by category

CATEGORY	% CONTRIBUTION WITH LULUCF	% CONTRIBUTION WITHOUT LULUCF
1.A - Fuel Combustion Activities	15.40%	32.83%
1.B - Fugitive emissions from fuels	0.02%	0.03%
2.A - Mineral Industry	0.44%	0.93%
2.B - Chemical Industry	0.04%	0.08%
2.C - Metal Industry	0.29%	0.61%
2.D - Non-Energy Products from Fuels and Solvent Use	0.01%	0.03%
2.F - Product Uses as Substitutes for Ozone Depleting Substances	3.72%	0.03%
3.A - Livestock	12.01%	25.58%

CATEGORY	% CONTRIBUTION WITH LULUCF	% CONTRIBUTION WITHOUT LULUCF
3.B - Land	53.30%	
3.C - Aggregate sources and non-CO2 emissions sources on land	11.39%	24.27%
3.D - Other	-0.24%	-0.52%
4.A - Solid Waste Disposal	1.22%	2.60%
4.B - Biological Treatment of Solid Waste	0.05%	0.10%
4.C - Incineration and Open Burning of Waste	1.16%	2.47%

CATEGORY	% CONTRIBUTION WITH LULUCF	% CONTRIBUTION WITHOUT LULUCF
4.D - Wastewater Treatment and Discharge	1.22%	2.59%

1.3.2 Key categories

Key categories with LULUCF were dominated by CO2 from 3B-land accounting for 81.25%. CH4 from 3.A.1-Enteric fermentation contributed 4.23%, CH4 and N2O from 3.C.1-Burning contributed 3.67%, CO2 from 1.A.1-Energy Industries weighing in with 2.65%, and 2.F.1-Refrigeration and Air Conditioning HFCs and PFCs contributing 1.44% (Table 1.3)

Table 1.3: Key categories with LULUCF

IPCC CATEGORY	GREENHOUSE GAS	|EX,T| (GG CO2 EQ)	% CONTRIBUTION	CUMULATIVE TOTAL OF %
Forest land Remaining Forest land	CO2	130,790.30	61.06%	61.06%
Land Converted to Forest land	CO2	16,364.07	7.64%	68.70%
Land Converted to Cropland	CO2	12,415.55	5.80%	74.49%
Land Converted to Grassland	CO2	9,079.85	4.24%	78.73%
Enteric Fermentation	CH4	9,067.03	4.23%	82.97%
Burning	CH4	5,800.69	2.71%	85.67%
Grassland Remaining Grassland	CO2	5,390.70	2.52%	88.19%
Energy Industries - Solid Fuels	CO2	3,810.64	1.78%	89.97%
Refrigeration and Air Conditioning	HFCs	3,081.62	1.44%	91.41%
Other Sectors - Liquid Fuels	CO2	2,875.48	1.34%	92.75%
Burning	N2O	2,068.80	0.97%	93.72%
Energy Industries - Liquid Fuels	CO2	1,861.34	0.87%	94.58%
Other Sectors - Biomass - solid	CH4	1,296.91	0.61%	95.19%

Key categories without LULUCF comprise CH4 from Enteric Fermentation (23.29%), CH4 from 3.C.1- Burning (14.90%), N2O from 2F.1-Refrigeration and Air Conditioning and CO2 from 1.A.4-Commercial, Residential and Agriculture (7.92%) (Table 1.4). Burning (5.31%), CO2 from energy 1.A.1-Energy Industries-Solid fuels (9.79%), C2- Energy Industries - Liquid Fuels (4.78%), HFCs from

Table 1.4: Key categories without LULUCF

IPCC CATEGORY CODE	IPCC CATEGORY	GREENHOUSE GAS	LEVEL WITH LULUCF	% CONTRIBUTION	CUMULATIVE TOTAL
3.A.1	Enteric Fermentation	CH4	9,067.03	23.29%	23.29%
3.C.1	Burning	CH4	5,800.69	14.90%	38.20%
1.A.1	Energy Industries - Solid Fuels	CO2	3,810.64	9.79%	47.99%
2.F.1	Refrigeration and Air Conditioning	HFCs, PFCs	3,081.62	7.92%	55.90%
1.A.4	Other Sectors - Liquid Fuels	CO2	2,875.48	7.39%	63.29%
3.C.1	Burning	N2O	2,068.80	5.31%	68.61%
1.A.1	Energy Industries - Liquid Fuels	CO2	1,861.34	4.78%	73.39%
1.A.4	Other Sectors - Biomass - solid	CH4	1,296.91	3.33%	76.72%
1.A.3.b	Road Transportation - Liquid Fuels	CO2	1,105.42	2.84%	79.56%
4.A	Solid Waste Disposal	CH4	1,010.10	2.60%	82.15%
3.C.4	Direct N2O Emissions from managed soils	N2O	916.54	2.35%	84.51%
4.D	Wastewater Treatment and Discharge	CH4	834.80	2.14%	86.65%
3.A.2	Manure Management	N2O	679.96	1.75%	88.40%
4.C	Incineration and Open Burning of Waste	CO2	655.15	1.68%	90.08%
1.A.2	Manufacturing Industries and Construction - Solid Fuels	CO2	554.05	1.42%	91.51%
3.C.5	Indirect N2O Emissions from managed soils	N2O	484.74	1.25%	92.75%
1.A.2	Manufacturing Industries and Construction - Liquid Fuels	CO2	404.68	1.04%	93.79%
2.A.1	Cement production	CO2	363.11	0.93%	94.72%
1.A.3.c	Railways - Liquid Fuels	CO2	286.77	0.74%	95.46%

3.B.1.a: Forest land Remaining Forest land-CO_2
3.B.2.b: Land Converted to Cropland-CO_2
3.A.1 Enteric Fermentation-CH_4
3.B.1.b: Land Converted to Forest land-CO_2
3.B.3.b: Land Converted to Grassland-CO_2
1.A.1: Energy Industries - Solid Fuels-CO_2
3.B.3.a: Grassland Remaining Grassland-CO_2
3.C.1: Burning-CH_4
2.F.1: Refrigeration and Air Conditioning-HFCs
3.C.1: Burning-N_2O
1.A.3.b: Road Transportation - Liquid Fuels-CO_2
3.C.4: Direct N_2O Emissions from managed soils-N_2O

1.4 ENERGY

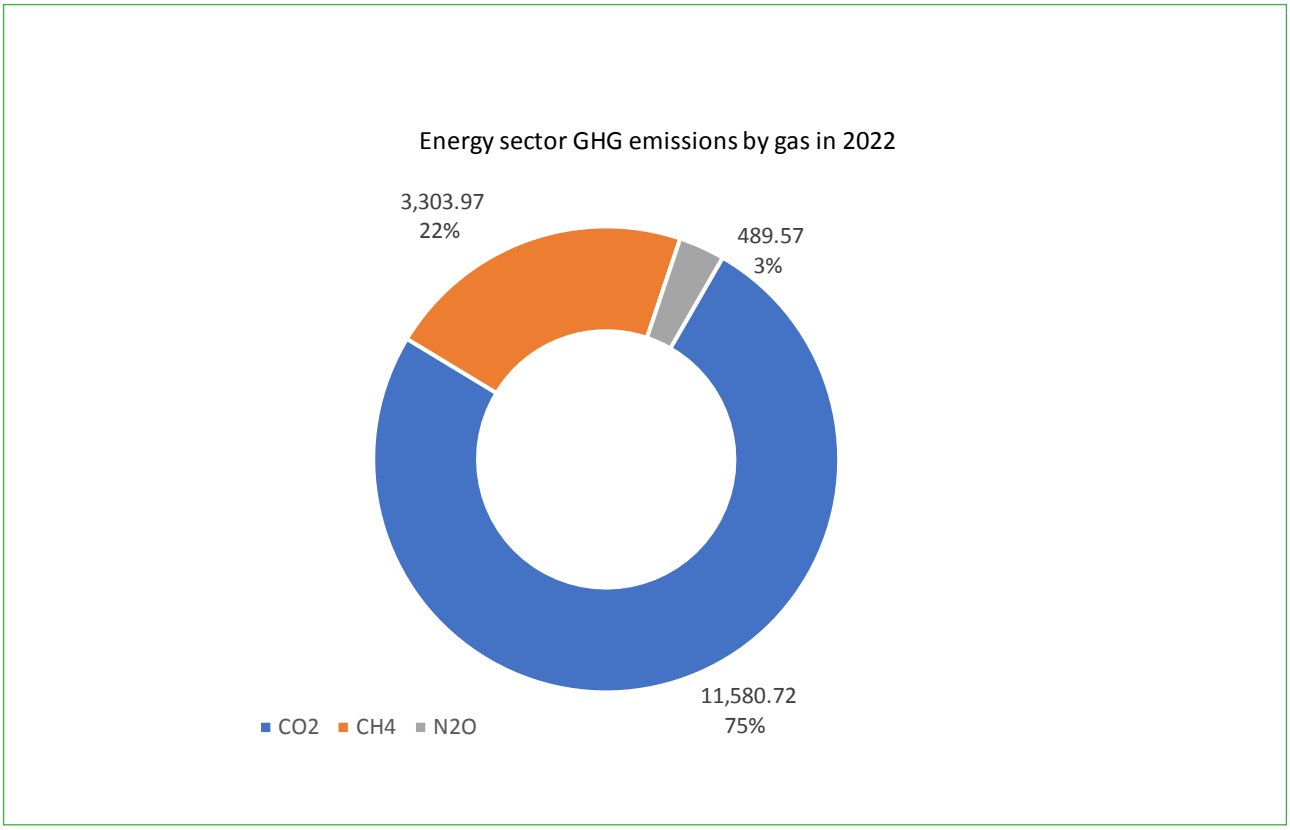
1.4.1Energy Resources

Zimbabwe's primary energy sources comprise solid biomass (63.82%), coal (16.80%), liquid fossil-fuels (14.64%), hydro (4.73%) and solar (0.01%) (MoEPD, 2022). Firewood is the major energy source for the domestic and agriculture sectors contributing 62.57% of the primary energy sources. The remaining 1.25% of solid biomass comprises of charcoal (1.04%) and bagasse (0.21%). The three main transport modes that serve the Zimbabwean economy are roads, railways and aviation, with road dominating. Inland water transport is limited and takes place mainly in man-made water bodies such as Lake Kariba (GoZ, 2018). Zimbabwe is endowed with diverse energy resources. Proven energy resources include 12 billion metric tonnes (mt) of coal reserves, approximately 40 terra cubic feet of coal bed methane (CBM), an annual daily average solar radiation of 20 MJ/m2 and 1.5 million tonnes of bagasse from sugar cane production (GoZ, 2012). CBM has not yet been exploited, although there have been intensified efforts to begin exploration. The country is currently assessing the possibility of oil and natural gas reserves.

1.4.1.1 Overview of GHG emissions from the energy sector

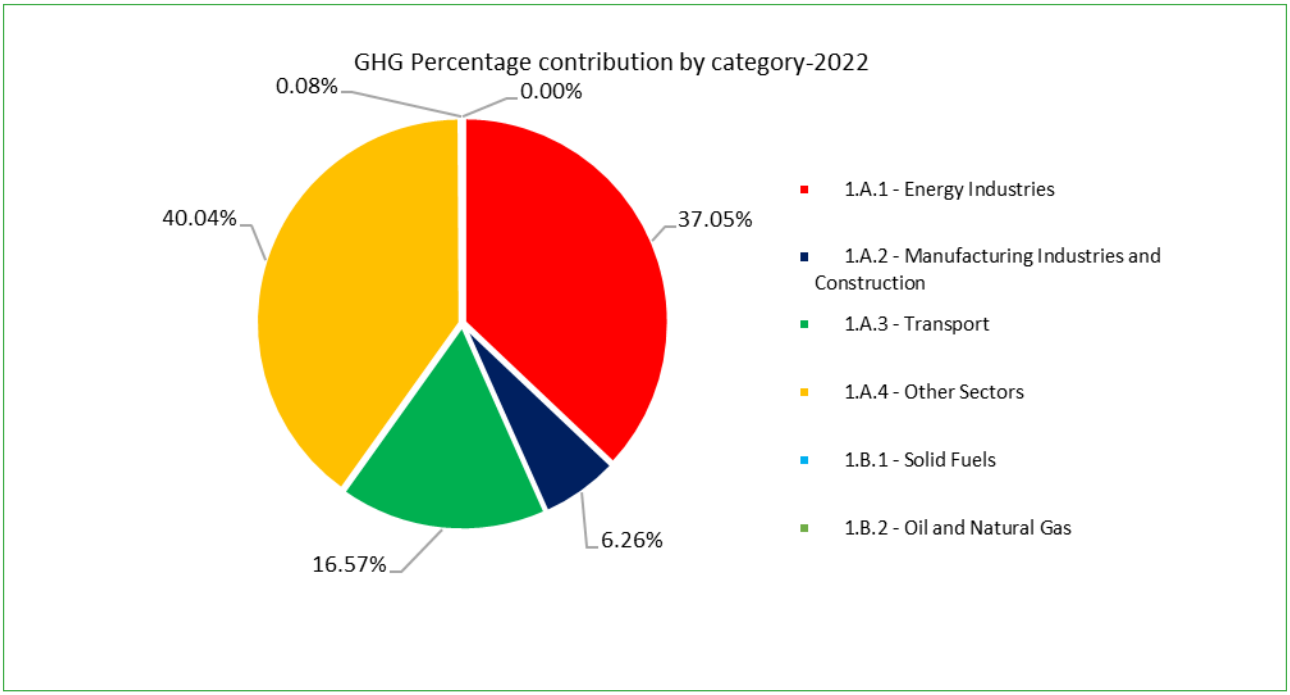
In 2022, Zimbabwe emitted 11,580.72 Gg of CO_2, *110.13 Gg of* CH_4 and 1.85 Gg of N_2O. The main gas emitted in 2022 was CO_2 accounting for 75.33%, followed by CH_4 contributing 21.49%. The least emissions were N_2O contributing 3.18% in 2022 (*Figure* 1.1). Fuel combustion activities contributed 99.04% of the total emissions. \s

Figure 1.1: GHG Contribution by Gas



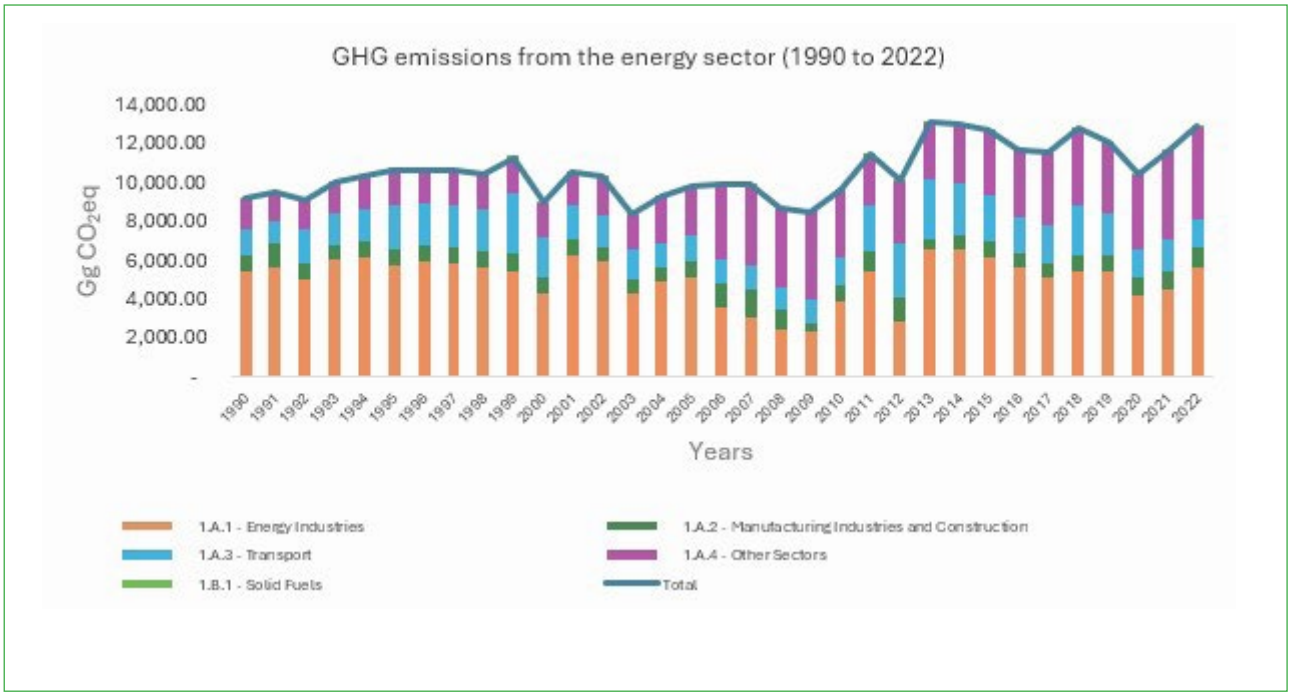
The highest GHG emissions in 2022 came from Other sectors (1.A.4)(Commercial, and Institutional (1.A.4.a), *Residential* (1.A.4.b) and Agriculture, Forestry and fisheries (1.A.4.c)) amounting to 6,156.31Gg CO_2eq accounting for 40.04%, closely followed by energy industries (1.A.1) with 5,695.46Gg CO_2eq contributing 37.05% of the total GHG emissions. Transport (1.A.3) was the third main contributor with 2,547.24Gg CO_2eq representing 16.57% and Manufacturing Industries and Construction (1.A.2) weighed in with 962.99Gg CO_2eq (6.26%) (Figure 1.2)\s

Figure 1.2: GHG Emissions Percentage Contribution by Category



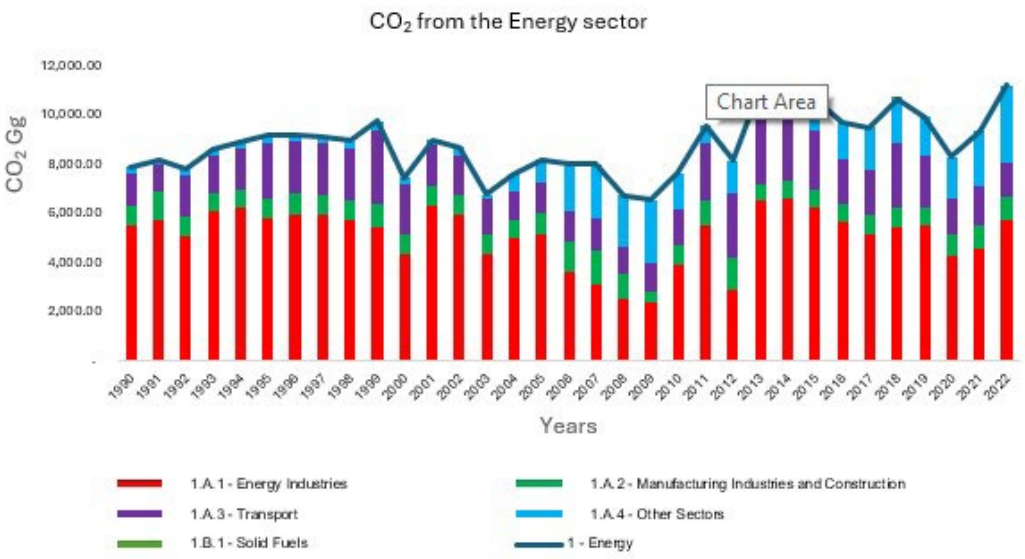
The highest GHG emissions (13,103.68 Gg CO2eq) were emitted in 2013 while the lowest emissions were in 2003 at 8,359.44 GgCO2eq. The dip in GHG emission from 2003 to 2009 is reflective of reduced energy consumption due to depressed economic activity in the country during that period (Figure 1.3). The increase from 1990 to 2022 was 39.71%.

Figure 1.3: Total GHG Emissions by Category



For the period 1990 to 2022 the CO2 emissions were dominated by the energy industries (1.A.1) where coal and diesel are consumed, followed by Transport (1.A.3) (Figure 1.4). CO2 emissions increased by 42.49% from 1990 to 2022, reflecting the general increase in energy demand.

Figure 1.4: CO_2 Emissions from Energy

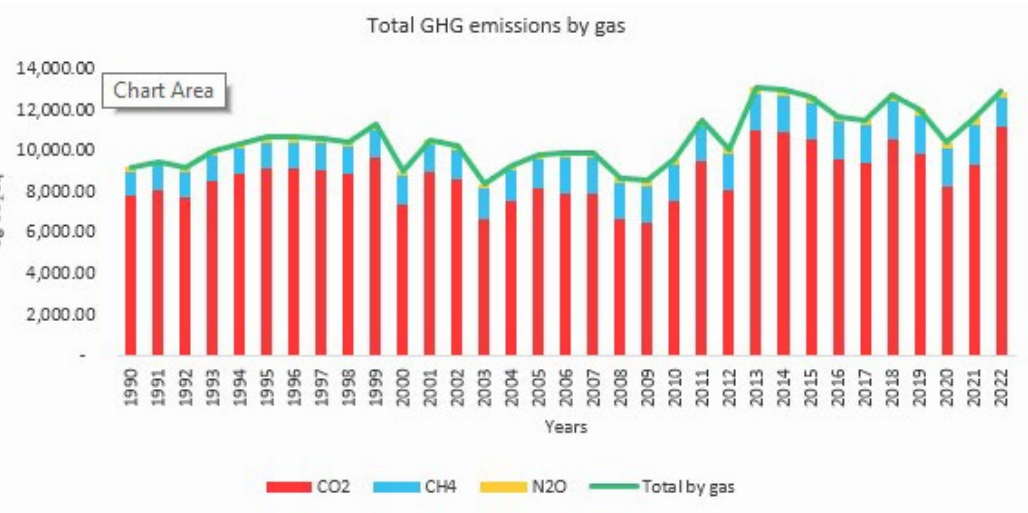


Methane emissions increased from 63.89 Gg in 1990 to 110.23 in 2022 representing a 72.53% increase. The main contributor is combustion of biomass in Other Sectors (1.A.4).

1.4.1.2 GHG Emissions Contribution by Gas from 1990 to 2022

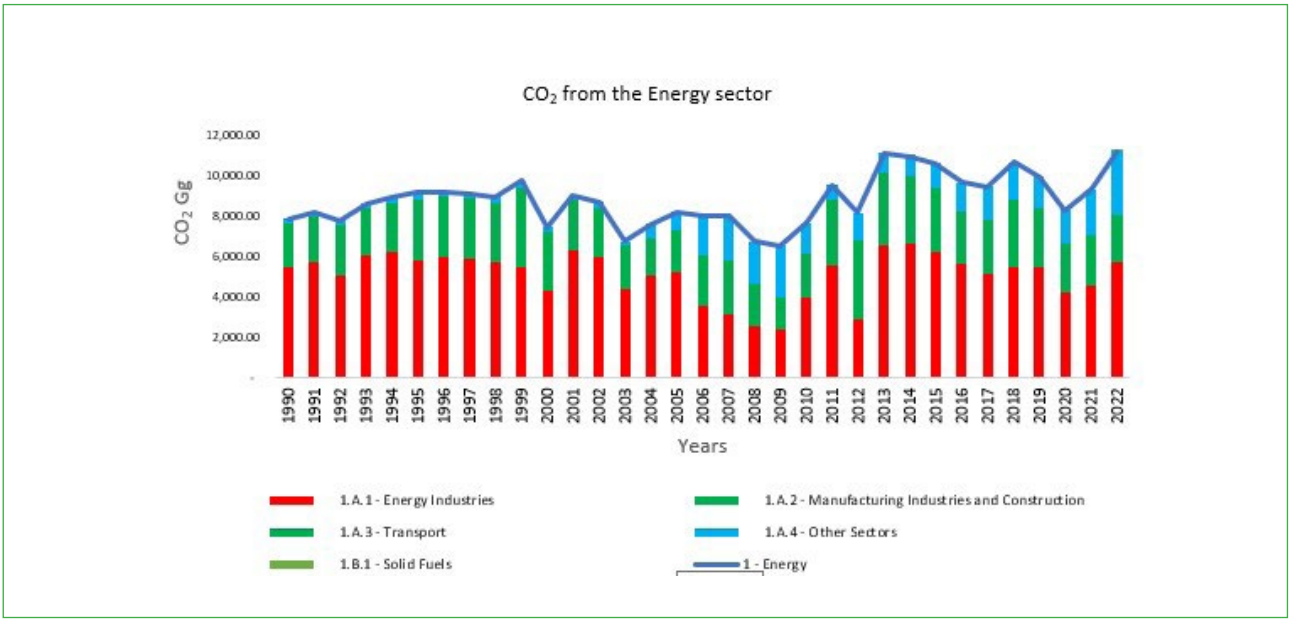
The main gas emitted throughout the time series was CO_2 accounting for over 70% of the emissions, followed by CH_4. The main driver for CO_2 is combustion activities in the energy industries (1.A.1), residential (1.A.4.*a*), transport (1.A.3) and MIC (1.A.2), in that order (Figure 1.5). The decreasing emission trends shown from 2003 and 2007 to 2008 are attributable, to a greater extent, to decreasing energy supply and consumption coupled with depressed economic activity during that period.

Figure 1.5: Energy Sector GHG Emissions Trends by gas



CO2 emissions from the energy sector increased from 7,829.90 Gg to 11,156.97Gg representing a 42.49% increase (Figure 1.6). The change was driven by increased consumption of coal and diesel mainly in power generation and industry (1.A.1 a). The decreases in CO2 from 2000 to 2010 is attributable to general decline in performance of the Zimbabwe economy during the period. The drop in 2020 is due to reduced economic activity during the COVID 19 pandemic.

Figure 1.6: CO_2 from Energy Sector



CH_4 emissions from the energy sector increased from 37.83 Gg to 47.36 Gg representing a 24.59% increase, mainly coming from subcategory *Other Sector (1.A.4)* (*Table* 1.5). The increase was driven by increased consumption of biomass in the country generally following population *trends.* Zimbabwe has a rural population of *62%* that *relies mainly* on fuelwood for cooking.

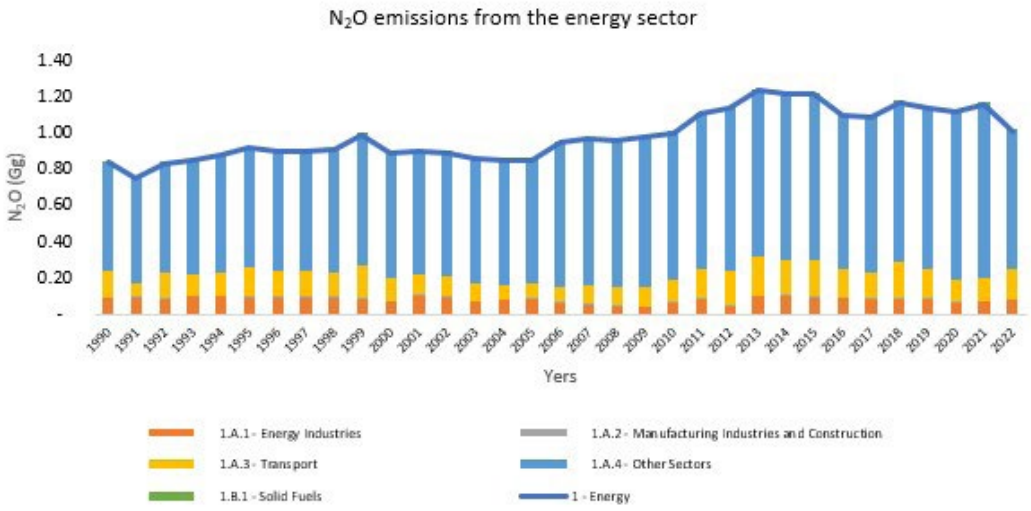
Table 1.5: CH_4 emissions from the Energy Sector

YEAR	1.A.1 - ENERGY INDUSTRIES	1.A.2 - MANUFACTURING INDUSTRIES AND CONSTRUCTION (GG)	1.A.3 - TRANSPORT (GG)	1.A.4 - OTHER SECTORS (GG)	1.B.1 - SOLID FUELS FUGITIVE EMISSIONS (GG)	TOTAL (GG)
1990	0.06	0.07	0.24	37.83	0.57	38.78
1991	0.06	0.09	0.27	38.61	0.57	39.60
1992	0.06	0.07	0.38	39.35	0.57	40.42
1993	0.07	0.07	0.31	40.04	0.57	41.05
1994	0.07	0.07	0.32	40.78	0.57	41.80
1995	0.06	0.07	0.51	41.13	0.57	42.34
1996	0.06	0.07	0.50	41.61	0.57	42.81
1997	0.06	0.07	0.50	42.15	0.57	43.35

YEAR	1.A.1 - ENERGY INDUSTRIES	1.A.2 - MANUFACTURING INDUSTRIES AND CONSTRUCTION (GG)	1.A.3 - TRANSPORT (GG)	1.A.4 - OTHER SECTORS (GG)	1.B.1 - SOLID FUELS FUGITIVE EMISSIONS (GG)	TOTAL (GG)
1998	0.06	0.07	0.50	42.96	0.57	44.16
1999	0.07	0.08	0.63	43.74	0.57	45.07
2000	0.05	0.07	0.45	44.56	0.57	45.70
2001	0.07	0.07	0.36	45.23	0.57	46.29
2002	0.06	0.07	0.34	45.93	0.57	46.98
2003	0.05	0.07	0.31	46.60	0.57	47.59
2004	0.05	0.07	0.28	48.57	0.60	49.57
2005	0.05	0.07	0.24	46.49	0.60	47.46
2006	0.04	0.12	0.23	56.04	0.56	56.99
2007	0.03	0.14	0.23	57.21	0.52	58.13
2008	0.03	0.10	0.19	57.32	0.38	58.01
2009	0.03	0.04	0.21	58.74	0.38	59.41
2010	0.04	0.08	0.25	57.16	0.39	57.92
2011	0.07	0.10	0.43	55.74	0.38	56.73
2012	0.05	0.12	0.50	56.12	0.39	57.17
2013	0.08	0.06	0.56	56.60	0.39	57.69
2014	0.09	0.07	0.48	57.74	0.40	58.77
2015	0.08	0.07	0.44	58.52	0.39	59.51
2016	0.07	0.07	0.37	59.52	0.39	60.44
2017	0.06	0.08	0.38	60.64	0.39	61.55
2018	0.07	0.07	0.53	61.41	0.41	62.50
2019	0.09	0.07	0.39	61.99	0.41	62.96
2020	0.06	0.07	0.30	62.72	0.43	63.58
2021	0.07	0.07	0.32	66.69	0.48	67.64
2022	0.12	0.07	0.32	47.36	0.44	48.31
Change 1990 to 2022	92%	8%	31%	25%	-23%	25%

N_2O emissions from the energy sector increased from 0.84Gg in 1990 to 1.01Gg in 2022 representing a 20.93% change. The N_2O mainly came from the combustion of biomass from subcategory Other Sectors (1.A.4), followed by transport (1.A.3) (Figure 1.7).

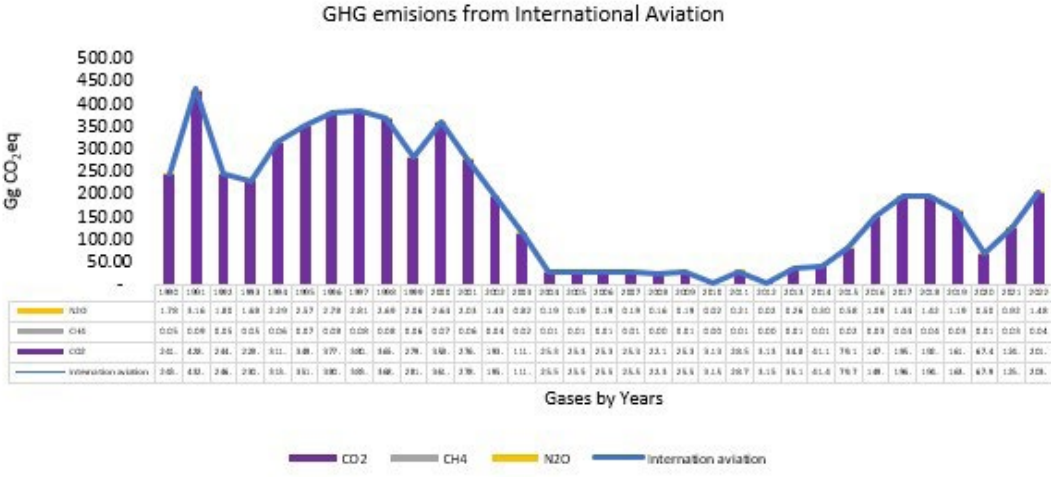
Figure 1.7: N2O Emissions from the Energy Sector



1.5.1 Memo items

The emissions from bunker fuels used for international aviation (1.A.3.a.i) and CO_2 from biomass were not included in the national totals in accordance with the UNFCCC GHG Inventory Reporting Guidelines and the 2006 IPCC Guidelines. In Zimbabwe the memo items came from the emissions from international aviation (1.A.3.a.i). The emissions, overall, decreased by 16.47% from 243.08 $GgCO_2eq$ in 1990 to 203.06 Gg CO_2eq in 2022 (Figure 1.7). The major drops from 2000 to 2012 are attributable to reduced international travel in Zimbabwe during the period of poor economic performance.

Figure 1.8: Total emissions from international aviation



1.5.1.1 Overview of Methodologies, Emission Factors and Parameters

The 2006 IPCC Guidelines were used to estimate the primary GHG*s* from the energy sector, CO_2, CH_4 and N_2O, using tier 1 methodologies. Precursor gases were estimated using the European EMEP/EEA Guidebook for 2023. The net calorific values (NCVs) were obtained from the MoEPD (MoEPD, 2022). The energy data provided by the MoEPD (national energy balance), ZERA (fuel sales) and from the UNSD were converted to energy units using the net calorific NCVs in *Table* 1.6. The IPCC Inventory software version 2.93 was used for computation.

Table 1.6: Net Calorific Values for Fuels

FUEL	NCV	FUEL	NCV	FUEL	NCV
Motor gasoline	44.3	Blast furnace gas	2.47	Biogasoline	27
Aviation Gasoline	44.3	Coke oven coke	28.2	Municipal waste (biomass)	11.6
Jet Kerosine	44.1	Biodiesel	27	Diesel	43
Lubricants	40.2	Landfill gas	50.4	LPG	47.3
Paraffin wax	40.2	Sludge gas	50.4	Other kerosine	43.8
Coking coal	28.2	Other biogas	50.4	Wood/Wood waste	15.6
Other bituminous	25.8				
Sub-bituminous	18.9				

Source:(MoEPD, 2022)

The categories not estimated (NE) and the reasons are given in *Table* 1.7.

Table 1.7: Categories not estimated

SOURCE CATEGORY NOT ESTIMATED	REASON
1.A.3.e.i - Pipeline Transport	Data not available. Gasoline and diesel are sometimes transported using pipeline.
1.A.5 - Non-specified	Disaggregated data not available
1.B.1.a.ii.2 - post-mining seam gas emissions	Activity data not available

1.6.1 Energy Sector Key Categories

The following are the key categories in the energy sector, with LULUCF;

- 1.A.1-Energy Industries - Solid Fuels-CO_2: 1.49%
- 1.A.4-Other Sectors - Liquid Fuels-CO_2:1.12%
- 1.A.1-Energy Industries - Liquid Fuels-CO_2:0.73%

Key categories from the energy sector without LULUCF are;

- 1.A.1 Energy Industries - Solid Fuels CO2: 9.79%
- 1.A.4 Other Sectors - Liquid Fuels CO2: 7.39%
- 1.A.1- Energy Industries - Liquid Fuels- CO_2:

4.78%

- 1.A.4 Other Sectors - Biomass - solid CH_4: 3.33%
- 1.A.3.b Road Transportation - Liquid Fuels-CO_2: 2.84%
- 1.A.2-Manufacturing Industries and Construction - Solid Fuels-CO_2: 1.42%
- 1.A.2-Manufacturing Industries and Construction - Liquid Fuels-CO_2: 1.04%
- 1.A.3.c-Railways - Liquid Fuels-CO_2: 0.74%

1.6.2 GHG Emissions by Category and Sub-category

1.6.2.1 1.A 1 Energy Industries

GHG emissions from electricity production in the thermal power stations and the manufacture of charcoal accounted for the emissions in energy industries. Electricity generation accounted over 70%, on average, of the emissions throughout the time series. The lowest GHG emissions from energy industries (1.A.1) were *2486.24* Gg CO_2eq in 2009, while the highest were 6550.7*7* Gg CO_2eq emitted in 2014. The fluctuations in the total GHG emissions follow the trends in the performance of the economy.

1.6.2.2 1.A.2 Manufacturing Industries and Construction (MIC)

Emissions from *MIC* came from the combustion of, other bituminous coal, Liquefied petroleum gas (LPG), motor gasoline, diesel and other oil products The emissions include combustion for the generation of electricity and heat for own use in these industries. In Zimbabwe, industries generate electricity from standby electrical power generators to alleviate power shortages. Emissions from fuel combustion in coke ovens within the iron and steel industry *were reported under 1*.A.1.c and not under manufacturing industry. Industry in Zimbabwe 1.A.2 includes the sub-categories 1.A.2.a to 1.A.2.m, activity data provided by UNSD were disaggregated industry category. The following industries exist in Zimbabwe:

- 1.A.2.a - Iron and Steel
- 1.A.2.b - Non-Ferrous Metals
- 1.A.2.c - Chemicals
- 1.A.2.d - Pulp, Paper and Print
- 1.A.2.e - Food Processing, Beverages and Tobacco
- 1.A.2.f - Non-Metallic Minerals
- 1.A.2.g - Transport Equipment
- 1.A.2.h - Machinery
- 1.A.2.i - Mining (excluding fuels) and Quarrying
- 1.A.2.j - Wood and wood products
- 1.A.2.k - Construction
- 1.A.2.l - Textile and Leather
- 1.A.2.m - Non-specified Industry

The emissions generally follow the trends in economic activity as shown by the GHG emissions from iron and steel in 2014 and pulp and owing to decline in production activities

(Figure 1.9).

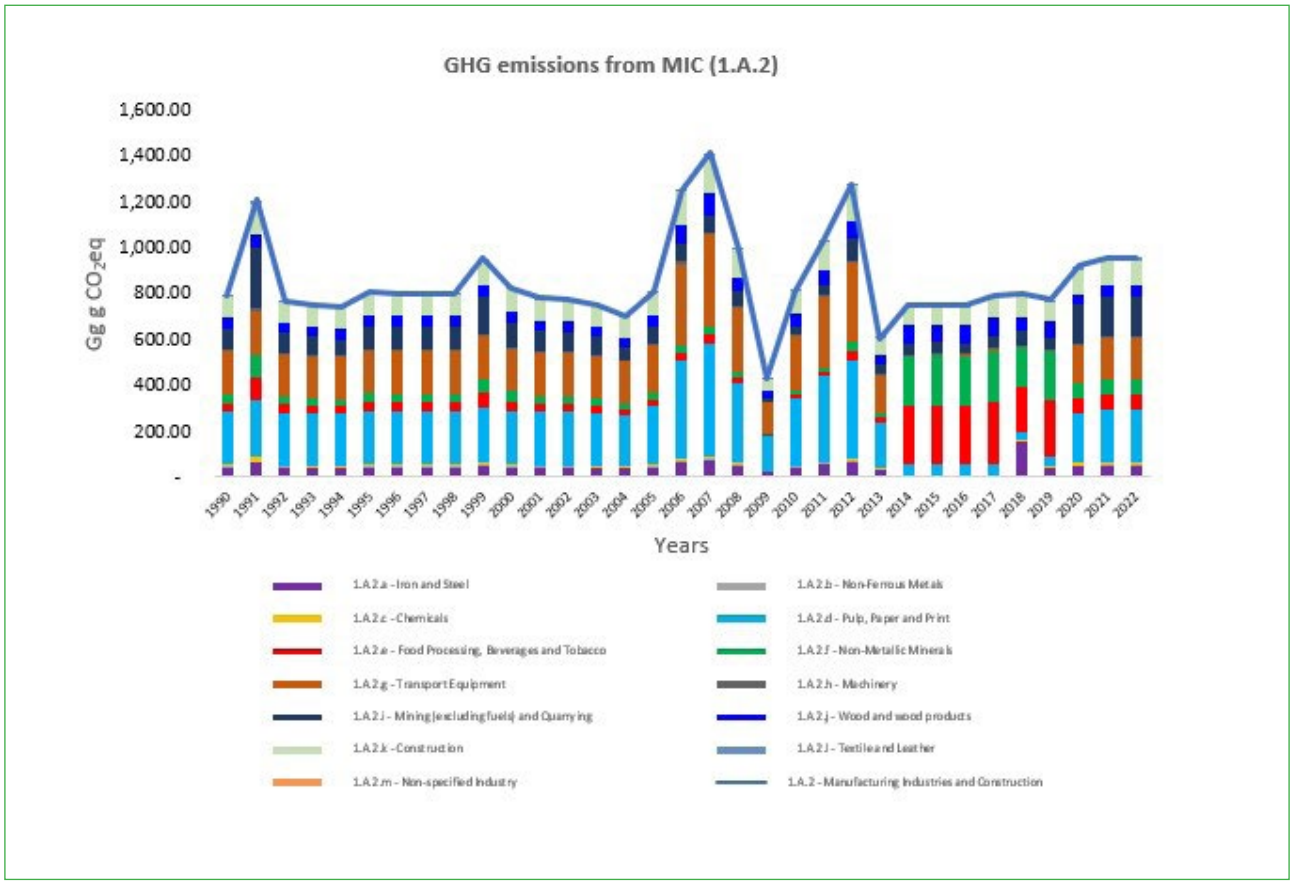


Figure 1.9: GHG Emissions from 1.A.2

1.4.4.3 1.A 3 Transport

GHG emissions from transport (1.A.3) are dominated by Road Transportation (1. A.3. b. i-Cars, 1.A.3.b.ii- Light Duty Trucks (LDT) and Heavy-Duty Trucks (HDT) and Buses (Figure 1.10). From 2000 there has been a general decline in economic performance in the country, until 2008 and the fuel consumption in the transport category follows the same trend.

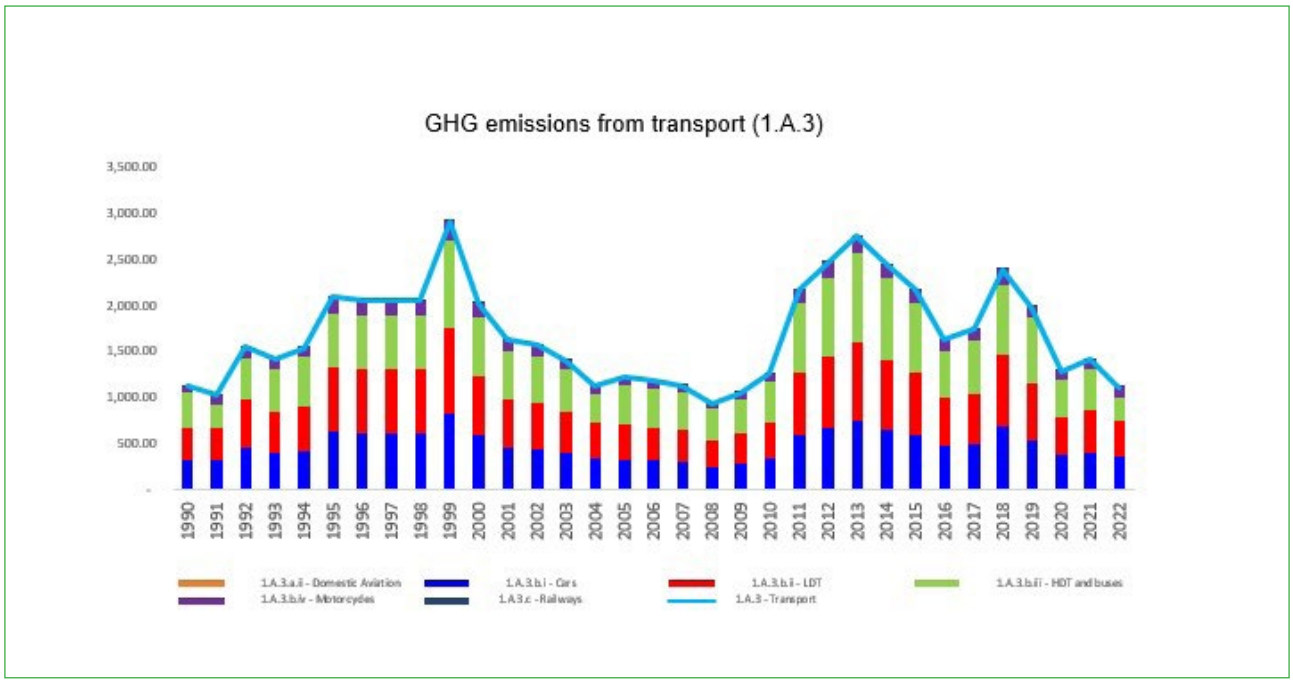


Figure 1.10: GHG Emissions from Transport

1.4.4.4 1 A4 Other Sectors

Emissions from Other Sectors (1.A.4) included commercial activities (1.A.4.a), residential areas (including rural-1. A.4.b), as well as those from agriculture activities on the farms, in forestry and fisheries (1.A.4.c) (Figure 1.11). Residential emissions are driven by biomass consumption.

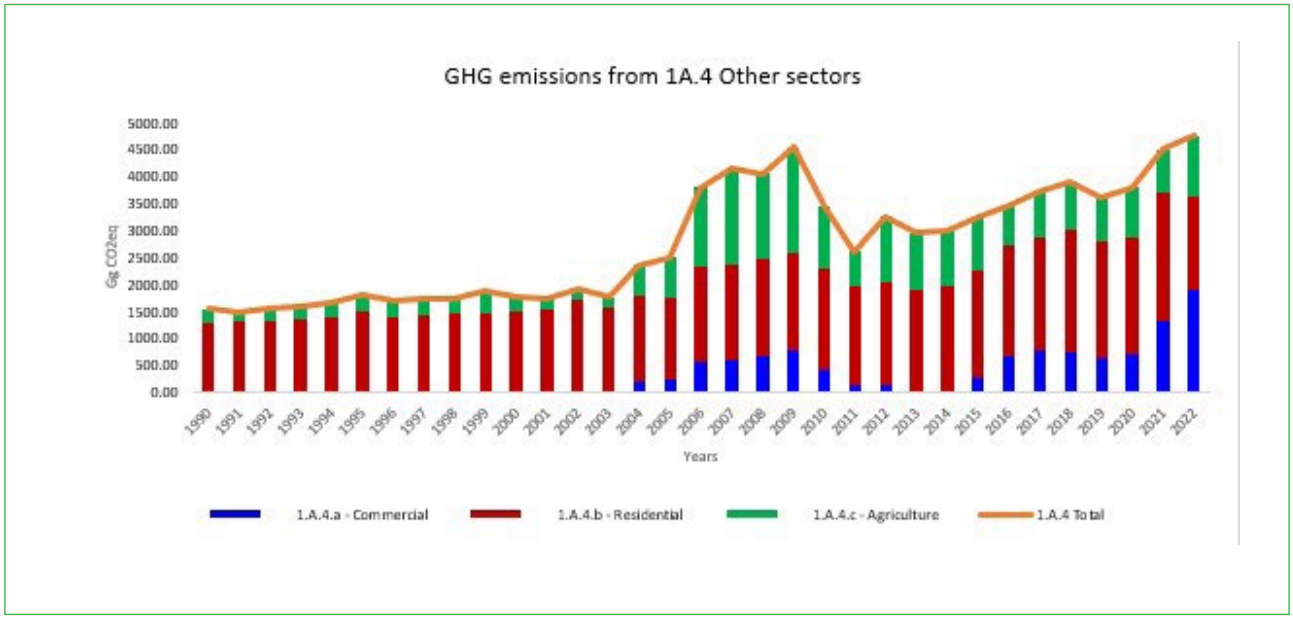


Figure 1.11: GHG Emissions from other Sectors (1.A.4)

Emissions from this sector are significant in Zimbabwe owing to the predominant nature of the agriculture activities in the economy and heavy reliance on biomass by rural communities.

1.4.4.5 1 B Fugitive Emissions from Fuels

In Zimbabwe's BTR1 inventory, fugitive emissions were estimated from: 1.B.1.a Coal Mining and Handling and Charcoal production. The fugitive emissions from coal mining were calculated assuming an average opencast output contribution factor of 90% *and* 10% from underground (MoMMD, 2023). Fugitive emissions from charcoal production decreased by 28.92% between 1990 and 2022 (*Table 1.8*). The increase in coal mining for use in power production and industry from 1990 to 2022 saw

the fugitive emissions from coal mining rising by 71.06%.

Table 1.8: GHG Emissions from Fugitive Emissions

YEAR	1.B.1.A.I - UNDERGROUND MINES	1.B.1.A.II - SURFACE MINES	1.B.1.C.I - CHARCOAL AND BIOCHAR PRODUCTION	1.B.1.C.II - COKE PRODUCTION	TOTAL
1990	0.07	0.04	17.22	-	17.33
1991	0.07	0.04	17.22	-	17.33
1992	0.07	0.04	17.22	-	17.34
1993	0.07	0.04	17.22	-	17.34
1994	0.08	0.05	17.22	-	17.35
1995	0.08	0.05	17.22	-	17.35
1996	0.08	0.05	17.22	-	17.35
1997	0.08	0.05	17.22	-	17.36
1998	0.09	0.05	17.22	-	17.36
1999	0.09	0.05	17.22	-	17.36
2000	0.09	0.05	17.22	-	17.37
2001	0.09	0.05	17.22	-	17.37
2002	0.09	0.06	17.22	-	17.37
2003	0.10	0.06	17.22	-	17.38
2004	0.09	0.06	17.22	0.85	18.22
2005	0.11	0.06	17.22	0.95	18.34
2006	0.10	0.06	15.99	0.92	17.07
2007	0.10	0.06	14.76	0.88	15.80
2008	0.08	0.05	11.07	0.40	11.61
2009	0.09	0.05	11.07	0.45	11.67
2010	0.09	0.05	11.07	0.52	11.74
2011	11.62	0.09	0.06	11.07	0.40
2012	11.76	0.10	0.06	11.07	0.53
2013	11.77	0.10	0.06	11.07	0.54
2014	12.05	0.23	0.14	11.07	0.61
2015	11.94	0.16	0.09	11.07	0.61
2016	12.00	0.09	0.05	11.30	0.55
2017	12.02	0.11	0.06	11.53	0.32
2018	12.34	0.12	0.07	11.76	0.39
2019	12.58	0.10	0.06	12.00	0.41
2020	12.99	0.11	0.06	12.24	0.58

YEAR	1.B.1.A.I - UNDERGROUND MINES	1.B.1.A.II - SURFACE MINES	1.B.1.C.I - CHARCOAL AND BIOCHAR PRODUCTION	1.B.1.C.II - COKE PRODUCTION	TOTAL
2021	14.55	0.13	0.08	12.24	2.10
2022	13.31	0.16	0.10	12.24	0.81
Change between base year and 2022	71.06%	71.06%	-28.92%	-4.51%	-26.95%

1.5 INDUSTRIAL PROCESSES AND PRODUCT USE (IPPU)

1.5.1Sector Overview

The IPPU sector includes non-energy related emissions from industrial processes and product use, including emissions of F-gases. The direct GHG emissions released during these processes and product use include CO_2, CH_4, N_2O, HFCs, PFCs and SF_6. Indirect gases include NMVOC, CO, NO_x, SO_X and Short-lived Climate Pollutants (SLCPs) such as Black Carbon. The source categories covered by this inventory which are dependent on AD availability in Zimbabwe are:

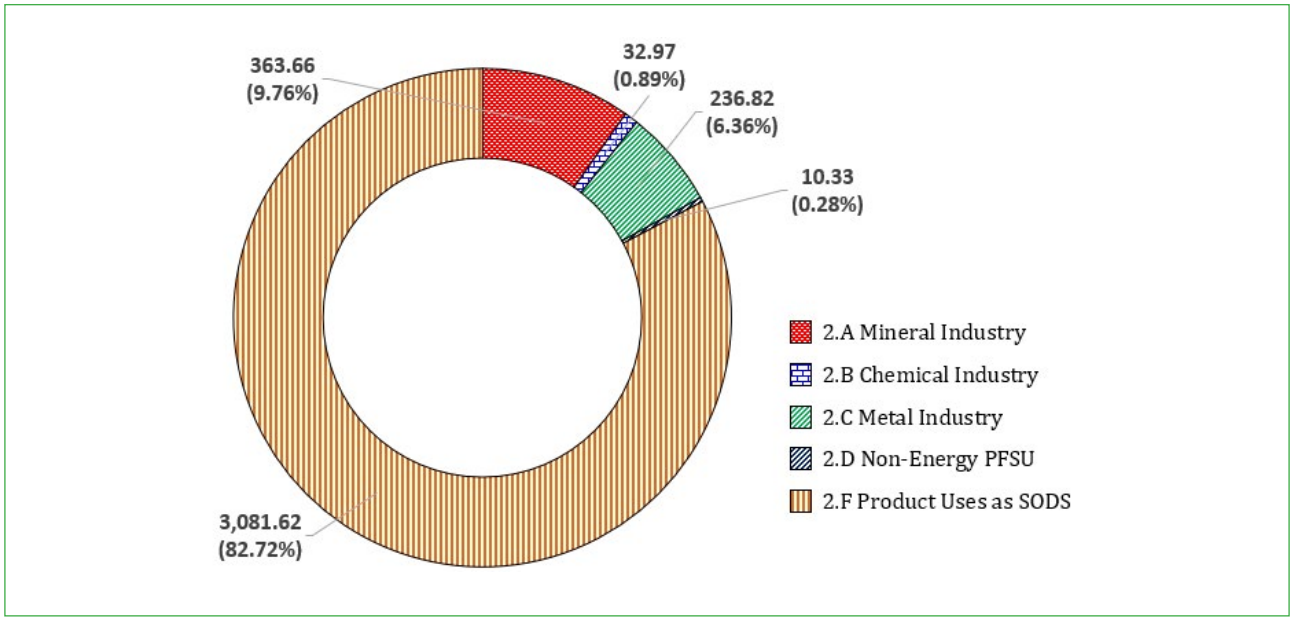
- 2A Mineral industry (2A1: Cement production, 2A2: Lime production, 2A3: Glass production, 2A4b: Other uses of soda ash),
- 2B Chemical industry (2B2: Nitric acid production),
- 2C Metal industry (2C1: Iron and steel production, 2C2: Ferroalloy production, 2C5),
- 2D Non-energy products from fuels and solvent use (2D1: Lubricant use, 2D2: Paraffin wax use),
- 2F Product uses as substitutes for Ozone Depleting Substances (ODS) (2F1: Refrigeration and Air Conditioning)

Other activities within the IPPU sector were excluded from the inventory because some of the activities do not occur in Zimbabwe, or the AD was not available.

1.5.1.1 Overview of GHG emissions from Industrial Processes and Product Use

The total emissions in 2022 were 3,725.41 Gg eq. The emissions were dominated by the Product Uses as Substitutes for Ozone Depleting Substances (SODS) (2F), contributing 82.7% of the total emissions, followed by Mineral Industry (2A) (9.8%), Metal Industry (2C) and Chemical Industry (2B) as shown in Figure 1.12 and Figure 1.3. The least emissions came from Non-energy Products from fuels and Solvent Use (PFSU) (2D) which contributed 0.38%.

Figure 1.12: GHG Emissions by Categories in 2022



HFCs contributed most of the emissions followed by CO2 as shown in Table 1.9 and Figure 1.14. These two gases contributed more than 98% of the total emissions. The contributions of N2O and PFCs were very small.

Table 1.9: Emission by Gases for 2022

GAS	CO2	N2O	HFCS	PFCS	TOTAL
GHG Emissions (Gg eq)	610.82	0.124	3,081.3	0.2902	3,725.41

Figure 1.13 IPPU Sector GHG Emissions

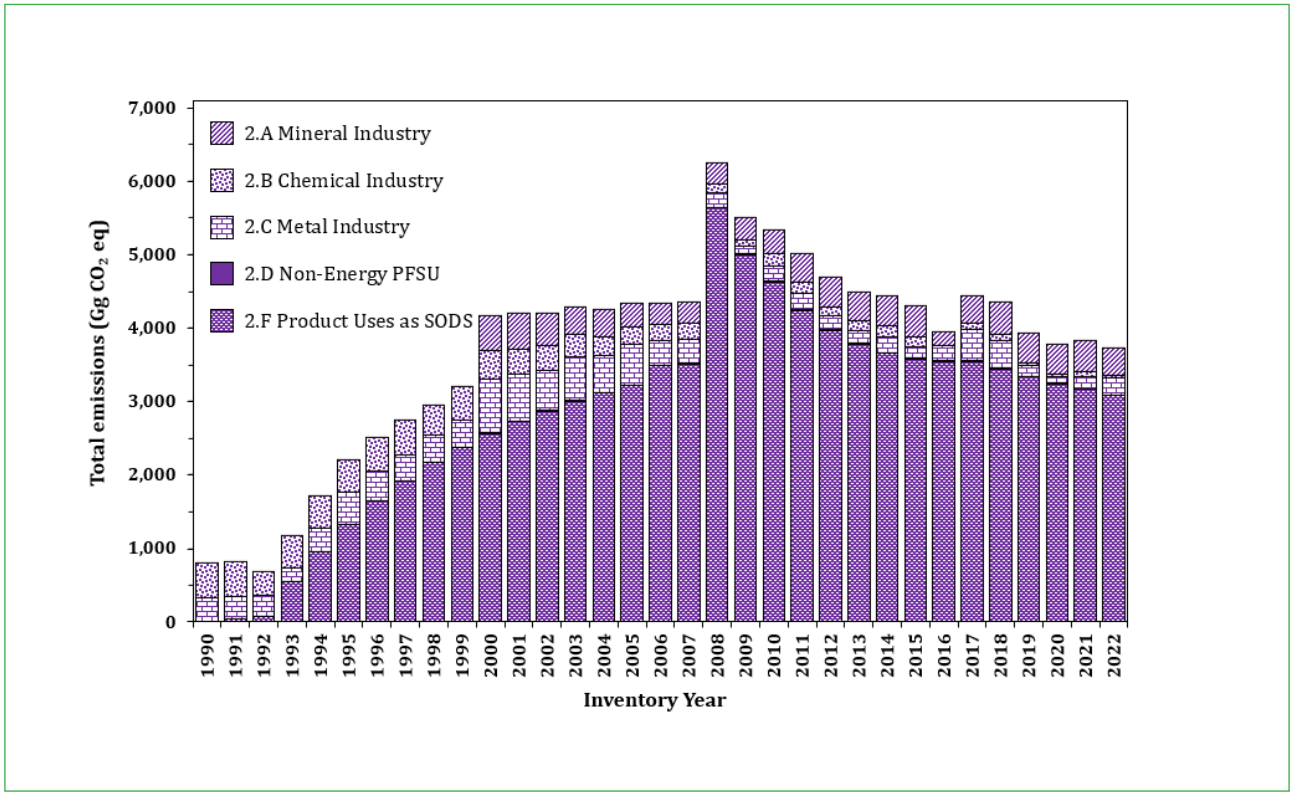
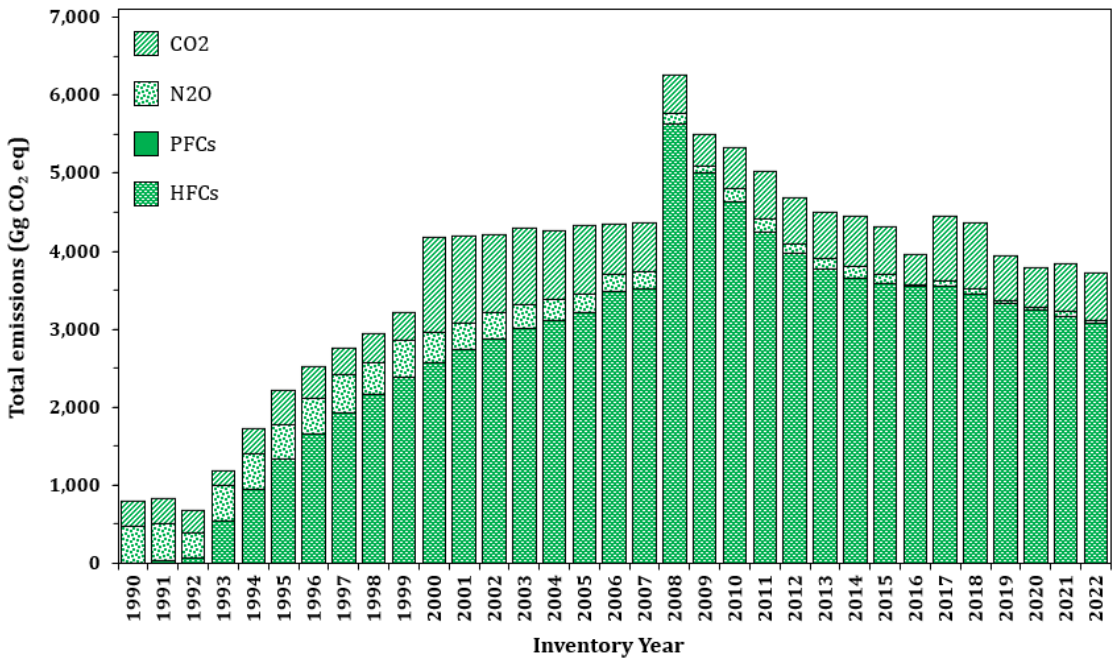


Figure 1.14: IPPU Sector GHG Emissions by Gases

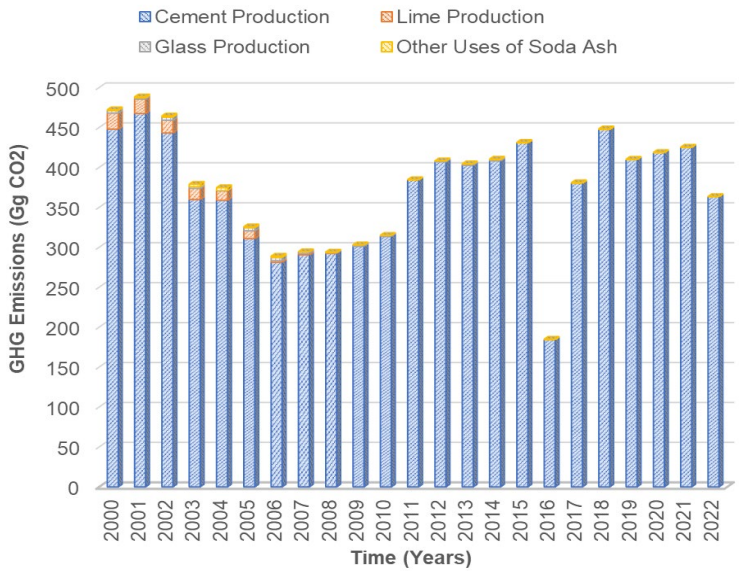


1.5.2 GHG Emissions by Category

1.5.2.1 Mineral industry (2A)

In this category, GHG emissions were estimated from Cement production (2.A.1), Lime production (2.A.2), Glass production (2.A.3), and other process uses of carbonates (2.A.4). Figure 1.15 shows the trend in GHG emissions from 2000 to 2022. There was a gradual increase in emissions from 472 Gg CO_2 in 2000 to 488 Gg CO_2 in 2001, followed by a decrease in emissions from 2001 to 2006 with steep declines from 2002 to 2003 and 2004 to 2005.

Figure 1.15 Trend in GHG emissions from the Mineral Industry (2.A) 2000-2022



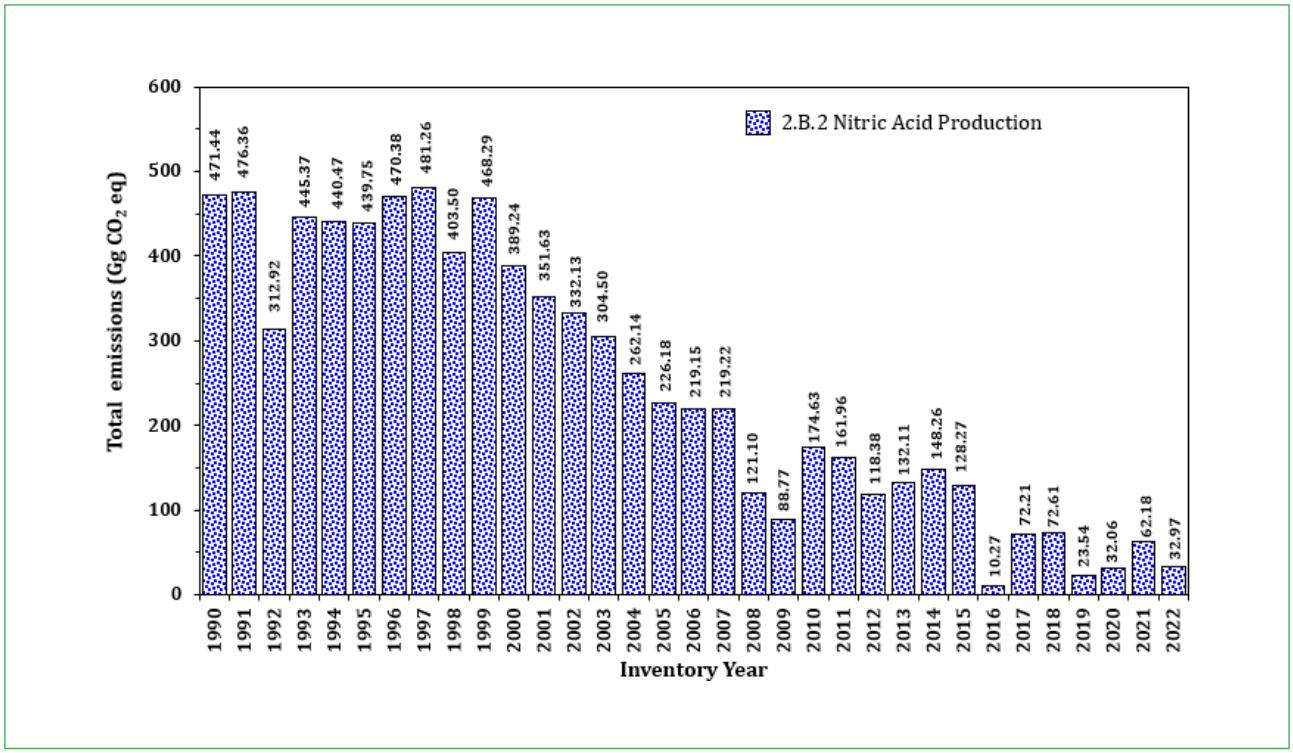
Overall, the emissions decreased by 33% from 2001 to 2006. The decrease was related to the economic downturn in the country. There was an increase in emissions from 2007 to 2012 with a rapid rise from 2010 to 2011, followed by a decrease to 2013 and gradual increases to 2014 and 2015. A significant dip in emissions occurred in year 2016 related to shocks experienced in the economy caused by monetary policy changes which affected access to foreign currency resulting in reduced production in the cement industry. The total emissions rebounded from 185 Gg CO_2 to 381 Gg CO_2 *and 448 Gg* CO_2 in 2017 and 2018 respectively. The relative increase in emissions from 2007 to 2018 was mostly due to a rise in construction activities mainly in the housing sector. A dip in emissions was experienced from 2018 to 2019, followed by gradual rise in 2020 and 2021 and then another dip in 2022. The dips in emissions were due to reduced production caused by shortage of forex to import raw materials and replacement parts.

Cement production contributed about 96% of total emissions from 2000 to 2008 and more than 99% of the emissions in the period 2009 to 2022. Lime production contributed about 3% to total mineral industry emissions in the period 2000 to 2008 while glass production and the other processes of carbonates contributed 0.6% and 0.5%, respectively in the same period. There has been no glass production since 2015 and the other processes of carbonates contributed 0.2% of emissions from 2015 to 2022.

1.5.2.2 Chemical industry (2B)

In this category, emissions are produced from nitric acid production. Figure 1.16 shows the trend in emissions from nitric acid production for the period 1990 to 2022. The trend shows a decrease in emissions with time.

Figure 1.16 GHG Emissions from Nitric Acid Production

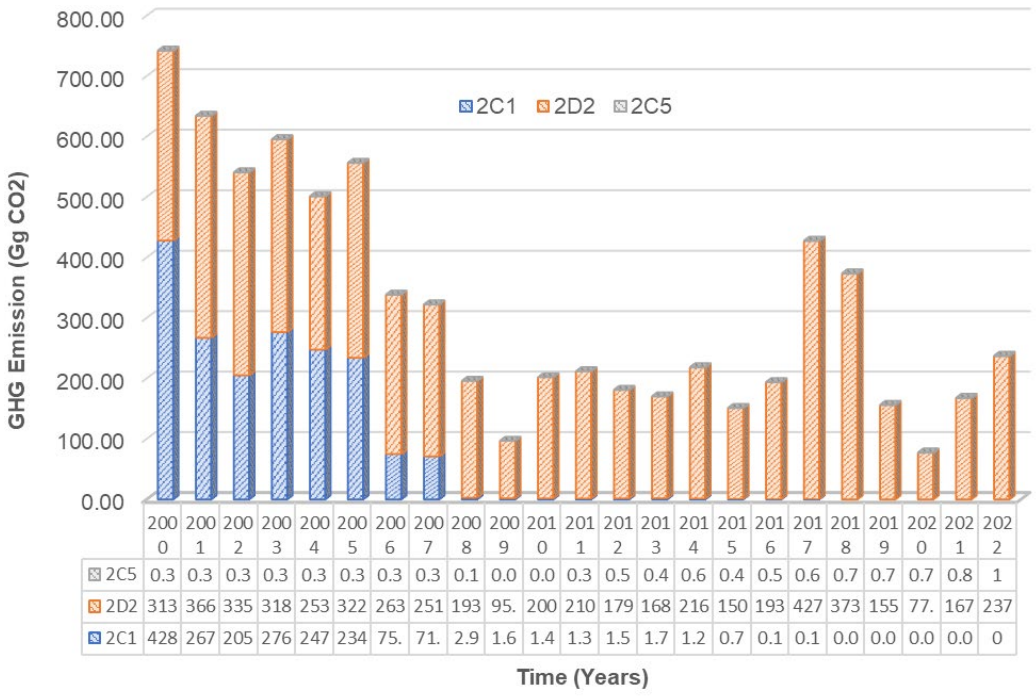


1.5.2.3 Metal industry (2C.)

Figure 1.17 shows an irregular trend for direct GHG emissions in the Metal Industry source category. A significant decrease in GHG emissions of 86.9% between 2000 (742.36 Gg-

CO_2 eq.) and 2009 (97.07 Gg-CO_2 eq.) is shown. This decrease corresponds with the closure of the sole iron and steel manufacturer in 2008 as well as a reduction in ferroalloy production. The method of steel production remaining in the country (Electric Arc Furnace) since the year 2009, does not result in significant emissions such as those from the Basic Oxygen Furnace (BOF).

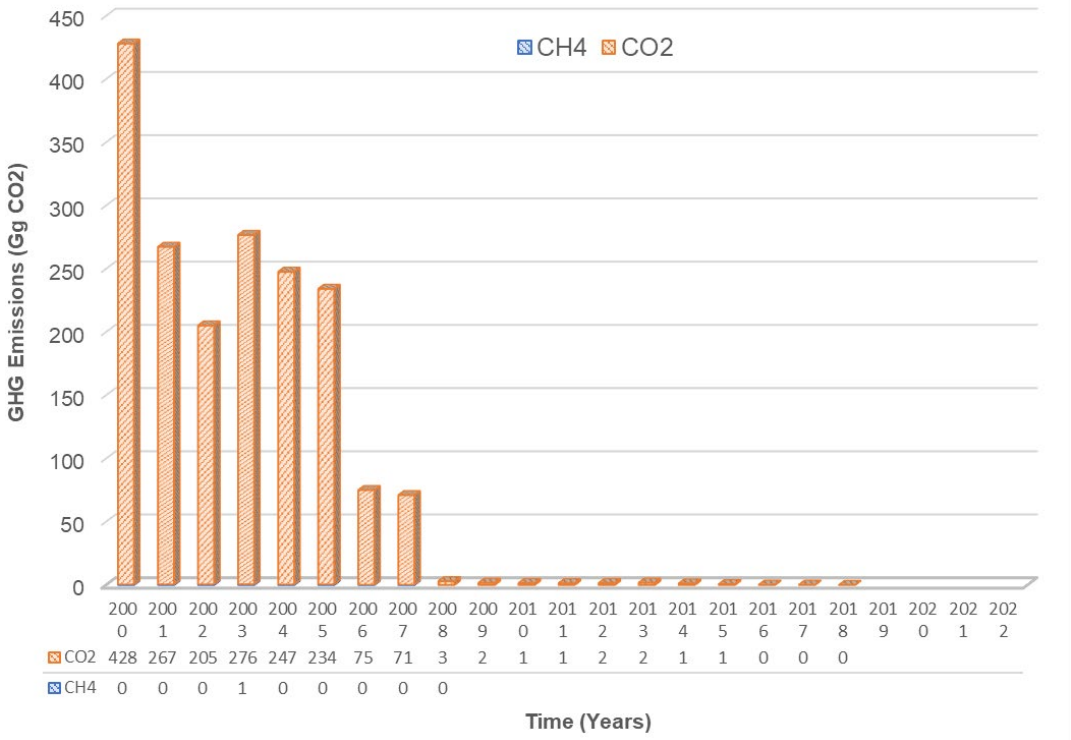
Figure 1.17: GHG Emissions by Categories for Metal industry (2C)



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
2C5	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.1	0.0	0.0	0.3	0.5	0.4	0.6	0.4	0.5	0.6	0.7	0.7	0.7	0.8	1
2D2	313	366	335	318	253	322	263	251	193	95.	200	210	179	168	216	150	193	427	373	155	77.	167	237
2C1	428	267	205	276	247	234	75.	71.	2.9	1.6	1.4	1.3	1.5	1.7	1.2	0.7	0.1	0.1	0.0	0.0	0.0	0.0	0

GHG emissions increased by 118.5 % between the year 2009 (97.07 Gg-CO_2 eq.) and 2011 (212.10 Gg-CO_2 eq.), which was followed by a decrease of 14.4 % between the year 2011 (212.10 Gg-CO_2 *eq.) and 2012 (181.41 Gg-*CO_2 eq.). There was an increase of 20.6 % between the year 2012 (181.41 Gg-CO_2 eq.) and 2014 (218.85 Gg-CO_2 eq.), which was followed by a decrease of 31.1 % between 2014 (218.85 Gg-CO_2 eq.) and 2015 (151.43 Gg-CO2 eq.). There was a further increase in emissions of 183 %between the year 2015 (151.43 Gg-CO2 eq.) and 2017 (428 Gg-CO_2 eq.) and a decrease of 82 percent in emissions between 2017 (428 Gg-CO2 eq.) and 2020 (77.78 Gg-CO_2 eq.). The inconsistency in the trend is related to the variations in ferroalloy production which in turn is influenced by the volatility in ferroalloy prices over the years and the economic downturn the country has been experiencing over the years. Emissions from secondary lead production contributed less than 1 %to the GHG emissions from the metal industry. Emissions by gas are shown in Figure 1.18.

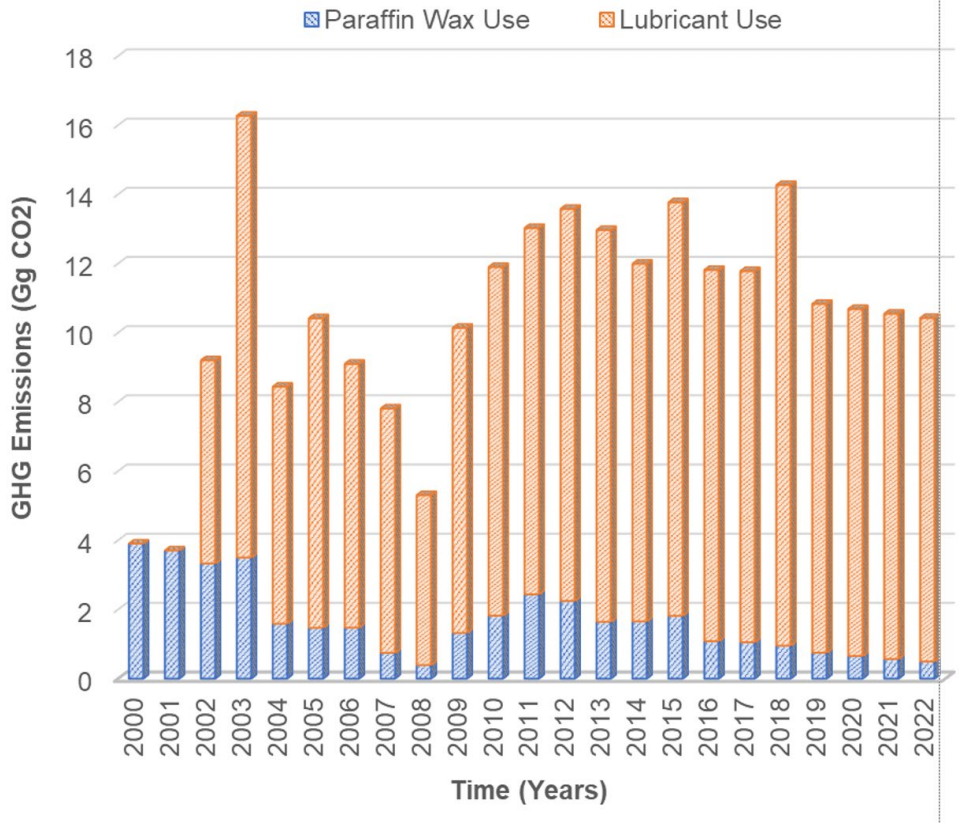
Figure 1.18: GHG emissions by Gases for Metal industry (2C)



1.5.2.4 Non-Energy Products from Fuels and Solvent Use (2D.)

The direct GHG emissions from Non-Energy Products from Fuels and Solvent Use (2D.) are shown in Figure 3.19. There has not been any definite trend in the emissions. Emissions of 3.9 Gg-CO_2 were recorded in 2000 which gradually increased to a peak of 16.27 Gg-CO_2 in 2003 with significant rises in 2002 and 2003. There is a dip in 2004 and emissions decreasing by 48 %from 16.27 Gg-CO_2 in 2003 to 8.44 Gg-CO_2 in 2004. The missions gradually rose to 10.41Gg-CO_2 in 2005 followed by a steady decrease to 5.30 Gg-CO_2 in 2008. There is a leap in emissions to 10.14 Gg-CO_2 in 2009 followed by steady increase to 13.58 Gg-CO_2 in 2012. This was followed by a steady decrease in emissions from 2012 to 2014. There are peaks in emissions in 2015 and 2018, insignificant differences in 2016 and 2017 as well as steady decrease from 2019 to 2022. From 2002 to 2022, paraffin wax use contributed about 13% while lubricant use contributed 87% to the total emissions from Non-Energy Products from Fuels and Solvent Use. Only CO_2 emissions were emitted.

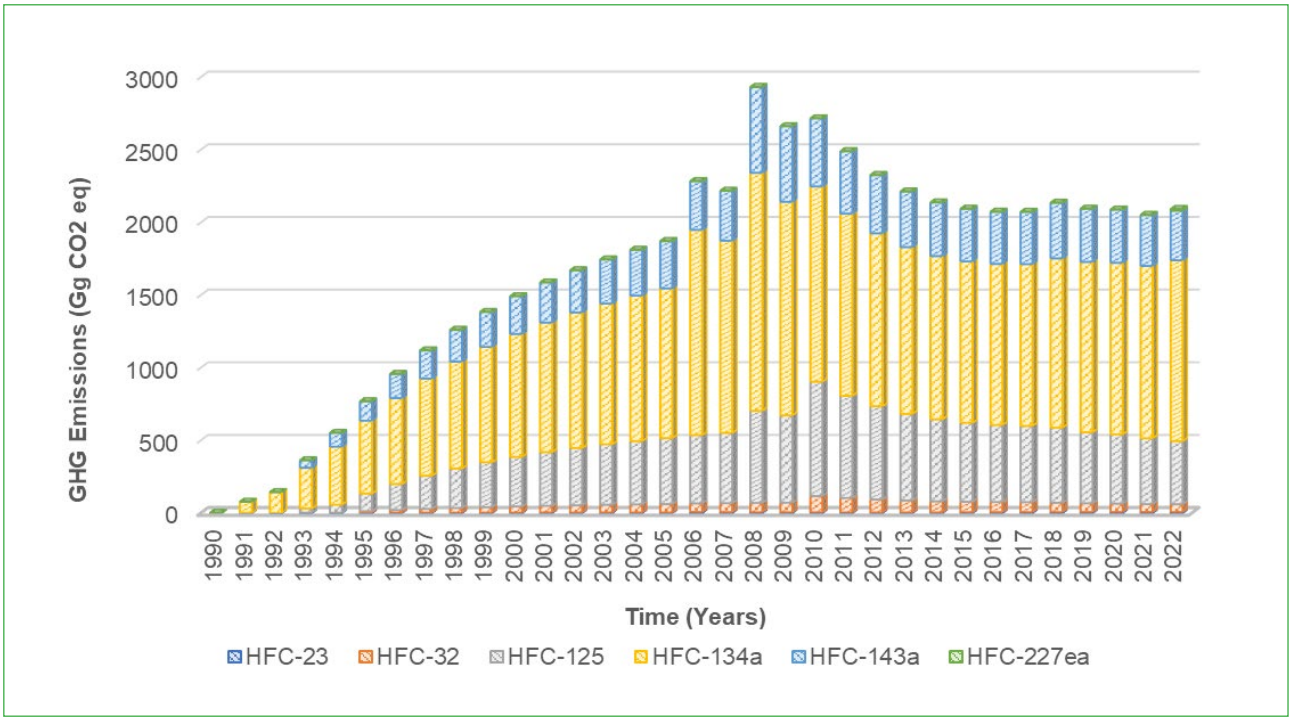
Figure 1.19: GHG Emissions from Non-Energy Products from Fuels and Solvent Use



1.5.2.5 Product uses as substitutes for Ozone Depleting Substances (2.F)

The trend shows the emissions increasing at a decreasing rate from 1991 to 2008 and peaking in 2008. Thereafter, the emissions fall at a decreasing rate and emission values are almost steady towards 2022. HFC-134a emission contributes more than 50% of the GHG emissions throughout the time series. It is followed by HFC-125 whose contribution ranges from 10% to 28% and HFC-143a whose contribution is about 16% to 20%. These three HFCS contribute at least 96% of the emissions from HFCs.

Figure 1.20: HFC Emissions from use of Substitutes to ODS



The emissions from PFC rise from about 2.1 Gg CO_2 eq in 2017 to 2.9 Gg CO_2 eq in 2018 and become steady. The emissions from PFC rise from about 2.1 Gg CO_2 eq in 2017 to 2.9 Gg CO_2 eq in 2018 and become steady. Emissions from PFC are insignificant compared to those of HFGC.

1.6 AGRICULTURE

1.6.1 Sector Overview

Agriculture is one of the major contributors to Zimbabwe's economy (15-18% of the country's GDP). Zimbabwe's agriculture is divided into four major sectors namely, Large Scale Commercial Farms, Small Scale Commercial Farms, Communal Lands and Resettlement Schemes.

The GHG inventory in the Agriculture sector covers emissions and removals under the following IPCC categories: Enteric fermentation (3.A.1), Manure Management (3.A.2), Biomass Burning (3.C.1), Liming (3.C.2), Urea Application (3.C.3), Direct N2O Emissions from Managed Soils (3.C.4), Indirect N2O Emissions from Managed Soils (3.C.5), Indirect N2O Emissions from Manure Management (3.C.6) and Rice Cultivation (3.C.7)..

1.6.1.1 Summary of Agriculture Sector Emissions: 1990-2022

The total agriculture sector GHG emissions in 2022 were 19,365.80 Gg CO2 eq., with Enteric Fermentation producing 47 % of the sectoral emissions (followed by emissions from biomass Burning which make up 40 % of the total agriculture emissions (7,798.25 Gg CO2 eq.) (Figure 1.21). Direct N2O emissions from managed soils and Manure Management contributed to 5.3 % (1,025.96 Gg CO2 eq.) and 4.3 % (841.63 Gg CO2 eq.), respectively. The sectoral emissions have grown by 8.2 % since 1990, with the highest emissions occurring in 1999 (19,435.98 Gg CO2 eq.) and the lowest in 2020 (14,572.65 Gg CO2 eq.).

Figure 1.21: Agriculture Sector GHG emissions by Source Between 19990 and 2022

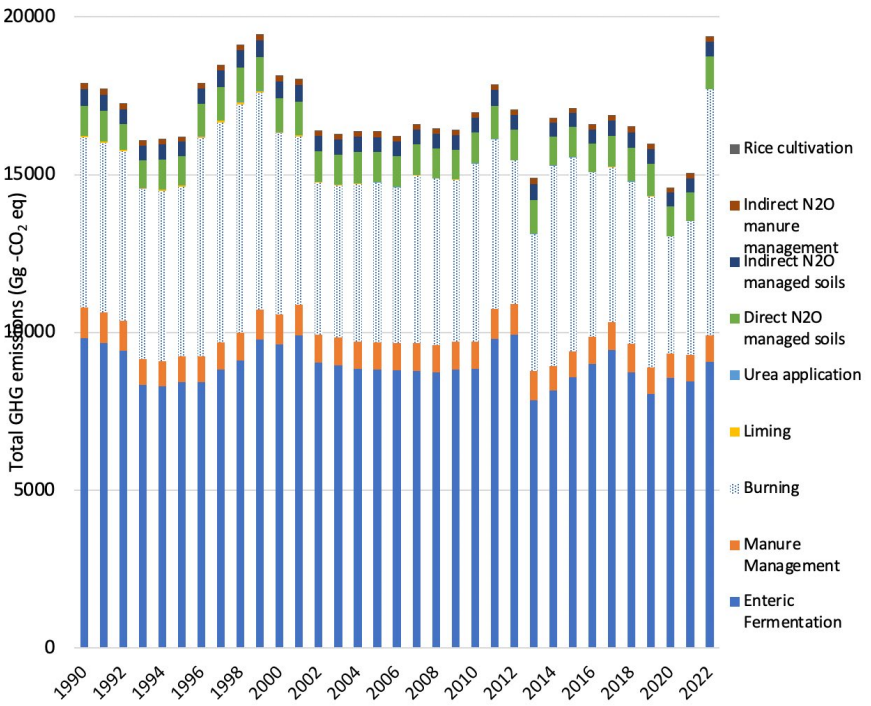
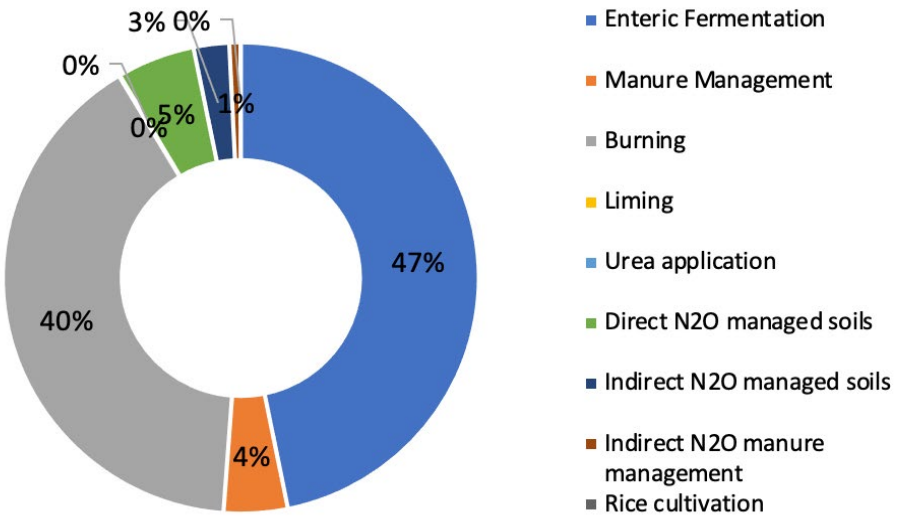


Figure 1.22: Agriculture sector GHG Emissions by Source in 2022



1.6.1.2 Emissions/Removals by Gas

Emissions of CH_4 dominated CO_2 and N_2O emissions over the 1990- 2022 time series, with enteric fermentation contributing to 60 % of the total agricultural CH_4 emissions. In 2022, CH_4, N_2O and CO_2 emissions were 1,5008.76, 4,344.03 and 13.01 Gg CO_2 eq. respectively (*Figure* 1.23). Thus, methane emissions made up 78 % of the total CH_4 emissions from the agriculture sector, while N_2O emissions made up the remaining 22 %. About half (48 %) of the nitrous oxide emissions were from biomass burning.

Figure 1.23: Agriculture Sector Emissions by Gas between 1990 and 2022

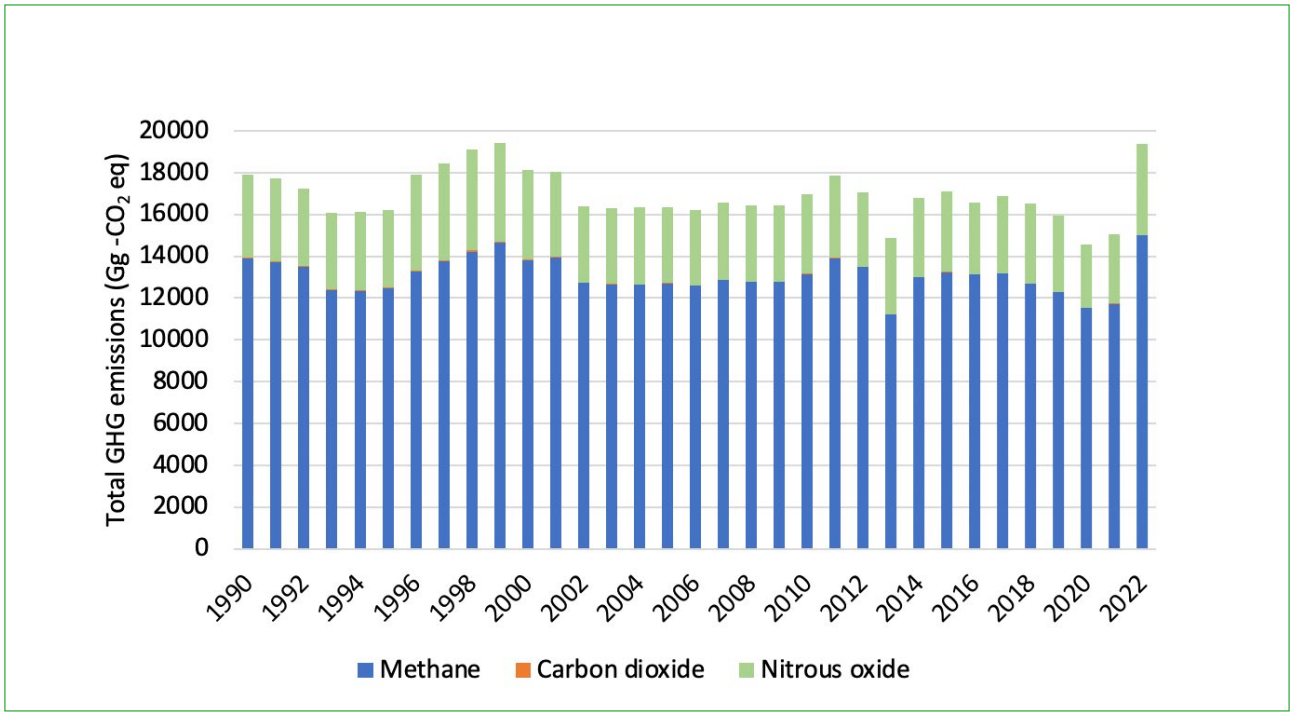
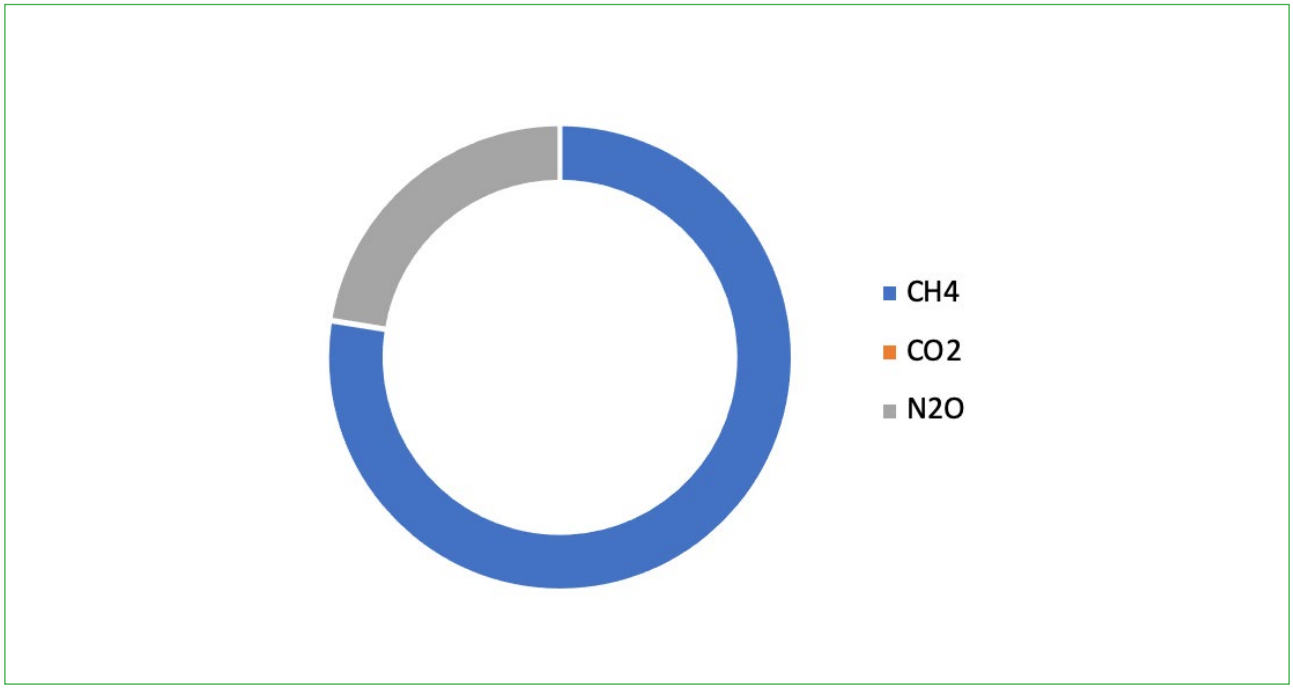


Figure 1.24: Agriculture Sector Emissions by Gas in 2022



1.6.1.3 Overview of Methodological Issues

The GHG emissions by source and removals by sink were compiled using the 2006 IPCC Guidelines (Volume 4) for GHG inventories (IPCC, 2006)[1] and their 2019 Refinements (IPCC, 2019)[2]. The emissions were estimated for a total of 9 IPCC sub-categories from the agriculture sector namely: (1) Enteric Fermentation (3.A.1), (2) Manure Management (3.A.2), (3) Biomass burning (3.C.1), (4) Liming (3.C.2), (5) Urea application (3.C.3), (6) Direct N_2O emissions from managed soils (3.C.4), (7) Indirect N_2O emissions from managed soils (3.C.5), (8) Indirect N_2O emissions from manure management (3.C.6), and (9) Rice cultivation (3.C.7).

1.6.2 Enteric Fermentation (3.A.1)

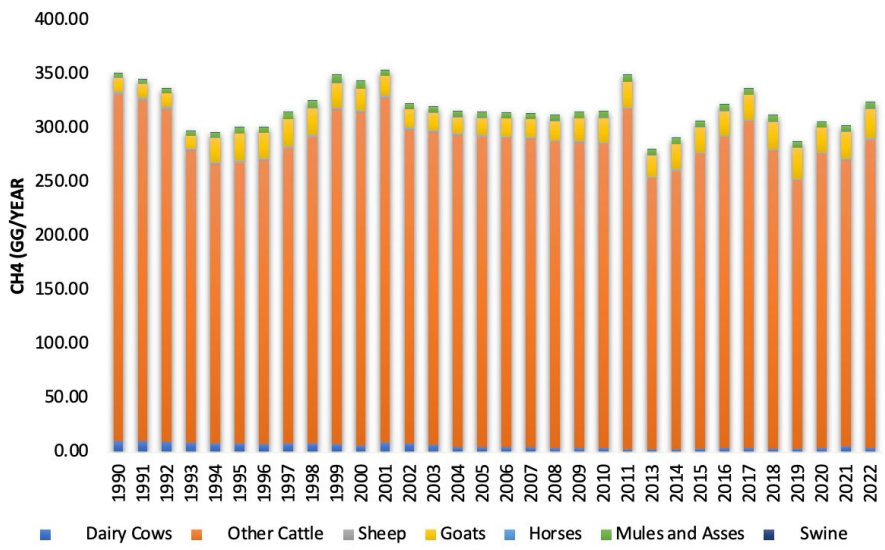
1.6.2.1 Source Category Description

Methane emissions from enteric fermentation largely depend on the livestock productivity levels, feed intake, diet quality and management circumstances. In Zimbabwe, most farmers practice extensive grazing in which cattle are grazed on natural rangeland mostly in the semi-arid region which covers up to three-quarters of the country's total land area. Methane emissions from enteric fermentation ranged from 350.64 Gg in 1990 to 323.82 Gg in 2022, with the lowest (280.17 Gg) emissions occurring in 2013 while the highest (354.40 Gg) emissions were in 2012 (Figure 1.25). The trend generally reflected the relative proportions of livestock subcategories and the effects of the drought years (1991/1992 and 2001/2002). In 2022, the Other Cattle sub-category contributed to the highest (89 %) amount of CH_4 emissions, while swine contributed the least emissions. The emissions decreased by 7.6 % between 1990 and 2022.

1 IPCC (2006) 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Prepared by the National Greenhouse Gas Inventories Programme, Eggleston H.S., Buendia L., Miwa K., Ngara T. and Tanabe K. (Eds), IGES, Hayama, Japan.

2 IPCC (2019) 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas inventories, Calvo Buendia, E., Tanabe, K., Kranjc, A., Baasansuren, J., Fukuda, M., Ngarize, S., Osako, A., Pyrozhenko, Y., Shermanau, P. and Federici, S. (eds). Published: IPCC, Switzerland

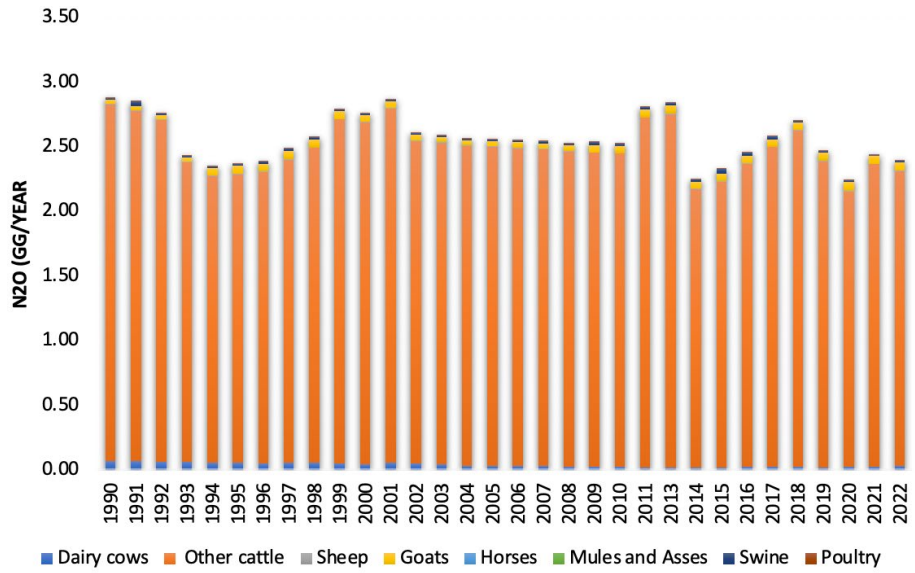
Figure 1.25: Methane Emissions from Enteric Fermentation by Livestock Category, 1990-2022



1.6.3 Manure Management (3.A.2)

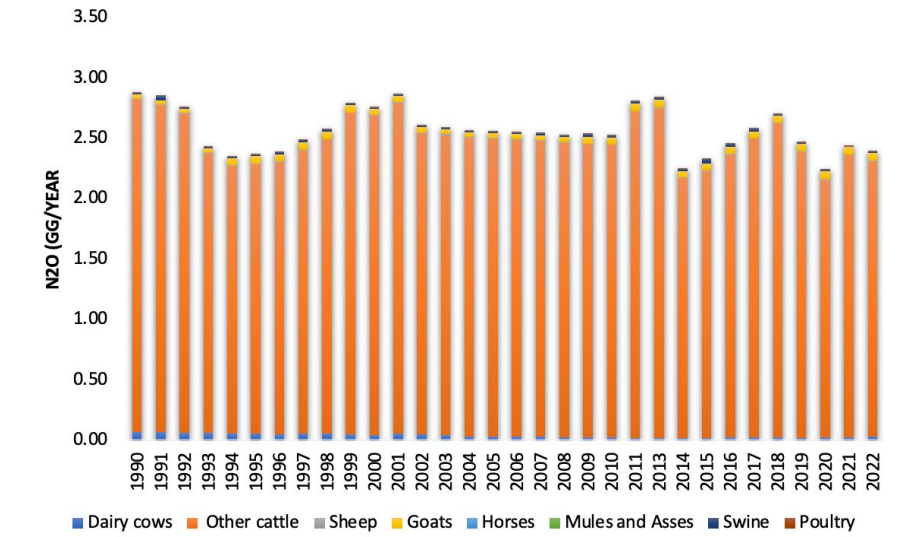
The GHG emissions from Manure Management (3.A.2) ranged from 972.96 Gg $CO2eq$ in 1990 to 838.22 Gg $CO2eq$ in 2022. Significant contribution to GHG emissions from livestock manure management were noted in 'Other cattle, and goats (*Figure* 1.26). Emissions followed similar trend with emissions from enteric fermentation. Direct CH_4 emissions from decomposing manure during the years 1990 to 2022 followed similar trend as enteric fermentation, ranging from 7.49 Gg in 1990 to 7.44 Gg in 2022, with the lowest (6.42 Gg) emissions occurring in 2013 while the highest (7.90 Gg) emissions were in 2011. The emissions decreased by 13.5 % between 1990 and 2022.

Figure 1.26: Emissions of CH4 from Manure Management by Livestock Type, 1990-2022



Direct N2O emissions from manure management during the years 1990 to 2022 ranged from 2.88 Gg in 1990 to 2.39 Gg in 2022 with the lowest (2.24 Gg) emissions occurring in 2020 while the highest emissions were in 1990 (Figure 1.27).

Figure 1.27: Emissions of N_2O From Manure Management by Livestock Type, 1990-2022

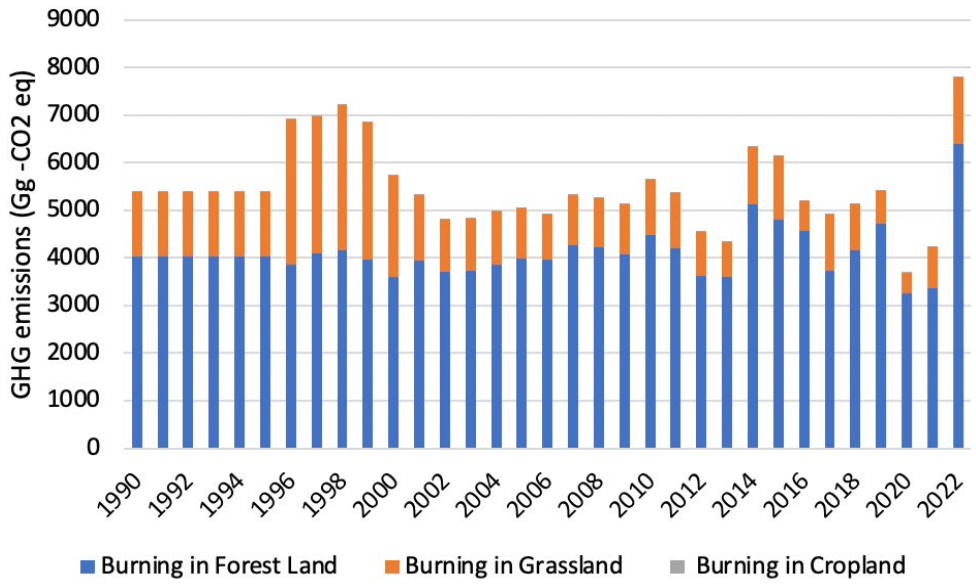


1.6.4 Biomass Burning (3.C.1)

Methane emissions from biomass burning ranged from the lowest of 98.88 Gg in 2020 to the highest of 204.62 Gg in 2022 and biomass burning emissions in forest land contributed 87 % of the total CH4 emissions from biomass burning. N2O emissions ranged from the lowest of 3.51 Gg in 2020 to the highest of 8.84 Gg in 1998 and biomass burning emissions in forest land contributed (3.C.1.a) to 67 % of the total N2O emissions from biomass burning (3.C.1). Emissions of GHG precursors (NOx, CO, NMVOCs and SO2) are given in Table 3.1, and followed the same trend as that of CH4 and N2O.

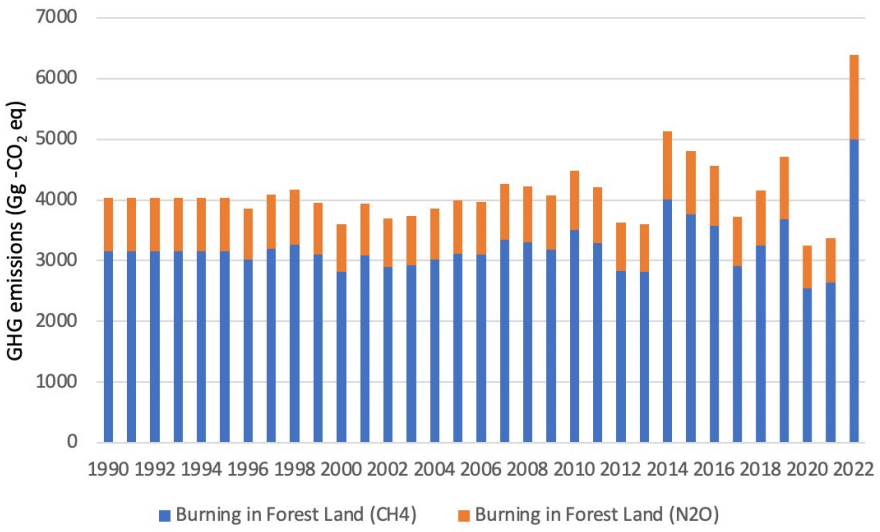
The emissions increased by 44.6 % between 1990 and 2022.

Figure 1.28: Greenhouse gas emissions from biomass burning 199-2022



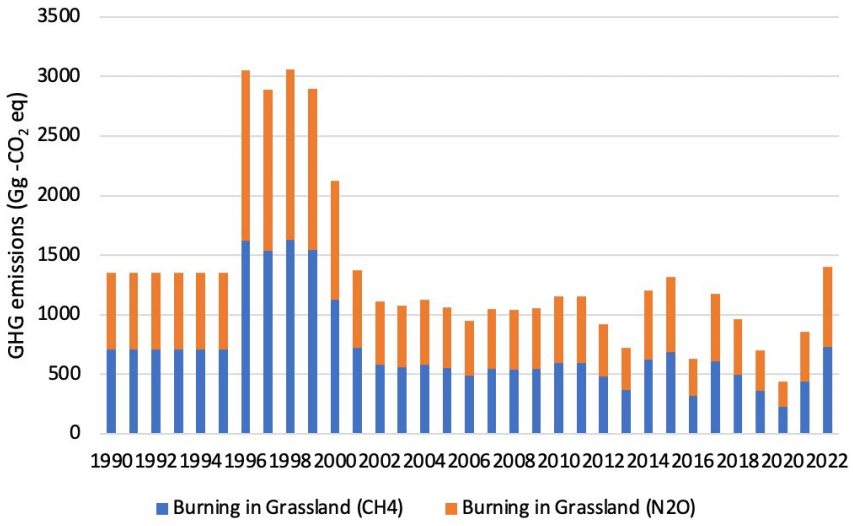
Non-CO_2 emissions from biomass in forest land (3.C.1.a) amounted to 6,388.40 Gg CO_2eq in 2022 (Figure 1.29) with the lowest emission observed in 2020 (3,249.60 Gg CO_2eq). Methane emissions contributed 78 % with N_2O emissions contributing 22 %.

Figure 1.29: GHG Emissions from Burning in Forest Land



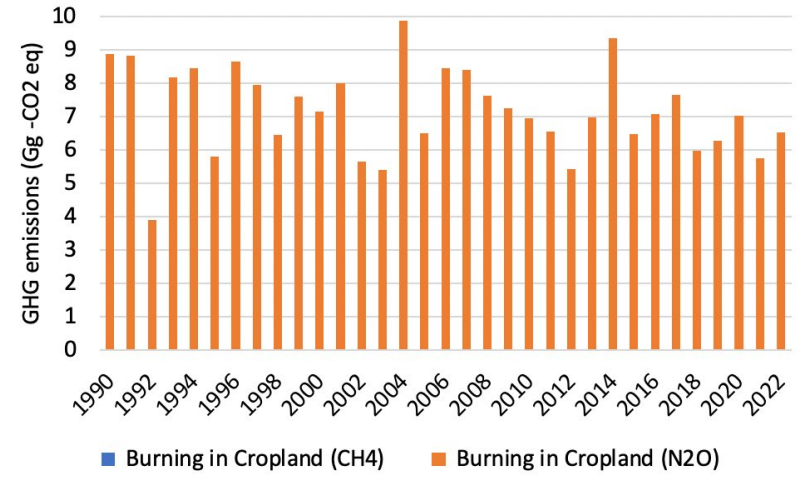
Non-CO_2 emissions from biomass in grassland land amounted to 1,447.93 Gg CO2eq in 2022 with the highest emissions occurring in 1998 (3057.36 Gg CO2-eq) while the lowest emissions observed in 1991 (442.21 Gg CO2eq) (Figure 1.30). Methane emissions contributed 52 % with N2O emissions contributing the remaining.

Figure 1.30: Greenhouse Gas Emissions from Burning in Grassland



Non-CO_2 emissions from biomass in cropland land amounted to 6.53 Gg CO2eq in 2022 (Figure 3A7Figure 1.31) with the highest emissions occurring in 2004 (9.89 CO2-eq) while the lowest emissions were observed in 1992 (3.89 Gg CO2-eq). Nitrous oxide emissions contributed to all of the emissions from burning in cropland.

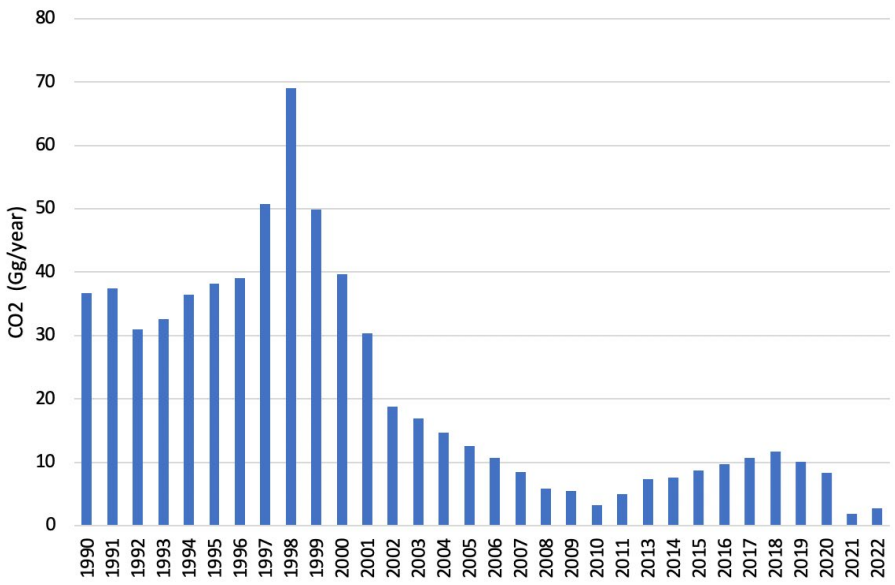
Figure 1.31: Greenhouse Gas Emissions from Burning in Cropland



1.6.5 Liming (3.C.2)

Emissions of CO_2 from liming were estimated between 12.51 Gg in 1990 and 2.8 Gg in 2022 (Figure 1.32). These emissions were principally from the use of local agricultural lime to correct for high soil acidity on cropland. The emissions generally increased between 1990 and 1998. Following the Land Resettlement Programme that started in 2000 there was a considerable decline in the use of lime. With the sub-optimal economic conditions in the country farmers affecting the fertiliser industry and the transport sector lime use decreased up to 2010. The emissions decreased by 92.4 % between 1990 and 2022.

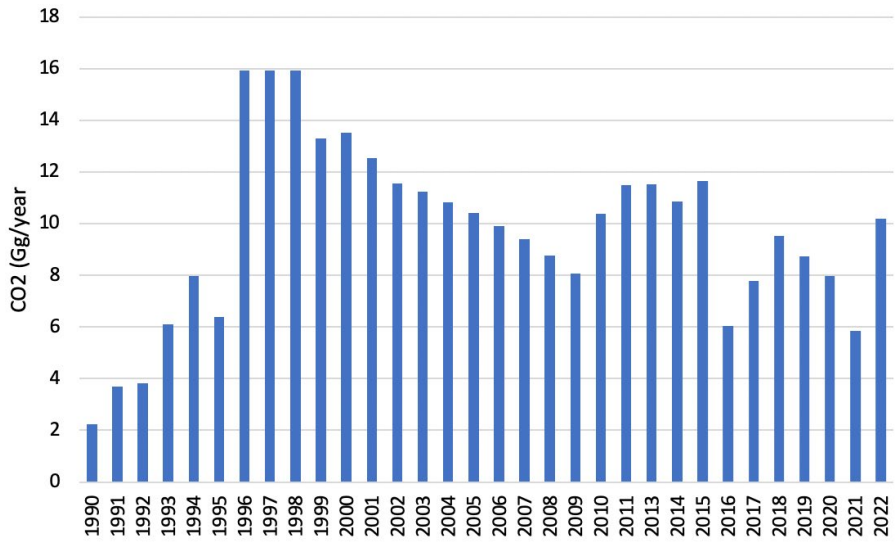
Figure 1.32: Emissions of CO2 from Liming, 1990-2022



1.6.5 Urea Application (3.C.3)

Emissions of CO_2 from urea application ranged from the lowest of *2.23*Gg in 1990 to the highest of 16 Gg in 1996 to 1998. The years 2011 and 2020 had emission surges. There was a considerable increase in the emissions from 1997 as many farmers were starting to use urea as a substitute for ammonium nitrate. However, after 1999 the emissions started decreasing until 2005. According to FAO (2006) the lack of foreign exchange to import anhydrous ammonia from South Africa, N-fertilizer output in 2002-2003 was about 50% of normal, and it also became uneconomic to import the anhydrous ammonia as the controlled price of urea was set at a level below landed cost. Another problem faced in the production of ammonia and ammonium nitrate was the shortage and ever-increasing cost of electricity. The emissions increased by 357 % between 1990 and 2022.

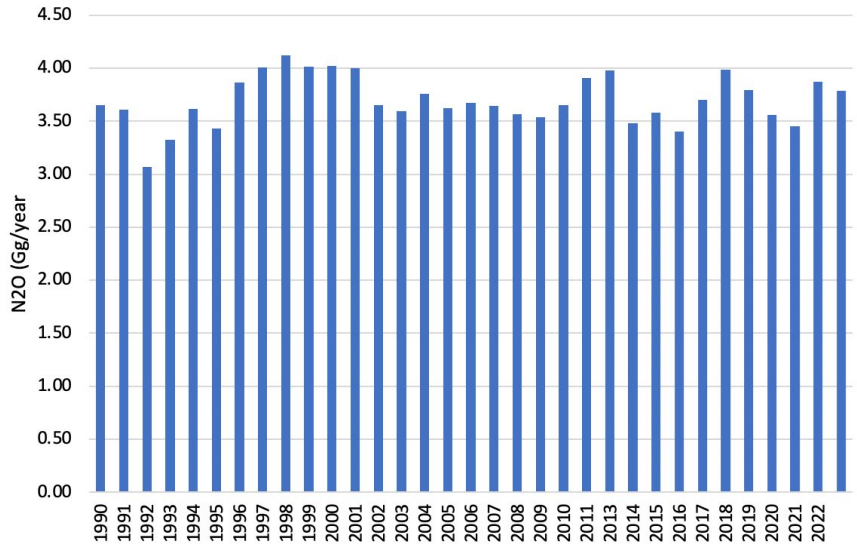
Figure 1.33: Emissions of CO2 from Urea, 1990-2022.



1.6.7 Direct N2O Emissions from Managed Soils (3.C.4)

Managed soils contribute significantly to the agriculture sector GHG emissions with Direct N2O Emissions ranging from the lowest of 3.65Gg to the highest of 3.87Gg Gg N2O between 1990 and 2022 (Figure 1.34)The emissions increased steadily (6%) between 1990 and 2022.

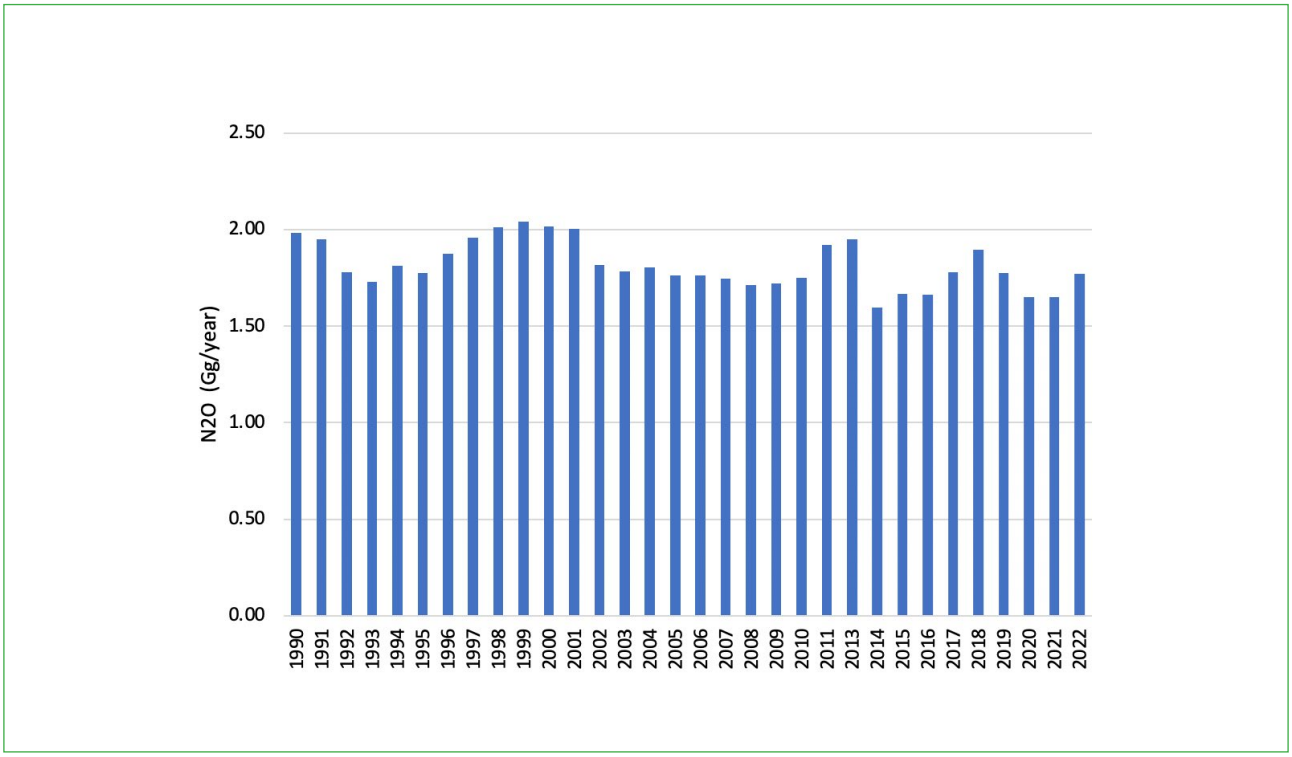
Figure 1.34: Direct N2O Emissions from Managed Soils, 1990-2022



1.6.8 Indirect N2O Emissions from Managed Soils (3.C.5)

Indirect N2O emissions from managed soils ranged from the lowest of 1.98 Gg in 1990 to the highest of 2.04 Gg in 1999 and followed the same trend as direct N2O emissions (Figure 1.35),The emissions decreased by 10.7 % between 1990 and 2022.

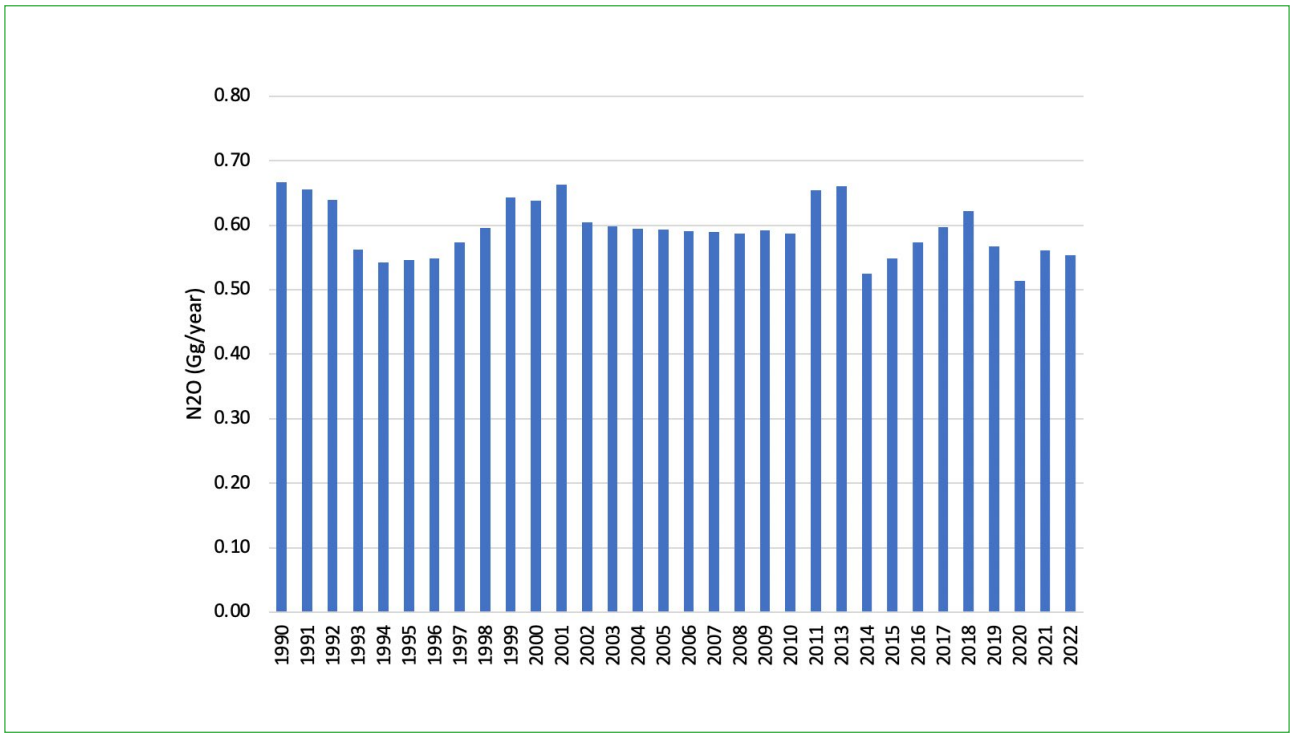
Figure 1.35: Indirect N_2O Emissions from Managed Soils



1.6.9 Indirect N_2O Emissions from Manure Management (3.C.6)

The indirect N_2O emissions from Manure Management, largely followed livestock population trends. The indirect N_2O *emissions from Manure Management ranged from* the high of *0.67 Gg* N_2O in 1990 to the low value of 0.55 Gg N_2O in 2022 and were largely from the volatilization of NH_3 and NOx from different manure management systems under 7 livestock categories. The emissions decreased by 17.1 % between 1990 and 2022.

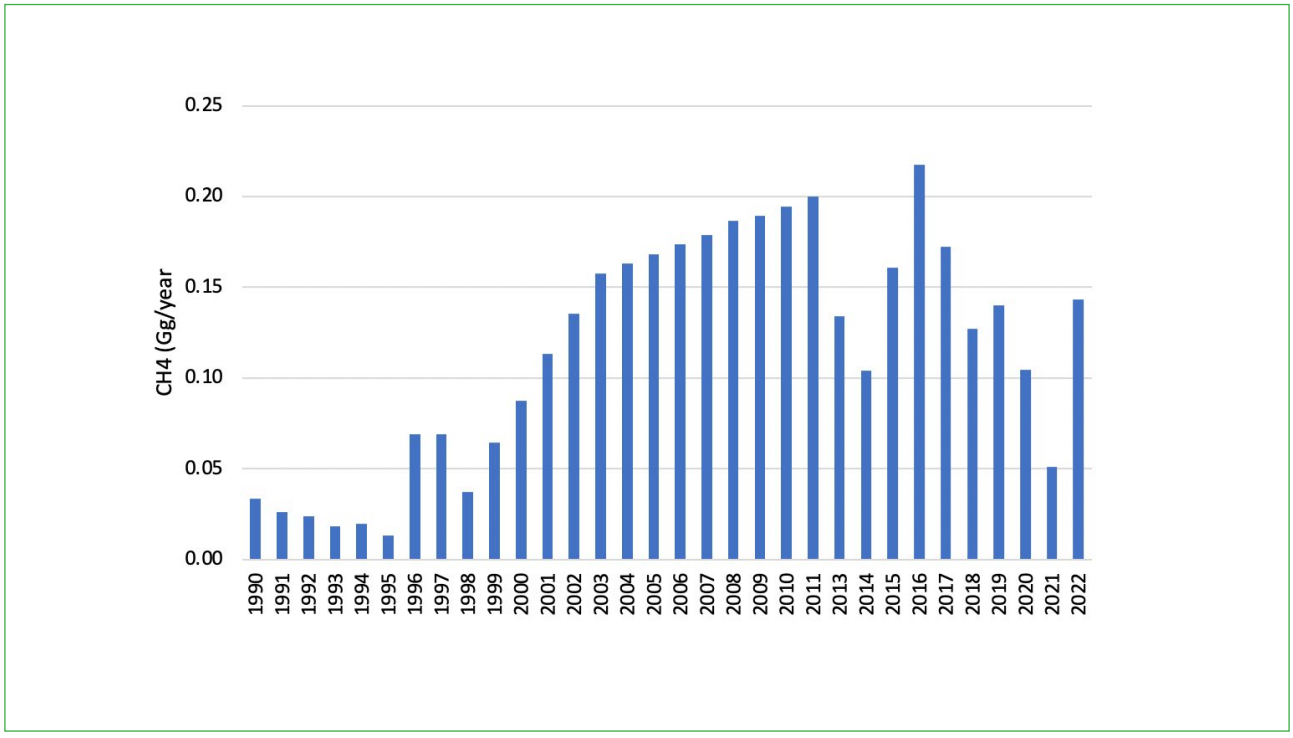
Figure 1.36: Indirect N2O Emissions from Manure Management, 1990-2022



1.6.10 Rice Cultivation (3.C.7)

Methane emissions from rice cultivation ranged from 0.03*Gg* in 1990 to 0.14 Gg in 2022 and increased considerably throughout the time series *(*Figure 1.37*)*. The emissions increased by 326 % between 1990 and 2022.

Figure 1.37: Methane Emissions from Rice Cultivation



1.7 LAND USE, LAND USE CHANGE AND FORESTRY (CRT 4)

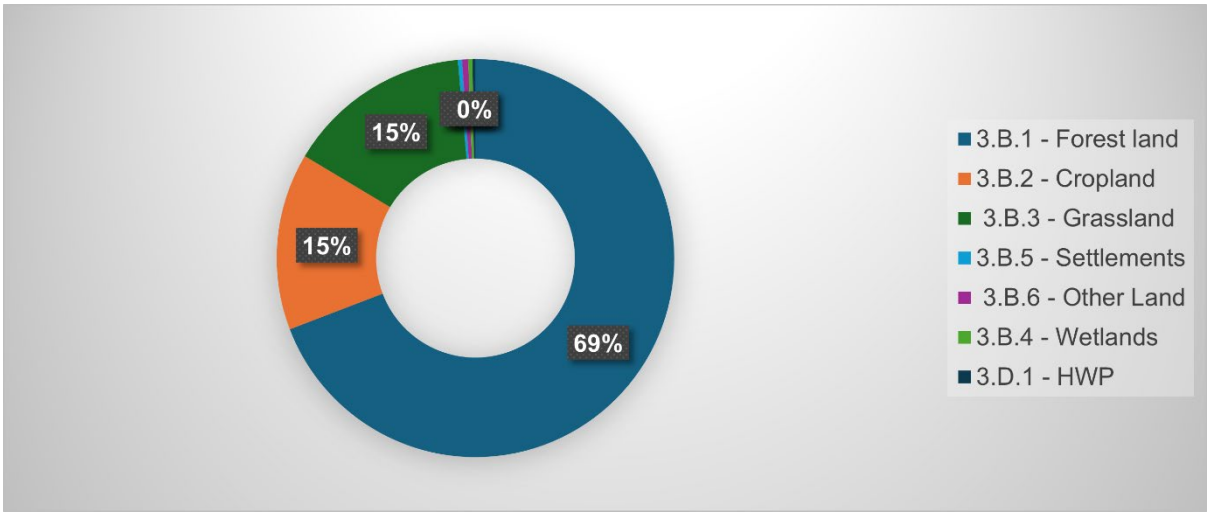
1.7.1 Sector Overview

The Land Use, Land-Use Change and Forestry (LULUCF) sector covers estimates of carbon dioxide (CO_2) emissions and removals from Forestland (3.B.1), Croplands (3.B.2), Grasslands (3.B.3), Wetlands (3.B.4), Settlements (3.B.5), other lands (3.B.6), and the Harvested wood products (HWP, *3.D.1*). The total area of the country is estimated at about 39 million hectares comprising Forest land (45.4%), followed by Cropland (29.1%), Grassland (23.5%), Wetlands (1.0%), Settlements (0.6%) and *Other* land (0.3%) (Forestry Commission, 2017).

The harvested wood products industry includes timber, veneer, and sawn timber for furniture, flooring, and sleepers is based on both plantation and natural forests. Emissions and removals are reported in subcategory land remaining in the same category and land converted *sub*category for Forest land and Cropland, while for the cropland, wetlands, settlements and other land categories, estimates of emissions are made from land converted *sub*category only.

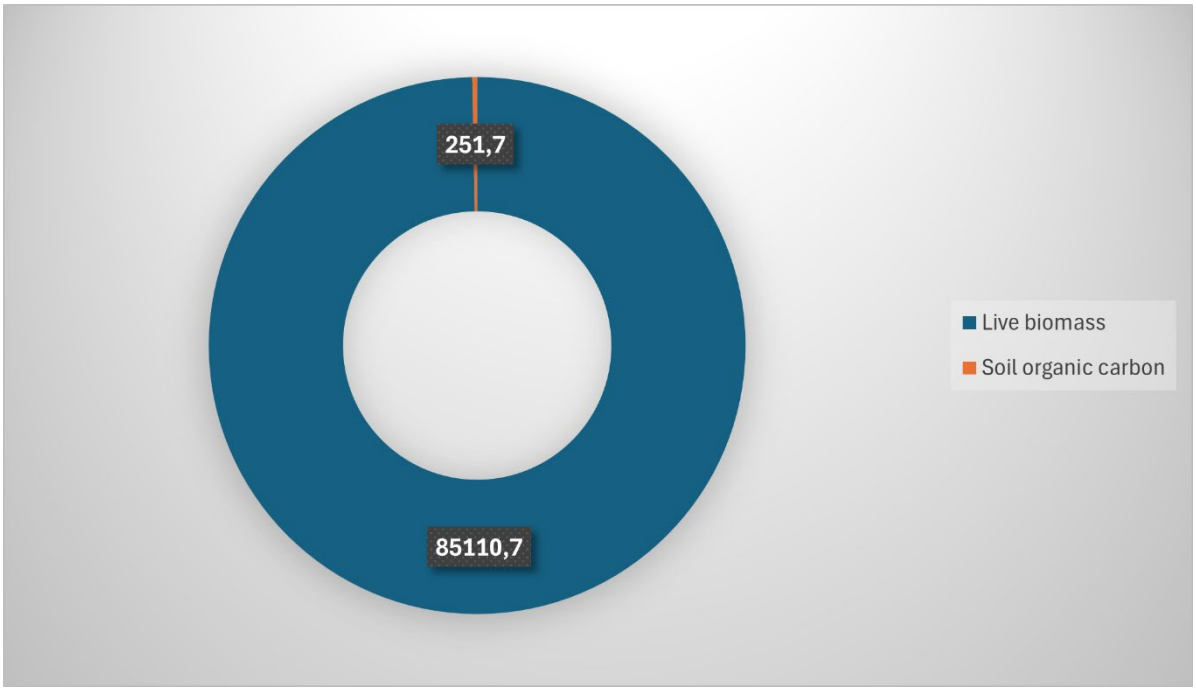
1.7.1.1 Overview of GHG Emissions/Removals in the LULUCF Sector

Figure 1.38: Percentage Share of 2022 Emissions or Removals by LULUCF Category



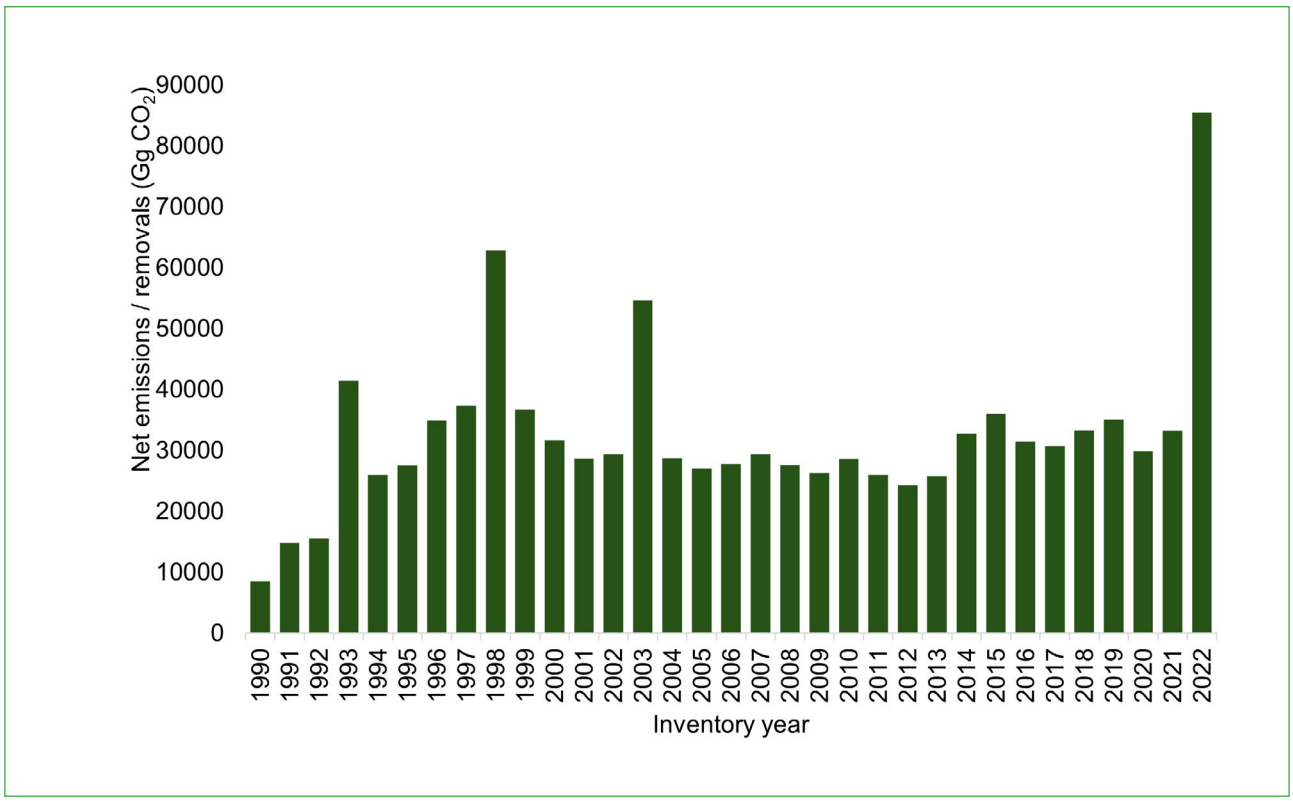
In the year 2022, Forest land had the highest share of net emissions *(69%)* of the LULUCF sector, followed by *Cropland and Grassland, while HWP* was the only category in a net removals state and the least contributor to the sector *total (*0.2%, *Figure 1.38*). Across land uses most of the emissions were as a result of changes *in live biomass at 85*,110.7 Gg CO_2 while changes in soil organic carbon contributed *251.7 Gg* CO_2 *(*Figure 1.39)

Figure 1.39: Proportion of Emissions on Land by Carbon Pool in 2022



1.7.1.2 Overview of Emissions Trends in the LULUCF Sector

Figure 1.40: Net CO2 Emissions/Removals from LULUCF for the Period 1990 to 2022



Total emissions from LULUCF in 2022 were 85, 461.7 Gg CO2 which is 150% higher than the LULUCF emissions in 1990 (8, 451.9 Gg)

Figure 1.40). The trend shows that the subsector was a net source of emissions throughout the time series.

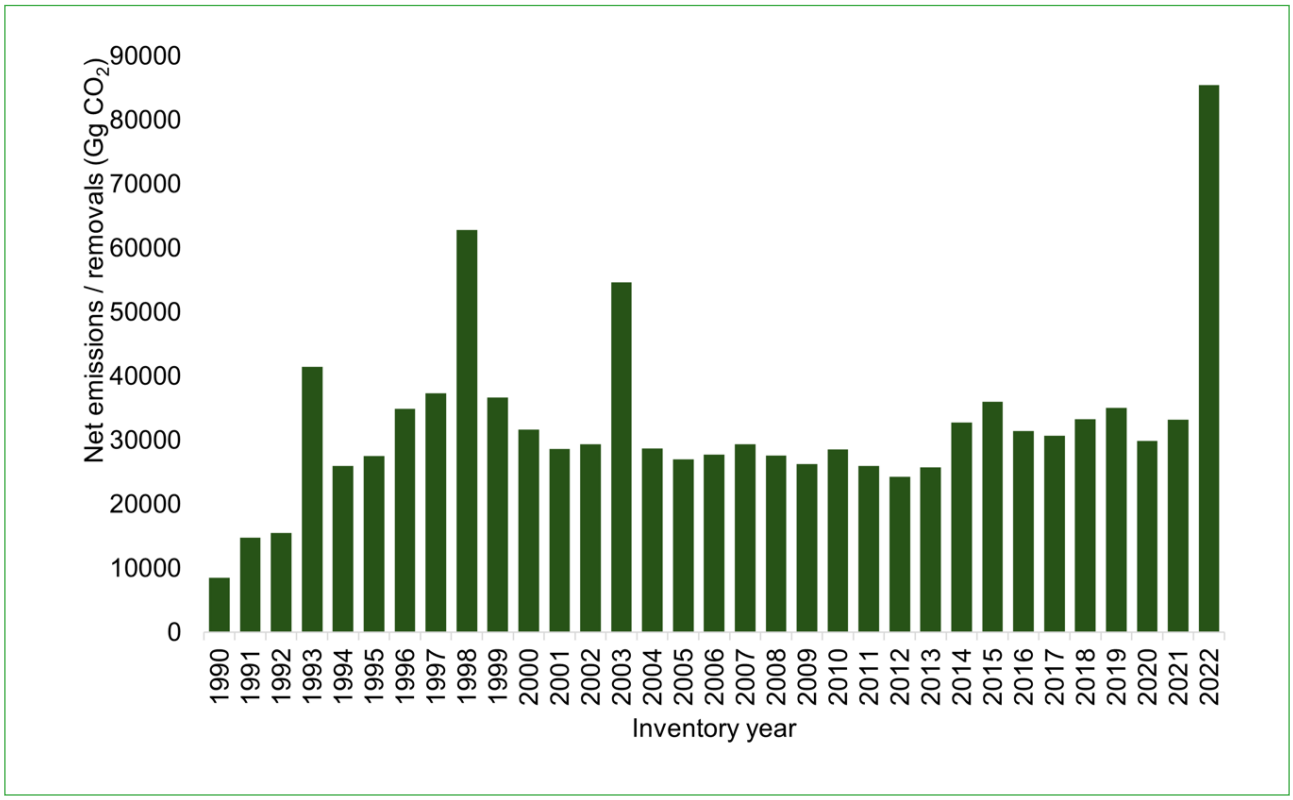
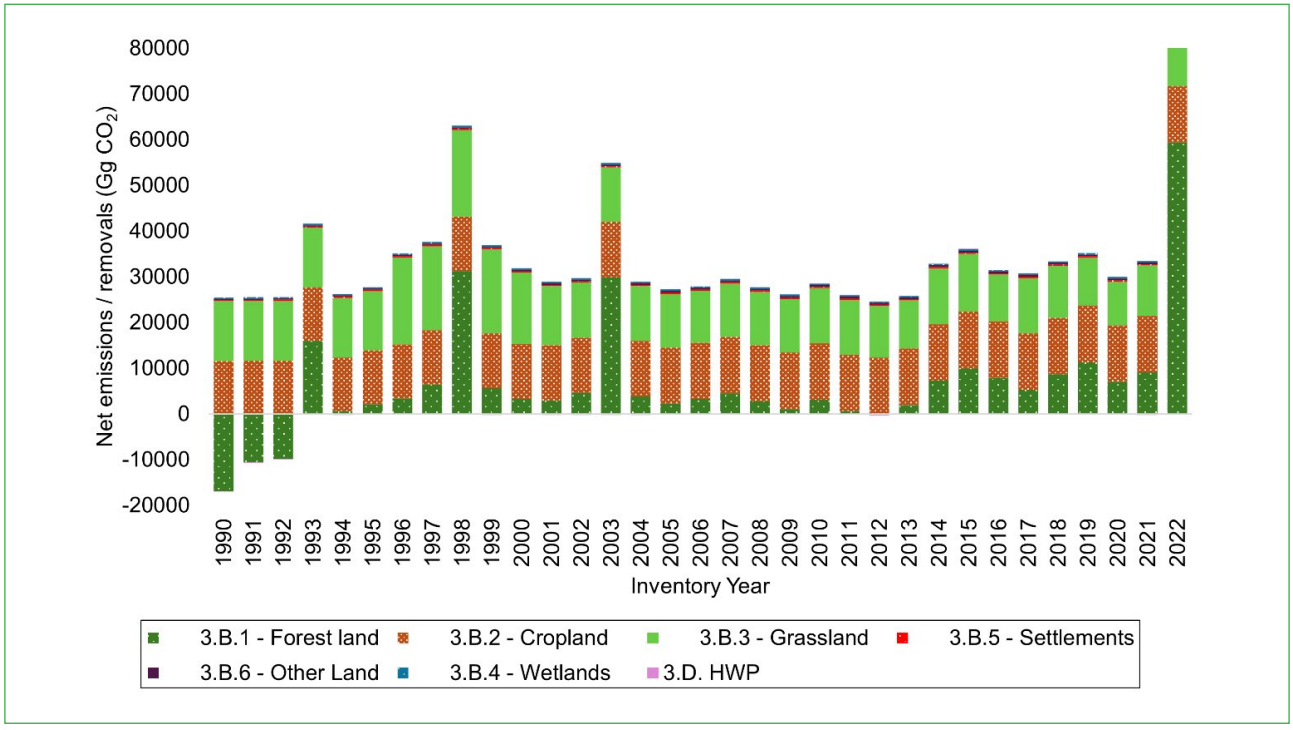


Figure 1.41: Trend of Net CO2 Emissions/Removals by LULUCF Categories from 1990 to 2022



Forest land (3.B.1) was a net sink the first three years of the time series (1990 -1992) and in 2012. For the rest of the years, it has been a net emitter. The emissions were driven mostly by high burnt forest areas during those years. Most of these years were following a severe drought and could have been associated with early drying up of vegetation increasing their flammability and spread of fires in the absence of sufficient rains.

The trend of emissions shows that cropland was a net emitter, with emissions rising from 11, 564.4 Gg CO2 in 1990 to 12, 357.2 Gg CO2 in 2009 and remaining constant until 2022 . This is driven mostly by the conversion of Forest land and Grassland to cropland in the early 2000 following the land reform program.

The grassland category was a net emitter throughout the time series from 1990 to 2022. The emissions rose from 13, 084.8Gg CO2 in 1990 to 18, 966.8 Gg CO2 in 1996 then declined to 9, 591.0 Gg CO2 in 2020 before rising to 12, 894.2 Gg CO2 in 2022 (Figure 1.41), mostly driven by emissions from forest land converted to grasslands (8, 291.7 Gg CO2) and wildfire disturbances in wooded grassland remaining wooded grassland.

Wetlands (3B4) comprised flooded land, which represent man-made water bodies in the country. No emissions were estimated from flooded land remaining flooded land; however, CO2 emissions were estimated from land converted to flooded land which amounted to 301.2 Gg CO2 annually for the whole time series (Figure 1.41).

Settlements (3B5) sub-category comprised settlements remaining settlements and land converted to settlements. Settlements remaining settlements do not have any emissions or removals, however, emissions from the land converted to settlements fell from 301.6 Gg CO_2 in 1990 to 288.8 Gg CO_2 in 2009 which then remains constant until 2022 (Figure 1-36).

Other land sub-category (3B6) comprised rock out crops, mine dumps and other land which could not be classified into the other five categories. No emissions or removals were estimated in the other land remaining other land subcategory, however emission from the land converted to other land subcategory rose from 219.5 Gg CO_2 in 1990 to 422.5 Gg CO_2 in 2009 and remained constant until 2022 (Figure 1.41).

HWP was a net sink for most of the years in the time series. The sink increased from –89.8 Gg CO_2 in 1990 to –169.5 Gg CO_2 in 2001 before declining until the category became a net emitter at 131.7 Gg CO_2 in 2009 which then decline and start regaining the net sink position up to –236.3 Gg CO_2 in 2021 and –202.0 Gg CO_2 in 2022 (Figure 1.41).

1.7.1.3 Overview of Methodological Issues Parameters and Emission Factors

The Global climate and soil maps provided for in the 2006 IPCC Guidelines were overlaid on the country land use maps and the whole country was classified under tropical dry climate and high activity clay mineral soils. The emissions / removal estimates were made based on Tier 1 methods of the 2006 IPCC Guidelines for National Greenhouse Gas Inventories (IPCC, 2006) and the 2019 refinements to the 2006 IPCC Guidelines for all the IPCC six land use categories (Forestland, Cropland, Grassland, Wetlands, Settlements and other land) and HWP. The IPCC Inventory Software version 2.93 of 2024 was used to estimate emissions and removals. The overall change in carbon stocks was determined using the gain-loss method which accounts for the change in living biomass, dead organic matter, and soil organic carbon (IPCC, 2006).

Activity data were obtained from the Forestry Commission, the Environmental Management Agency (EMA), the Timber Producers Federation (TPF) and FAOSTAT.

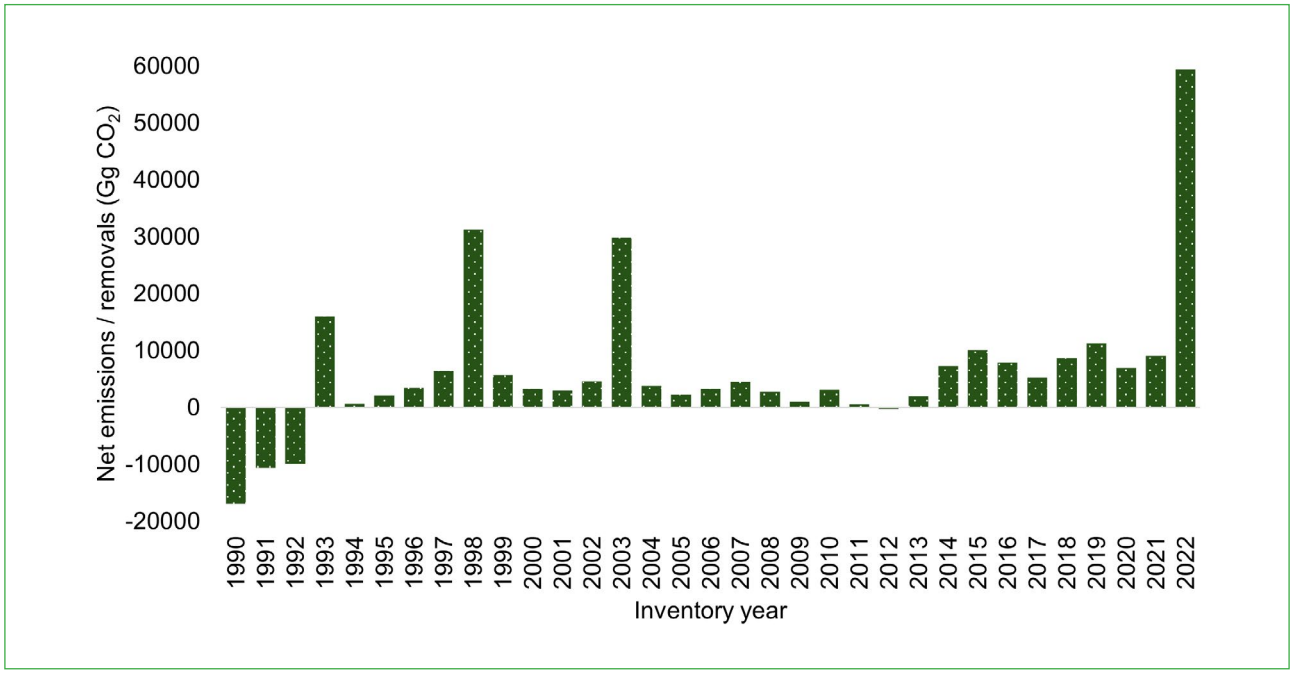
1.7.2 LULUCF Key Categories

In the sector, Forest land remaining forest land (3.B.1.a), Land converted to Grassland (3.B.3.b), land converted to forest land (3.B.1.b), Grassland Remaining Grassland (3.B.3.a) - and land converted to cropland (3.B.2.b) are key categories both by level and trend assessment approach 1.

1.7.3 LULUCF Emissions by Categories

1.7.3.1 Forest Land (CRT 3B1)

Figure 1.42: Net CO2 Emissions / Removals from Forest Land from 1990 and 2022



Forest land was a net sink at -16, 929.9 $GgCO_2$ in 1990 this however rapidly declines, and it became a net emitter at 16, 013.7 $GgCO_2$ in 1993. Since then, forest land largely became a net emitter experiencing high emissions spikes in 1998 (31,267.96 $GgCO_2$), 2003 (29,907.8 $GgCO_2$) and 2022 (59,399.7 $GgCO_2$, (*Figure 1.42*). The emissions spikes are largely as a result of high burnt areas during the respective years while most of the emissions throughout the time series are related to harvesting of wood removals, firewood collection and wildfires.

Forest land remaining forest land and land converted to forest land are responsible for most of the CO_2 removals in the sector. However, the removals from these land conversions are offset by the emissions in the forest land remaining forest land which became a net source from 1993 (Figure 1.43). Live biomass loses in forest land remaining forest land, grassland converted to forest land and live biomass gains in cropland converted to forest land contributed significantly to the overall emissions / removal profile in forest land ().

Figure 1.43: Net CO_2 Emissions/Removals by Forest Land Subcategories between 1990 and 2022

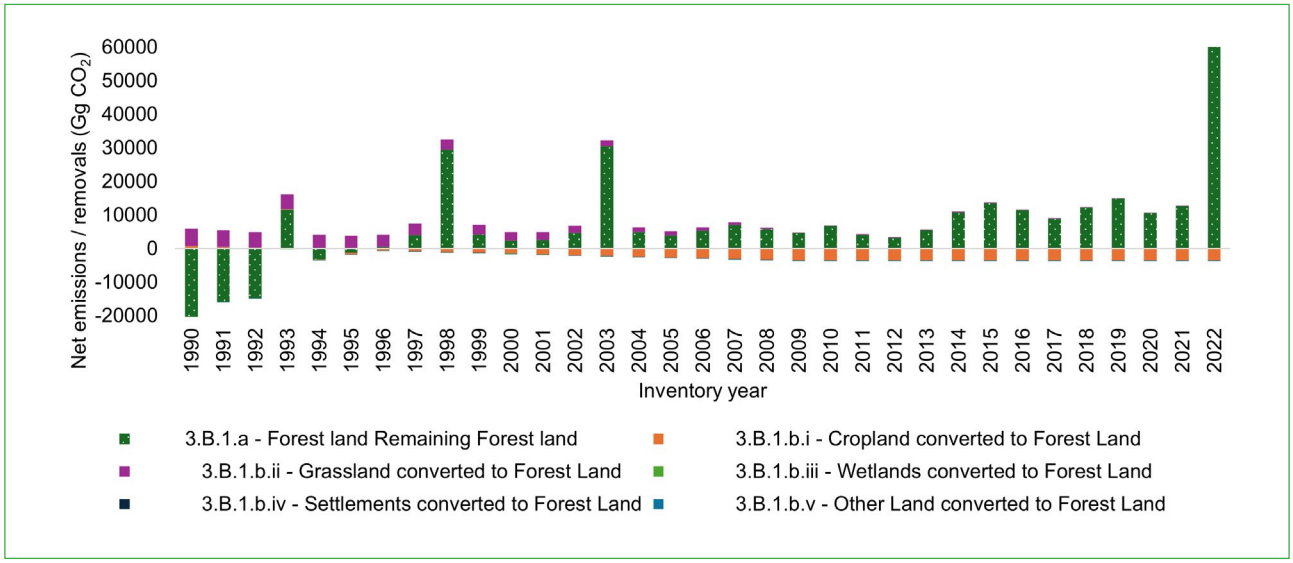
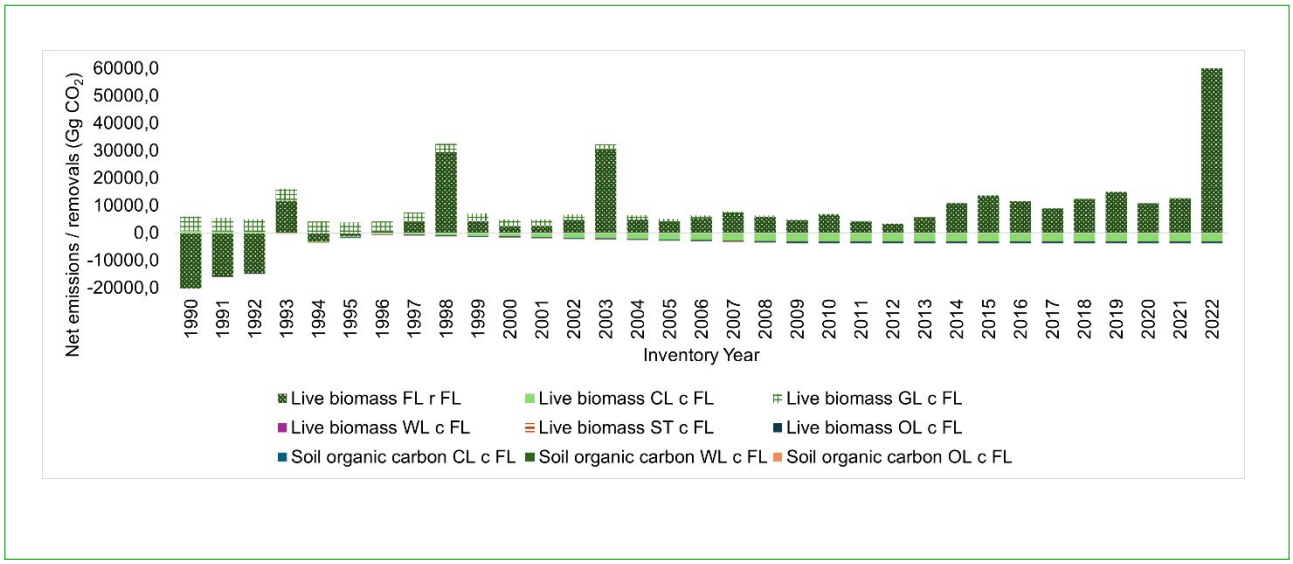
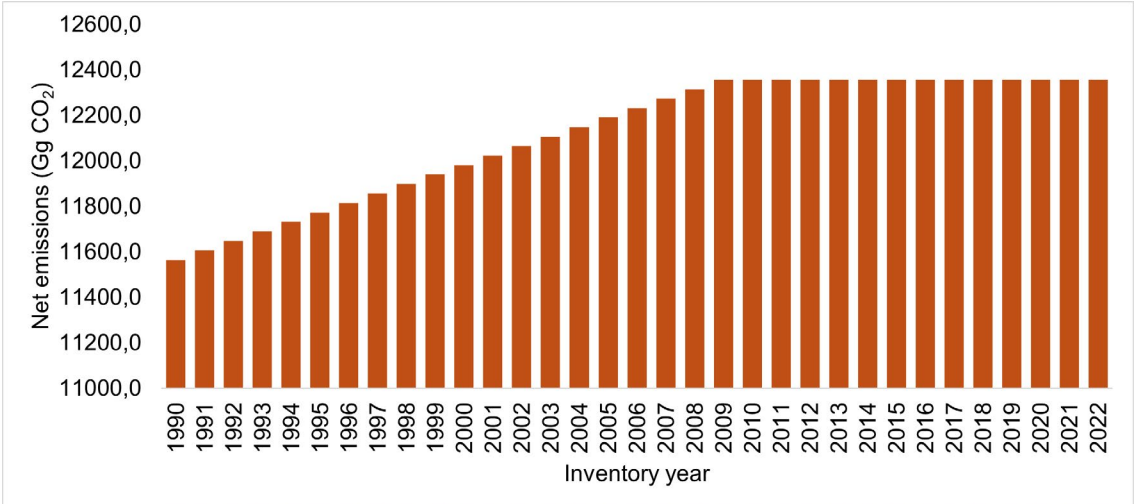


Figure 1.44: Forest Land Net CO_2 Removals/Emissions by Carbon Pool between 1990 and 2022



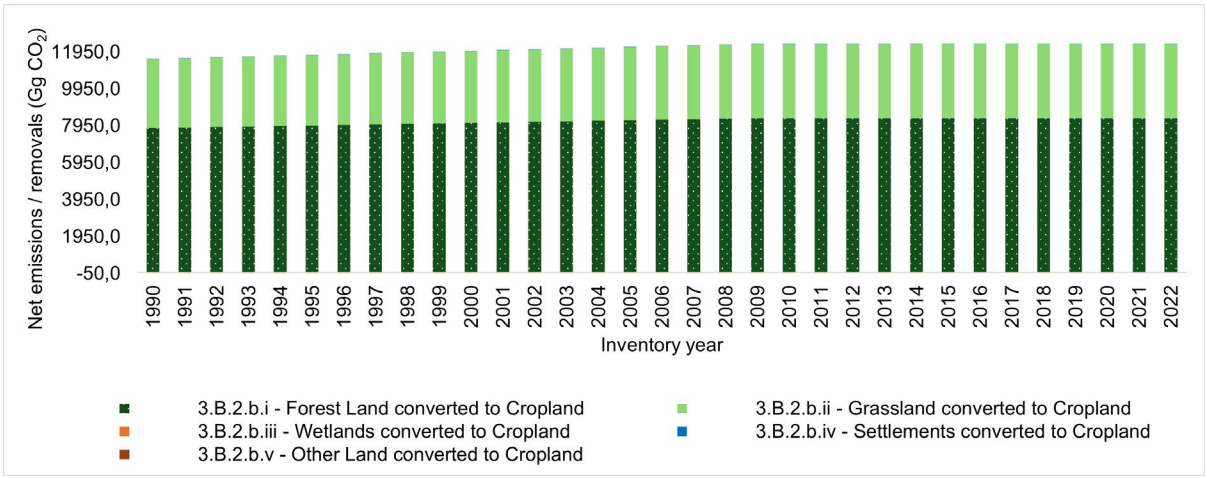
1.7.3.2 Cropland (CRT 3B2)

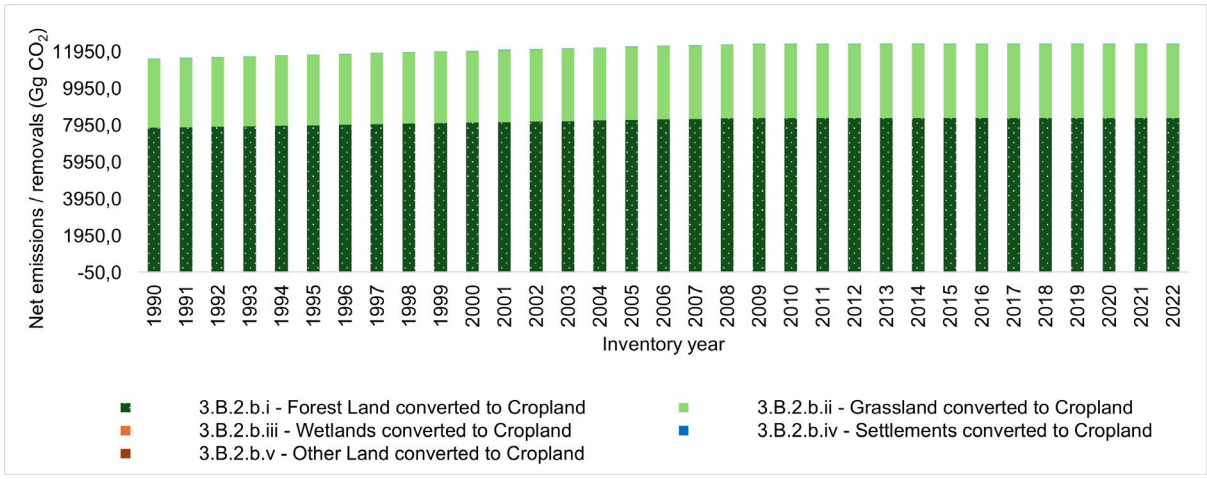
Figure 1.45: Net CO2 Emissions from Cropland from 1990 to 2022



Throughout the time series (1990 – 2022) emissions from cropland increased from 11, 564.6 Gg CO_2 in 1990 to 12, 357.2 Gg CO_2 in 2009 and remained constant until 2022 (Figure 1.54) of which 70% of the emissions are from forest land converted to cropland across time series (Figure 1-42). The drivers of the forest-cropland conversion are related to expansion of agricultural land following the Land Reform land reform program in the early 2000s.

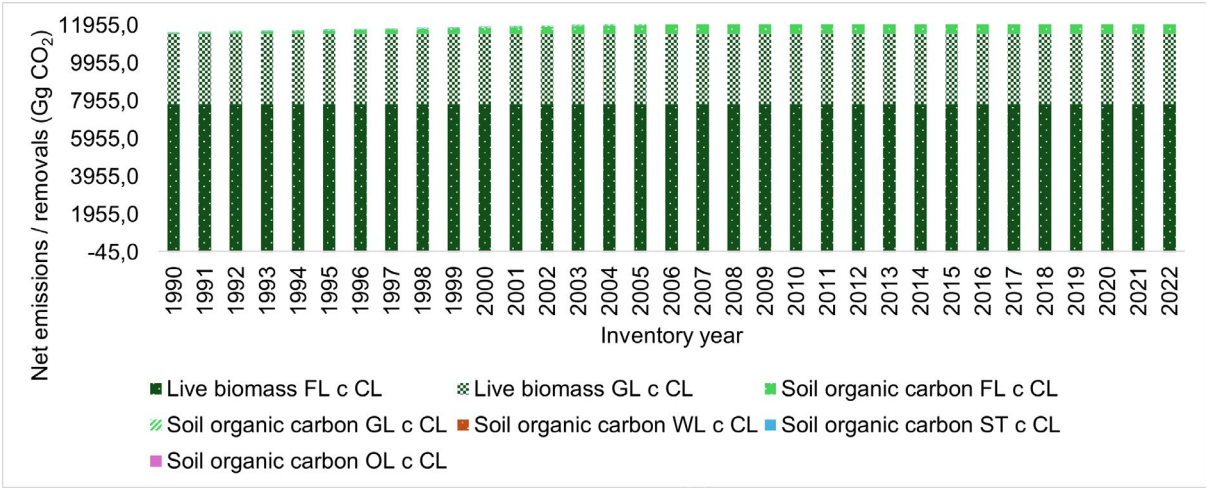
Figure 1.46: Net CO2 Emissions/Removals by Cropland Sub-Categories between 1990 and 2022





Most of the emissions in cropland were from live biomass losses due to conversion of forest land and grassland to grassland (*Figure 1.46*) while some removals from soil organic carbon were observed in wetlands and other land converted to cropland ().

Figure 1.47: Net CO2 Emissions/Removals in Cropland by Carbon Pool between 1990 and 2022



1.7.3.3 Grassland (CRT 3B3)

Grassland comprised emissions and removals from grassland remaining grassland, forestland converted to grassland, cropland converted to grassland, settlements converted to grassland, wetlands converted to grassland and other land converted to grassland. CO_2 emissions from wildfires in wooded grasslands are included in this category while non-CO_2 GHG emissions from burning on land are reported under Agriculture, 3C1. Emissions from grassland rose from 13,084.8 $GgCO_2$ in 1990 to 18, 966.8 $GgCO_2$ before falling to 9,591.0 $GgCO_2$ in 2020 and rising to 12,894.2 $GgCO_2$ in 2022 (). Forest land conversion to grassland represents the greatest proportion of these emissions at 8,291.7 $GgCO_2$ throughout the time series (Figure 1.48). Live biomass emissions in grasslands remaining grasslands, where based on abrupt biomass change because of conversions between wooded grassland and herbaceous grassland and wildfire disturbances in wooded grassland

Figure 1.48: Net CO2 Emissions from Grassland between 1990 and 2022

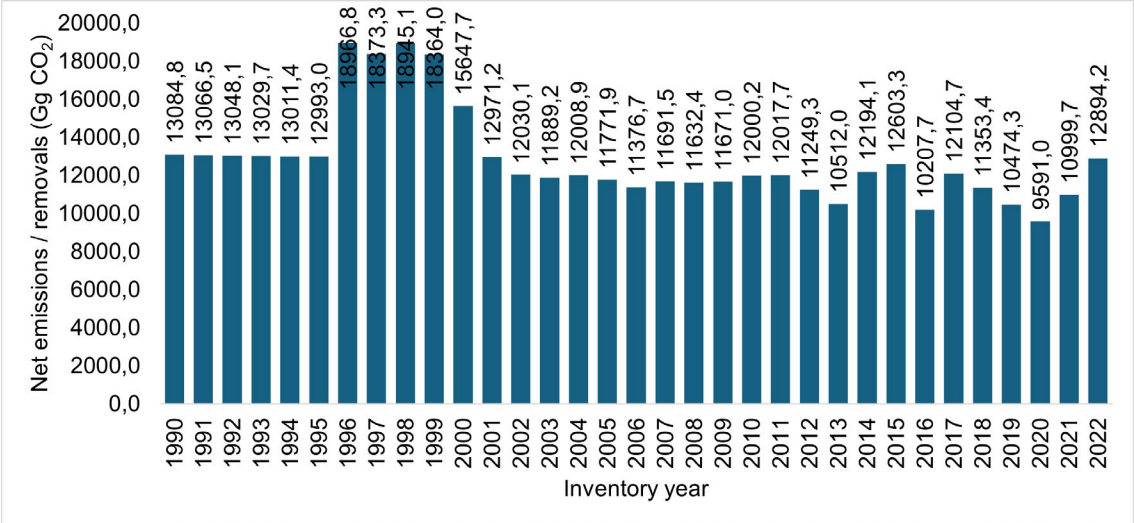


Figure 1.49: Net CO2 Emissions/Removals by Grassland Sub-Categories from 1990 to 2022

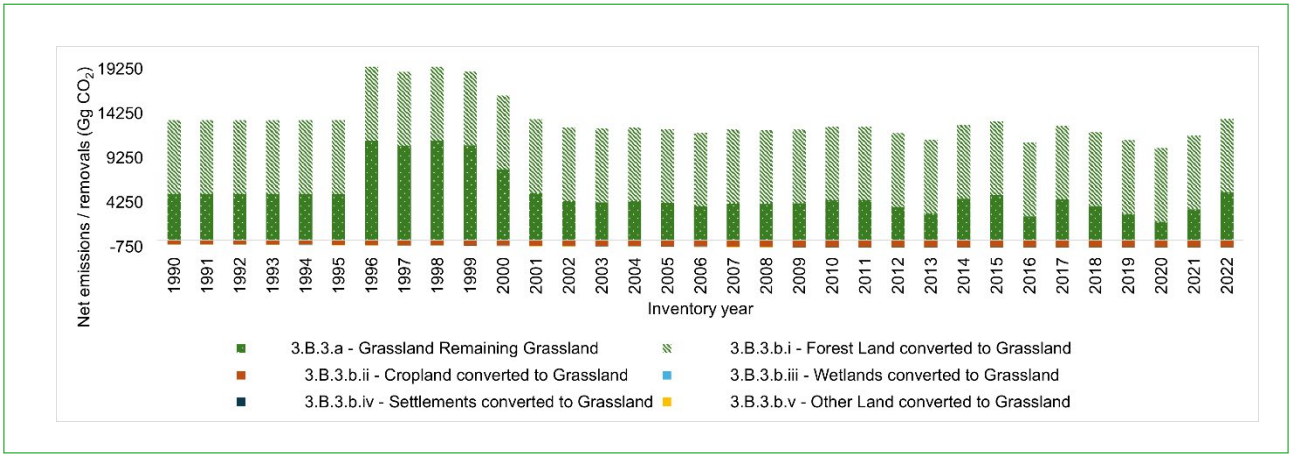
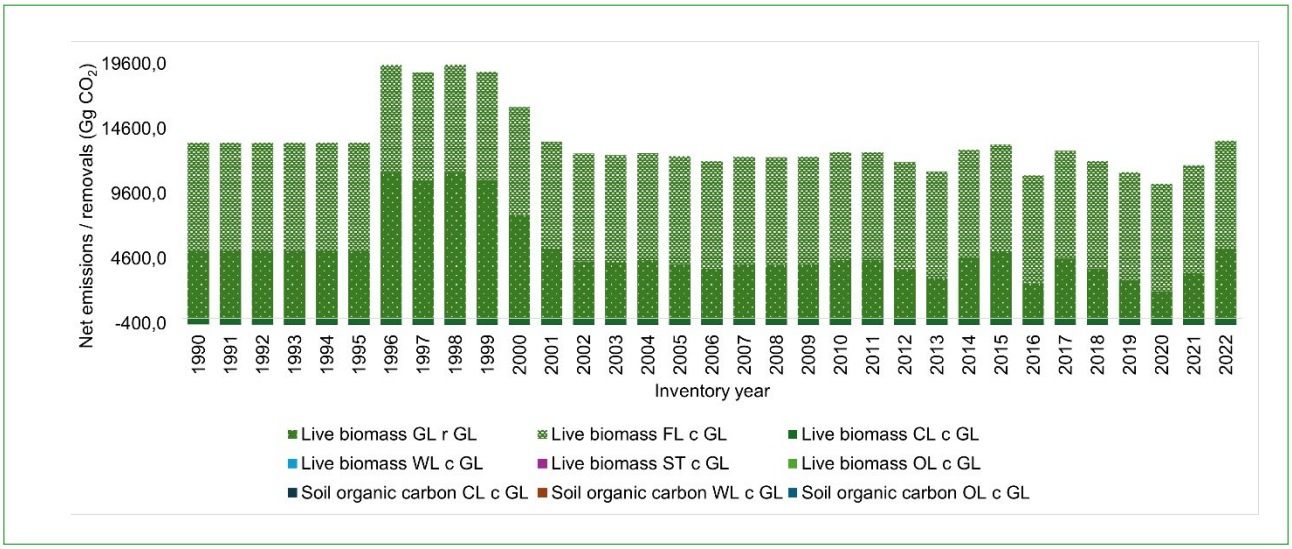


Figure 1.50: Net CO2 Emissions/Removals in Grassland by Carbon Pools between 1990 and 2022



1.7.3.4 Wetlands (CRT 4D)

Wetlands in this inventory are flooded lands including man-made lakes and dams predominantly used for irrigation, energy generation and recreation. Zimbabwe has no known peat lands; hence no associated emissions are reported. The conversion of indigenous forestland to flooded land through the construction of reservoirs is the biggest contributor in the wetlands emissions category. This is driven by the agricultural development drive in the country together with more erratic rainfall distribution in the past two decades which calls for water harvesting to ensure successful agricultural production. Emissions from wetlands were at 301.2 Gg CO_2 throughout the time series.

1.7.3.5 Settlements (CRT 4E)

Settlements comprises emissions and removals from land converted to settlements. Emissions from settlements were 301.6 Gg CO_2 in 1990 and declined to 288.8 Gg CO_2 in 2009 and remained constant until 2022 (Figure 1.51). The conversion of forestland to settlements and grassland to settlements were significant contributors to emissions in the settlement's category (Figure 1.52). This is driven by the expanding human population and urbanisation. Consequently, live woody biomass was lost in the process of conversion of forest land and grassland to settlements while some soil organic carbon where accumulated when cropland was converted to settlements (Figure 1.53).

Figure 1.51: Net CO2 Emissions from Settlements between 1990 to 2022

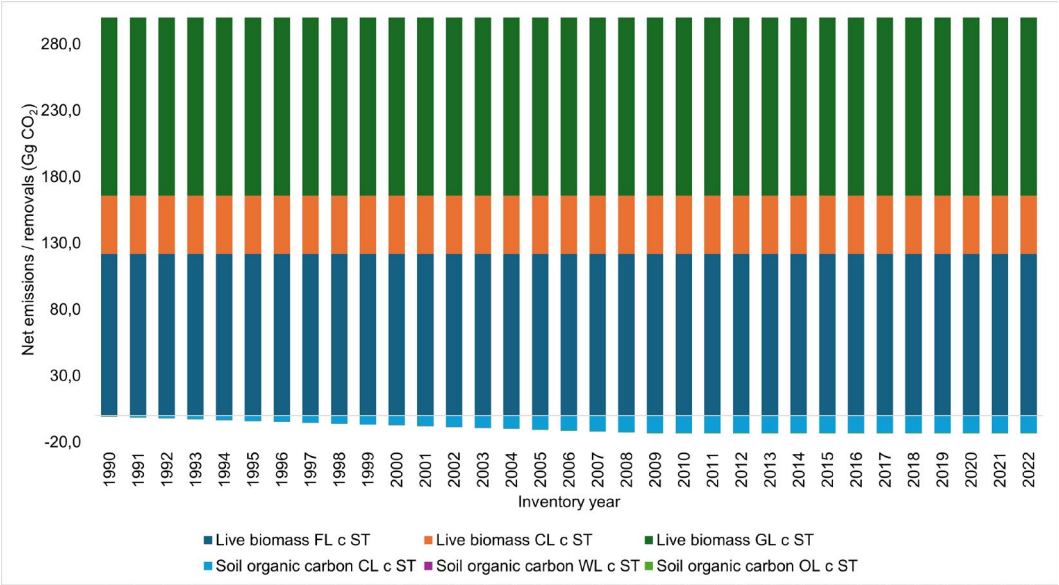


Figure 1.52: Net CO_2 Emissions/Removals by Settlement Sub-Categories from 1990 to 2022

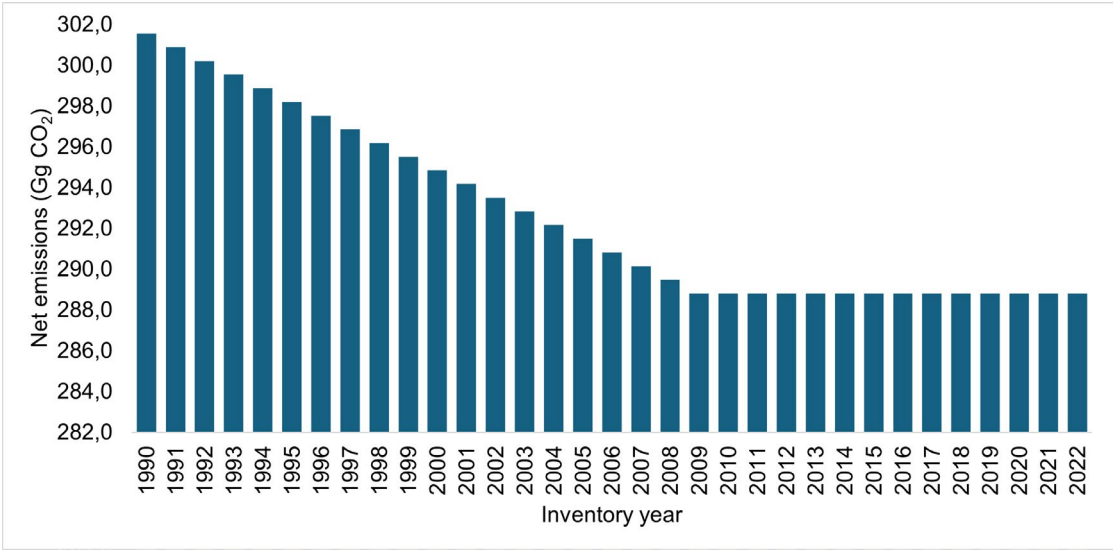
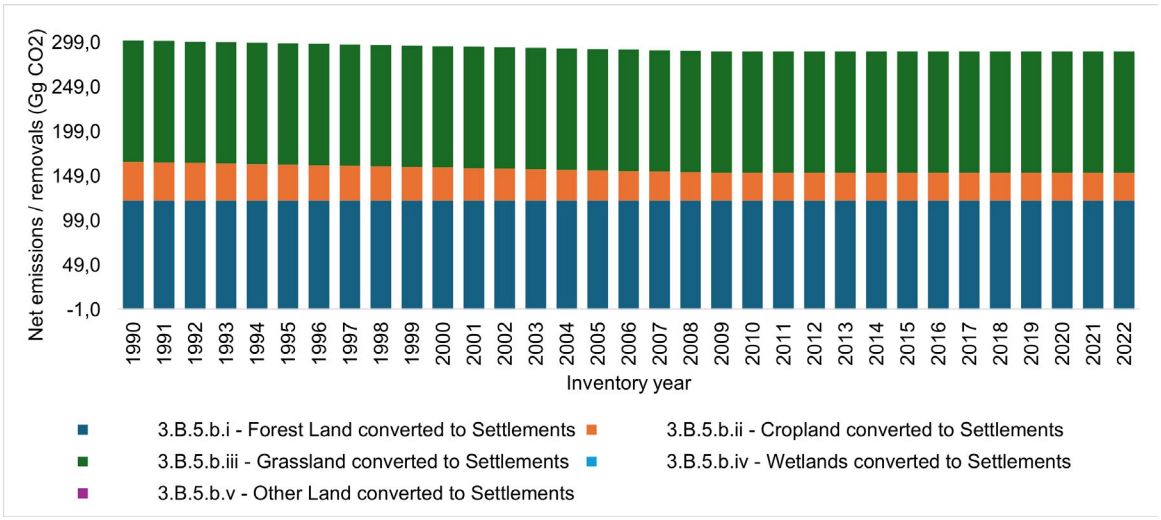


Figure 1.53: Net CO_2 Emissions/Removals by Settlement Sub-Categories by carbon pool from 1990 to 2022



1.7.3.6 Other land (CRT 4F)

Emissions from other land sub-category arise from forest land, cropland, grassland, settlements and wetlands converted to other land. Other land emissions rose from 219.5 Gg CO_2 in 1990, to 422.5 Gg CO_2 in 2022 (Figure 1.54). The conversion of forest land (especially indigenous forest) to other land and cropland to other land were significant contributors in this category, while most emissions were result of live biomass and soil organic carbon losses during conversion of forest land to other land (Figure 1.55).

Figure 1.54: Net CO_2 Emissions from other Land between 1990 and 2022

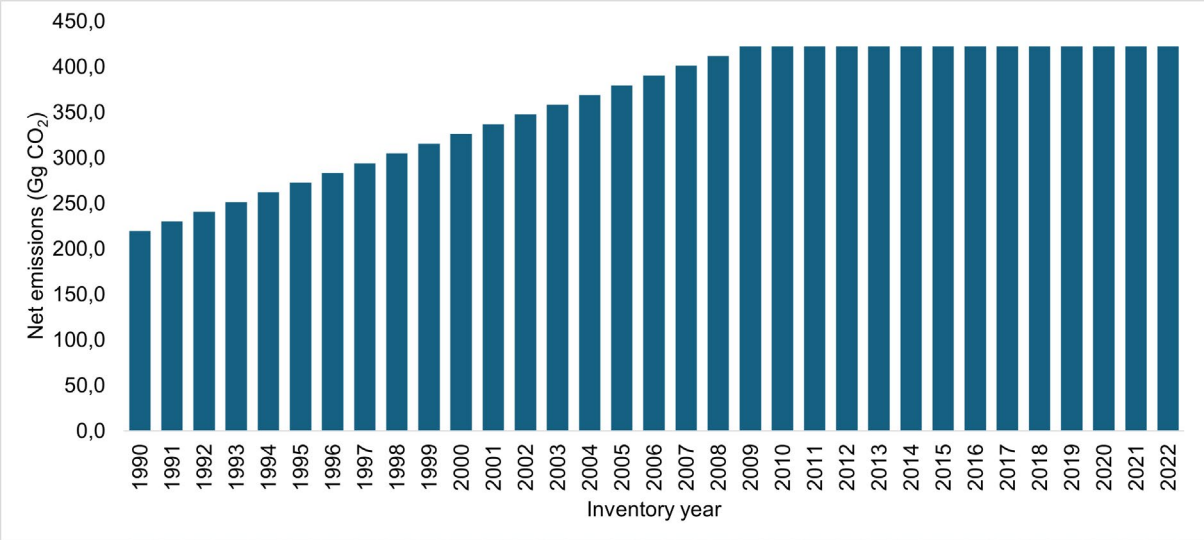
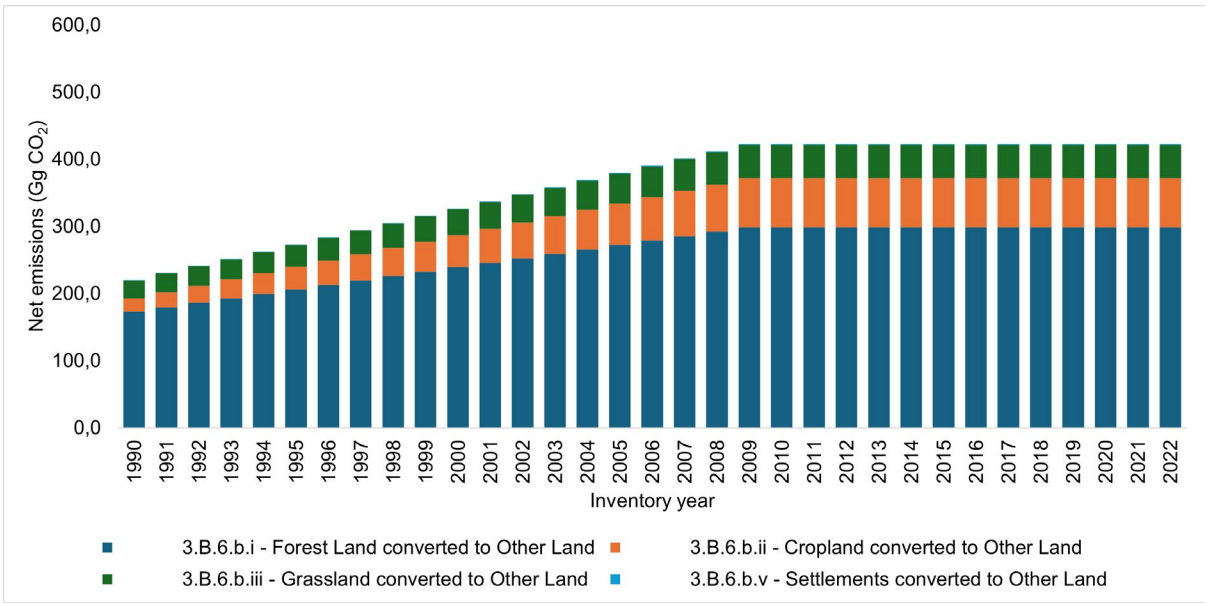


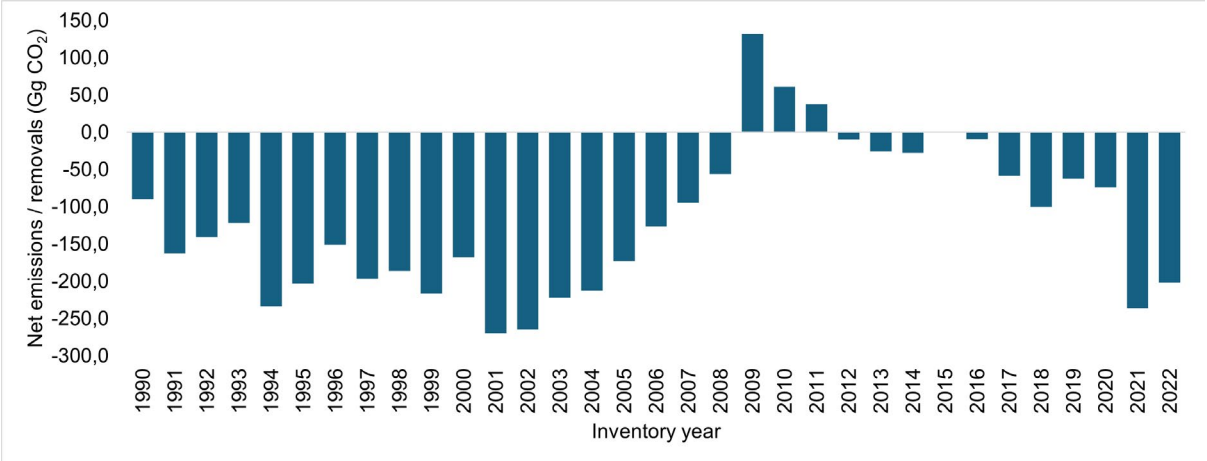
Figure 1.55: Net CO2 Emissions from other Land by Sub-Categories between 1990 And 2022



1.7.3.7 Harvested Wood Products (3.D.1)

HWP was a net sink for most of the years in the time series. The sink increased from –89.8 $GgCO_2$ in 1990 to –169.5 $GgCO_2$ before declining until the category became a net emitter at 131.7 $GgCO_2$ in 2009 which then decline and start regaining the net sink position up to –236.3 $GgCO_2$ in 2021 and –202.0 Gg CO_2 in 2022.

Figure 1.56: Net CO2 emissions/removals from HWP



1.8 WASTE

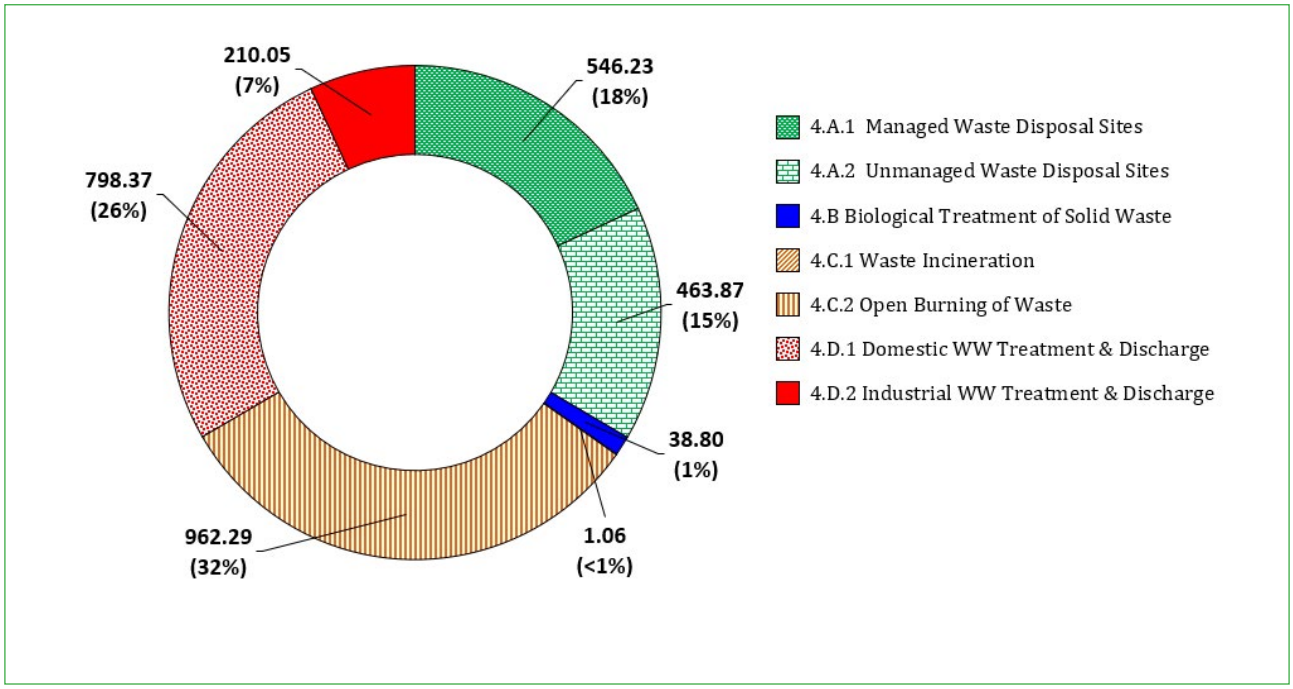
1.8.1 Overview of Sector

In the waste sector, greenhouse gas (GHG) emissions from treatment and disposal of waste are estimated for solid waste disposal (4.A.), biological treatment of solid waste (4.B.), incineration and open burning of waste (4.C.) and wastewater treatment and discharge (4.D.). In Zimbabwe waste management is largely linear with almost all waste that is collected being sent to SWDS. There were very few formal waste segregation and recycling programs for the generality of the population between 1990 and 2022. Waste recycling was limited to activities by waste pickers who coincidentally were deemed illegal in most jurisdictions. Waste recycling rates were 0.2% in rural areas and 0.1% in urban areas in 2022. Similarly, the composting rates were generally low. In 2022, nationally, only 9.3% of the households participated in composting activities. This meant that the bulk of the degradable waste went to the SWDS. With little pressure being exerted on organic waste sent to SWDS, emissions from solid waste disposal on land will likely keep on increasing in tandem with population increase. The methane that was generated at all the SWDS in Zimbabwe was neither measured nor collected for flaring or use as an energy source.

1.8.2 Overview of Greenhouse Gas Emissions in Waste Sector

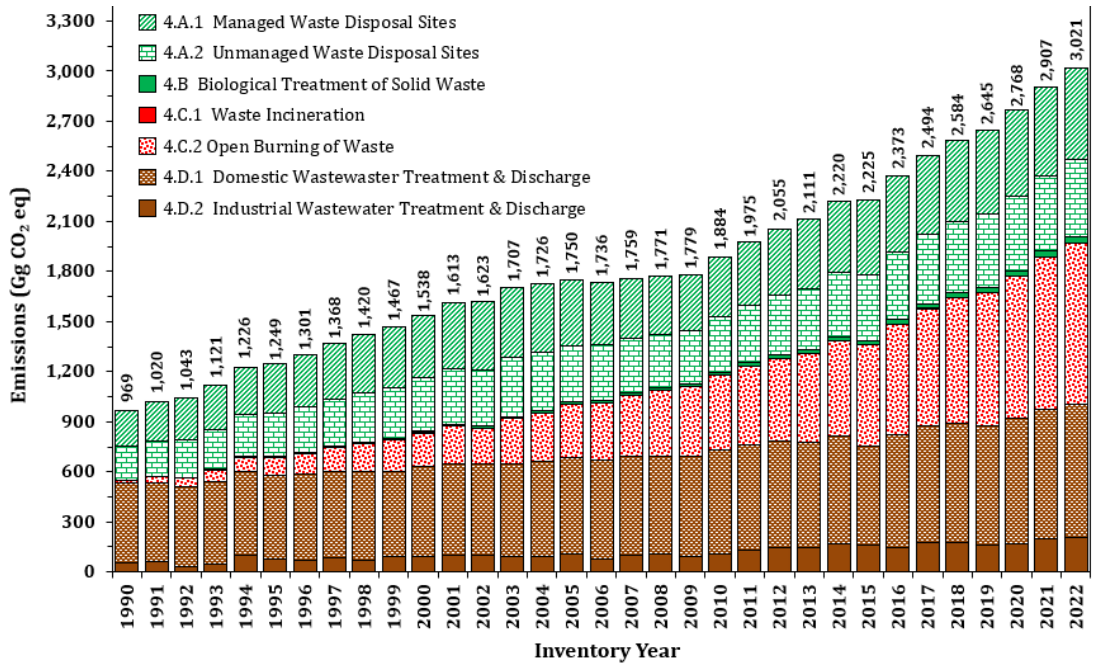
In 2022, emissions from the waste sector amounted to 3,021 Gg CO_2eq. Solid waste disposal sites (4A) and wastewater treatment and disposal (4D) were the major source categories in 2022. Emissions from Solid waste on disposal (4.A) amounted to 1,010.1 Gg CO_2eq in 2022 as indicated in Figure 1.57 below. Managed waste disposal sites contributed 546.23 Gg CO_2eq and unmanaged waste disposal sites contributed 463.83 Gg CO_2eq Biological treatment of waste (4.B) contributed 38.8Gg CO_2eq emissions accounting for 1.4% which were the least emissions in the waste sector. Open burning of waste (4.C) contributed 962.3 Gg CO_2eq emissions whilst wastewater treatment and discharge (4.D) emissions amounted to 1,008.42 Gg CO_2eq which is a contribution of 33% to the sector emissions.

Figure 1.57: Waste Sector Emissions



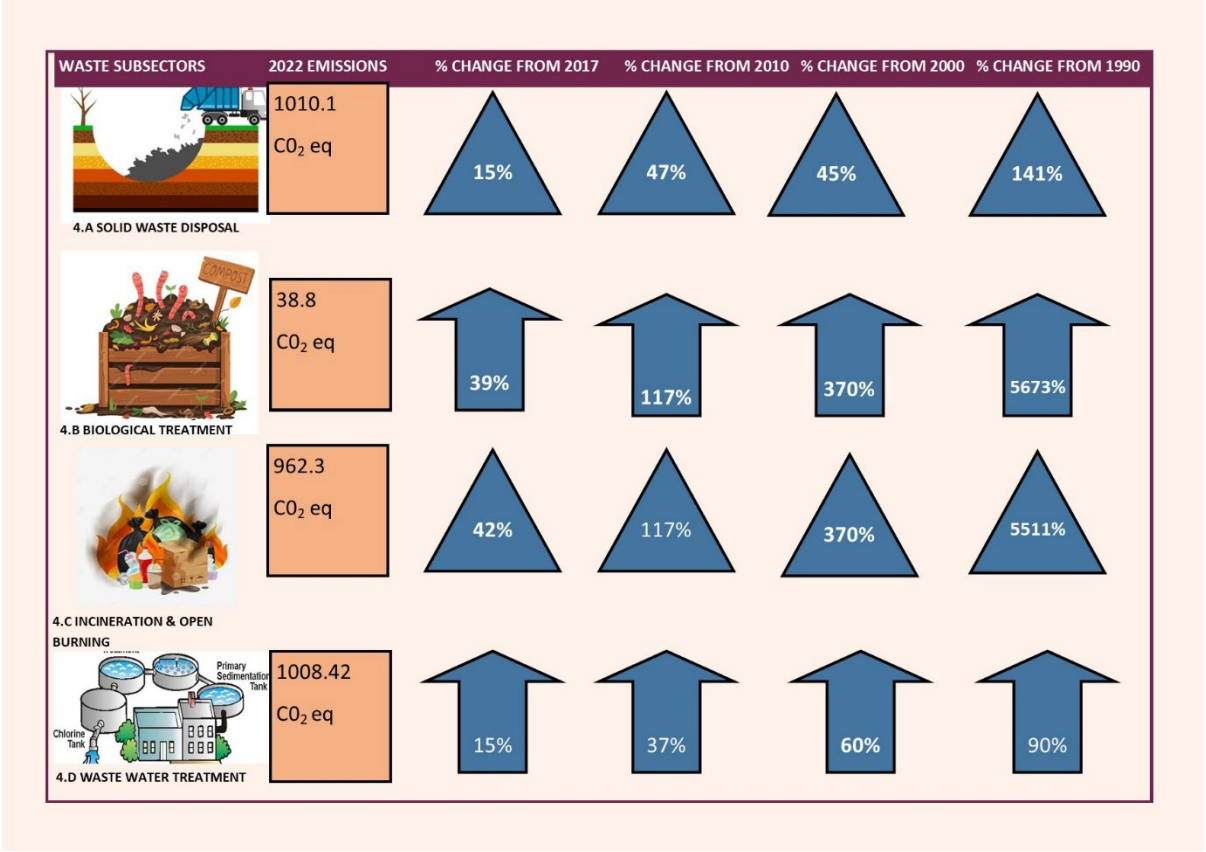
The GHG emissions from the waste sector were generally on an upward trend from 1990 to 2022 as shown in Figure 1.58. Solid waste disposal (4.A) emissions were a major source of emissions whilst those from biological treatment of waste (4.B) remained generally low throughout the time series. Emissions from Incineration and open burning (4.C) rose significantly during the same period. Wastewater emissions (4.D) showed a steady increase between 1990 and 2022. The emissions from the waste sector in Zimbabwe generally follow the population and economic performance trends in the country.

Figure 1.58: Waste sector emissions 1990 to 2022



In terms of changes, emissions from solid waste disposal on land (4.A) increased by 15% in 2022 from the emissions reported in 2017 and by 141% from those reported for 1990 as indicated in *Figure 1.59*. Emissions from Biological Treatment of waste (4.B) in 2022 increased by 39% from the 2017 estimations while Incineration and Open Burning (4.C) category registered an increase of 42% from the 2017 emissions. Wastewater category emissions increased by 15% and 23% from the 2017 and 2010 emissions, respectively.

Figure 1.59: Percentage Change in Emissions



1.8.3 Solid Waste Disposal Solid Waste Management (4.A)

1.8.3.1 Category Description

In 2022, this sector contributed 36.76Gg of methane emissions, with managed waste disposal sites contributing 19.958Ggand 16.801Gg methane emissions coming from unmanaged deep waste disposal sites. During the period 1990 and 2022, emissions from this category expressed in CO_2 eq in Figure 1.60 below, were generally on an upward trend as shown. There was a steady increase in emissions between 1990 and 2003 because of the population increase. During 2003 and 2008, the country experienced a marked economic decline that affected refuse collection hence emissions during this period were on a decline. In 2009, the improvement in the performance of the economy and the emissions from this category increased .

Figure 1.60: Waste Disposal Emissions 1990 -2022

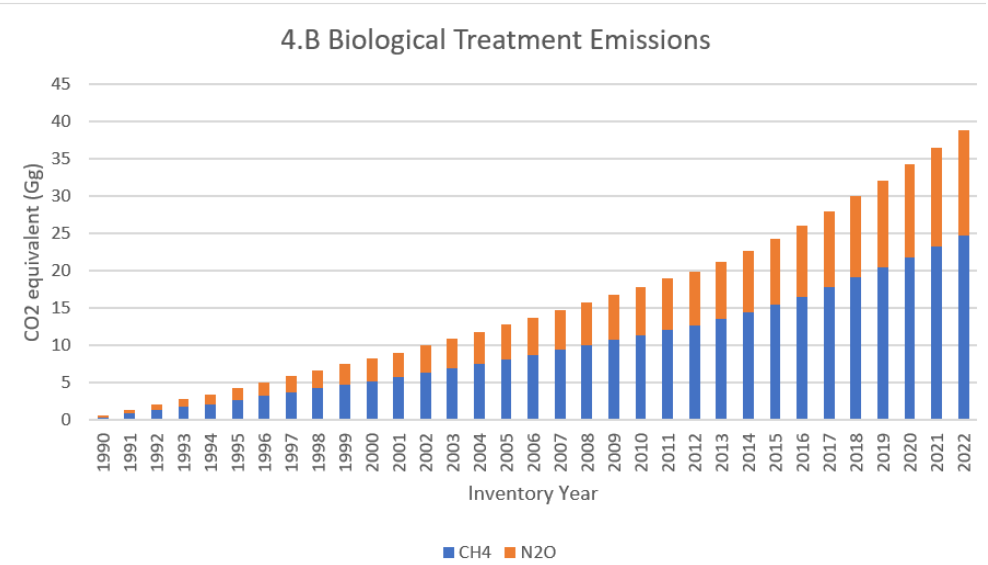
1.8.3.2 Methodological Issues

Estimation of CH_4 emissions from SWDS was performed using the First Order Decay (FOD) model. Emissions were estimated using tier 1 from the 2006 IPCC Guidelines and the 2019 IPCC Refinements to the 2006 IPCC Guidelines. The IPCC Software version 2.93 Was used to compute the emissions. The inventory covered emissions from MSW under the category, Solid Waste Disposal (4.A). Emissions from ISW were not estimated was due to unavailability of activity data and alternative methods to make sound estimations.

1.8.4 Biological Treatment of Solid waste (4.B)

Biological treatment of solid waste has two main types of sources of emissions, that is, (i) composting and (ii) anaerobic digestion. In Zimbabwe, emissions were estimated for composting only and in 2022 0.884 Gg and 0.53 Gg methane and nitrous oxide were emitted, respectively giving a total of 38.12Gg CO_2eq. The emissions have generally been increasing since 1990 as indicated in Figure 1.61

Figure 1.61: Biological Treatment of Waste Emission



Anaerobic digestion was not estimated as there were no available activity data.

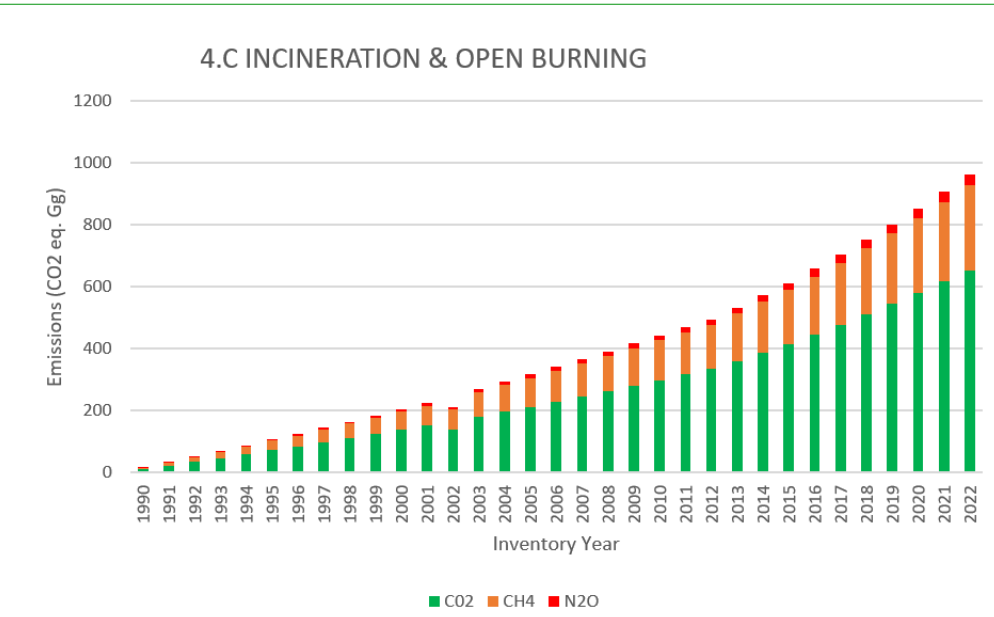
Methodological issues

Emissions were estimated using Tier 1 methodology for Biological Treatment of Solid Waste from the 2006 IPCC Guidelines and applying the surrogate data (population) to estimate the proportion of municipal solid waste treated by composting.

1.8.5 Incineration and Open Burning of Waste Municipal Solid Waste (4.C)

In this category, CO_2, CH_4, and NO_2 were estimated from open burning and incineration of waste. It was estimated that in 2022, CO_2 emissions accounted for 654.37 Gg non biogenic carbon dioxide emissions, 9.78 Gg methane emission and 0.128 Gg nitrous oxide emissions.

Figure 1.62: Incineration and Open Burning



Incineration of health care waste (HCW) is a common practise. Open burning is prohibited by law in Zimbabwe yet emissions from open burning have been increasing since 1990. This is due to poor waste management practices and reduced capacity for waste collection by local authorities.

1.8.5.1 Methodological issues

Emissions were estimated using Tier 1 methodology for Waste Incineration and open burning using the 2019 Refinements of the 2006 IPCC Guidelines (Chapter 5 Volume 5).

1.8.6 4D - Wastewater Treatment and Discharge

In this category, CH_4 and N_2O emissions from wastewater treatment and discharge were accounted for. In 2022, 29.81 Gg of methane and 0.066 Gg nitrous oxide were emitted. These estimations are both combined sewers in urban areas and for latrines that are used in the rural areas. Previously, estimations were not done for wastewater treatment in the rural areas.

1.8.6.1 Methodological issues

The calculation of methane emissions and nitrous oxide emissions was based on the 2006 IPCC guidelines using Tier 1 methodology and default emission factors.

INFORMATION NECESSARY TO TRACK PROGRESS MADE IN IMPLEMENTING AND ACHIEVING NATIONALLY DETERMINED CONTRIBUTIONS UNDER ARTICLE 4 OF THE PARIS AGREEMENT

2.1 OVERVIEW

2.1.1 National Circumstances and Institutional Arrangements

Zimbabwe's vision towards a knowledge driven and industrialised upper-middle income economy by 2030 acknowledges climate change, not only as a real phenomenon, but also a business case. The l climate change risks and impacts in the country have stimulated the necessity for adaptation and resilience building in all sectors of the economy. **Section 2.1** describes the National Circumstances and Institutional Arrangements relate to Zimbabwe's climate actions including the arrangements in place to implement the revised NDC.

2.1.2 Description of Zimbabwe's NDC Under Article 4 of the Paris Agreement

Zimbabwe's projected net GHG emissions were estimated in the margin of 75,000 Gg CO_2eq. in 2030 under the Business-as-Usual (BAU) Scenario. However, the country made commitments to reduce the projected emissions to about 45,000 Gg CO_2eq in 2030 through 17 mitigation actions (described later in Section 2.2). The GHG emissions reduction target under the Paris Agreement is a 40% reduction in economy-wide GHG emissions per capita compared to BAU by 2030, all conditional on international support. In the mitigation scenario, economy-wide emissions per capita are projected to be 2.3 tCO_2eq in 2030. The emissions baseline and mitigation measures cover the following IPCC sectors: Energy, Industrial Processes and Product Use (IPPU), Agriculture, Land Use, Land Use Change and Forestry (LULUCF) and Waste.

2.1.3 Information Necessary to Track Progress

A combination of GHG and non-GHG indicators were used in tracking progress towards the implementation of Zimbabwe's NDC for the year 2022. The total national GHG emissions in 2022 were estimated at 83,118.72Gg CO_2eq, while removals were estimated at 201.97 Gg CO_2eq, giving a net emission position of 82,916.75 Gg CO_2eq. Detailed analysis of the GHG and non-GHG indicators and other information necessary to track progress are given in Section 2.1.

Table 2.1: Progress towards NDC Implementation - GHG Indicators

NO.	MITIGATION MEASURE	GHG REDUCTIONS VS 2030 BASELINE (%)	ESTIMATED GHG EMISSIONS IN 2022 (GG CO2EQ)		GHG REDUCTION VS 2022 BAU (%)
			WITHOUT MEASURE IN 2022 (BAU)	WITH MEASURE IN 2022	
	Transmission and Distribution losses reduced from 18% in 2020 to 11% in 2025	1.01	6543.98 from Electricity generation (1.A.1.a.i)	5671.98 from Electricity generation (1.A.1.a.i)	13.31
	Expansion of Solar: 300 MW in 2025	0.61			
	Expansion of microgrids: Additional of 2.098 MW of capacity added through microgrids by 2028	0.004		No grid-tied solar plants yet	N/A
	4.1 MW biogas capacity added in 2024	0.01		No measure yet	N/A
	Energy Efficiency Improvements: Agriculture: 12% savings (2030 compared to baseline scenario) Commercial: 16% savings Domestic: 22.08% savings Manufacturing: 18.63% savings Mining: 8% savings	2.72	4,092.79 from MIC (1.A.2) and Other Sectors (1.A.4)	No measure yet	N/A
	2% biodiesel in fuel by 2030	0.25	1,105.42 from Road Transport (1.A.3.b)	No measure yet	N/A
	Fuel economy policy: Fuel efficiency improvement 2025-2030: Motorcycles: 2.2% per year, Light Duty Vehicles (LDVs): 2.9%/year Buses: 2.6%/year, Heavy Duty Vehicles (HDVs): 2.5%/year	0.73		No measure yet	N/A
	Public transport (modal shift). 5% shift from private car to public transport in 2030	0.23		No measure yet	N/A
	Increased clinker substitution with fly ash (up to 16% by 2030, 20% by 2050).	0.04	424.79 from Cement production (2.A.1)	363.11 from Cement production (2.A.1)	14.52%
	Increased clinker substitution with BFS (up to 16% by 2030, 20% by 2050).	0.04			
	Decomposition of N2O emissions through use of a secondary catalyst. Selective De-N2O catalyst results in abatement of approximately 75% of all N2O emissions produced during nitric acid production. Implementation by 2023	0.11	32.97 from Nitric acid production (2.B.2)	No N2O decomposition yet	N/A

NO.	MITIGATION MEASURE	GHG REDUCTIONS VS 2030 BASELINE (%)	ESTIMATED GHG EMISSIONS IN 2022 (GG CO2EQ)		GHG REDUCTION VS 2022 BAU (%)
			WITHOUT MEASURE IN 2022 (BAU)	WITH MEASURE IN 2022	
	HFC Phasedown schedule Kigali Amendment (Freeze 2024, 2029, 10% reduction)	0.44	3168.44 from Refrigeration and Air Conditioning (2.F.1)	3081.62 from Refrigeration and Air Conditioning (2.F.1)	-2.74%
	Increase area of forest land from 9.9 million hectares to 10.4 million hectares by 2025: Add 100,000 hectares of natural forest land per year between 2021 and 2025	12.73	Not assessed	xxx	N/A
	Increase area of forest plantation from 68848 hectares to 118848 hectares by 2025: Add 10,000 hectares of plantation forest land per year between 2021 and 2025	1.33	Not assessed	44,194.17 from Land (3.B)	N/A
	Reduce area burned by 500,000 hectares between 2020 and 2025	27.75	7869.49 from Burning (3.C.1)	No measure yet	N/A
	Waste to Energy: It was assumed that 42% of the methane generated would be collected and used for energy production through waste to energy projects in Harare, Bulawayo, Mutare and Gweru	1.26	1,010.19 from Solid waste disposal (4.A)	No measure yet	N/A
	20% of organic matter composted in the long term	0.45		1,010.10 from Solid waste disposal (4.A)	-0.009%

2.1.4 Mitigation Policies and Measures, Actions and Plans

2.1.4.2 Energy Sector

The measures in the energy sector are equally divided between complementing non-renewable energy sources with green energy sources (E2, E3, E4 and E6) and efficiency improvement-related innovations (E1, E5, E7 and E8) (Section 2.1.3). Measure E1 is supported by the National Development Strategy (NDS1), while measures E2, E3, E4, E5 and E6 are backed by the ZESA System Development Plan of 2017, Renewable Energy Policy and the Renewable Energy Fund. The Low Emissions Development Strategy (LEDS) 2020-50 supports measures E6, E7 and E8. Detailed analysis of mitigation polies and measures and plan in the Energy sector are given in **Section 2.5**.

2.1.4.2 IPPU Sector

For the IPPU sectors measures are targeted towards the production of cement (I1 and I2) and nitric acid (I3), as well as use of product uses as substitutes for ozone depleting substances (I4) (Section 2.1.3). Measure I4 is supported by the HFC Phasedown Schedule under the Kigali Amendment to the Montreal Protocol. The LEDS 2020-50 supports measures I1 to I3. Detailed analysis of mitigation polies and measures and plan in the IPPU sector are given in **Section 2.5**.

2.1.4.3 Agriculture Sector

Under the agricultural sector reducing biomass burning on cropland is the only measure collectively included with measures to reduce burning in forest land and grasslands (A3; Section 2.1.3). The measure is supported by NDS1 and the LEDS.

2.1.4.4 Forestry Sector

The government put significant value to forests as essential components of the economy, directly supporting livelihoods and biodiversity conservation. Zimbabwe's forests face pressures from agricultural expansion, settlement expansion, veld fires and other factors. In tobacco-growing regions, substantial deforestation occurs due to tobacco curing processes. Consequently, the government has developed a tobacco wood energy programme that promotes the growing of fast-growing trees as a source of firewood. Numerous initiatives are being implemented at the sub-national level, including Global Environmental Facility funded projects that support the rehabilitation of degraded forests. The Government of Zimbabwe has identified REDD+ as a critical mechanism for fostering atmospheric carbon sequestration and providing alternative livelihoods to communities heavily dependent on forests. In 2013, Zimbabwe submitted a country-level REDD+ country needs assessment (CNA) report to the UN-REDD programme as part of the preparation for REDD+ and the associated Monitoring, Reporting, and Verification (MRV). The CNA focused on the identification of national and sub-national stakeholders and their various roles in REDD+ issues, as well as gaps and capacity development needs in institutional roles and mandates regarding REDD+. The CNA noted two critical impediments to the development of REDD+ in Zimbabwe: (1) lack of finance and (2) lack of technical capacity.

2.1.4.5 Waste Sector

With solid waste disposal being the key category in the waste sector, the composting and waste to energy projects aim to reduce the amount of waste disposed at solid waste disposal sites and by extension emissions. The implementation of these actions is supported by a number of national policies and plans such as the Zimbabwe Integrated Solid Waste Management Plan and the LEDS as well as Local Authority by-laws.

2.1.5 Summary of Greenhouse Gas Emissions and Removals

Refer to Chapter 1

2.2 NATIONAL CIRCUMSTANCES AND INSTITUTIONAL ARRANGEMENTS FOR NDC TRACKING

2.2.1 National Circumstances

Zimbabwe implements its climate action cognizant of its national circumstances. The country is a developing nation situated in Southern Africa, pursuing a vision to becoming an upper middle-income economy by 2030. Zimbabwe's economy is anchored on natural resources, with agriculture and extractive industries contributing significantly to the country's gross domestic product (GDP). The country's Constitution (2013) gives

every person environmental rights. It further stipulates that the State must take reasonable legislative and other measures, within the limits of the resources available to it, to achieve the progressive realisation of the rights set out in that section. The national greenhouse gas (GHG) profile and related climate change mitigation efforts are reflective of the country's profile and its development trajectory. The country's risks and vulnerabilities to climate change are largely factors of its physical and socio-economic status. Zimbabwe collaborates with the global community in its efforts in climate action. Climate action is also mainstreamed in the country's development plans and programmes.

2.2.1.1 Government Structure

The governance systems are highlighted in the preamble.

2.2.1.2 Population Profile

The population profile is highlighted in the preamble.

2.2.1.3 Geographical Profile

The geographic characteristics are highlighted in the preamble.

2.2.1.4 Economic Profile

The socioeconomic standing is highlighted in the preamble.

2.2.1.5 Climate Profile

The climate profile is covered in the Vulnerability and Adaptation chapter (Chapter 3).

2.2.1.6 Sector Details

Energy Sector

The energy consumption by different sectors in Zimbabwe in 2022 amounted to 396 698 093 GJ with 16.04%, 51.30%, 7.40%, 25.22% and 0.04% having been used in the industrial sector including non-energy use, residential and households, commercial and public services, aagriculture, forestry and fishing, and other unspecified sectors respectively as shown in Table Table 2.2 and Figure 2.1

Table 2.2: Energy Consumption by Different Sectors in 2022

Sector /Use	Energy used (GJ)	% Mix
Industry	63,625,520	16.04%
Household	203,494,347	51.30%
Commercial and public services	29,355,930	7.40%
Agriculture, forestry and fishing	100,065,696	25.22%
Other not specified	156,600	0.04%
Total energy use	396,698,093	100%

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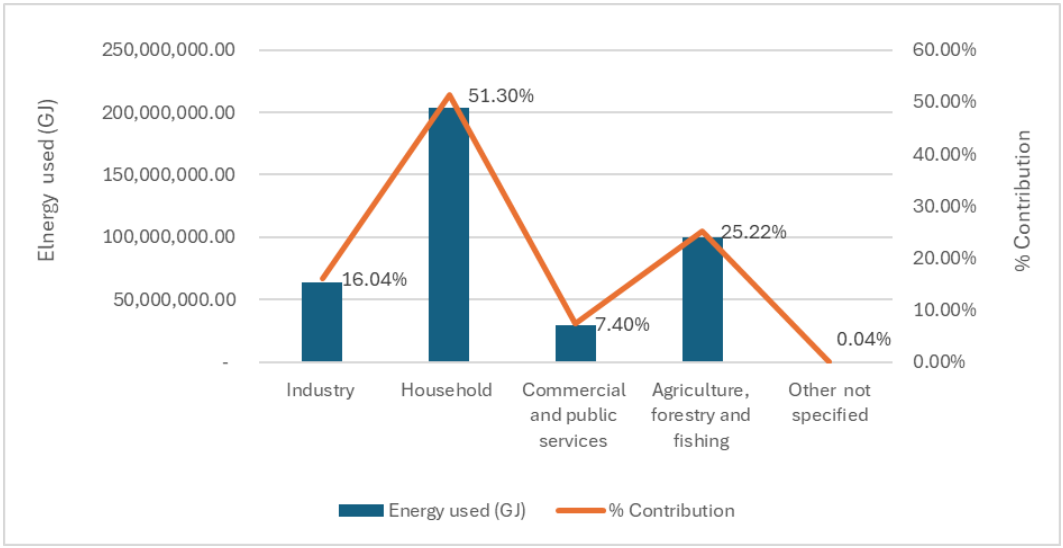
Figure 2.1: Energy Consumption by Different Sectors in 2022



Hard Coal

Total hard coal production in 2022 stood at 3 941.00 kt composed of 591.10 kt of coking coal and 3 349.90 of other bituminous coals. Total hard coal imports of 0.12 kt of anthracite was realised. About 549.34 kt of the other bituminous coals were exported resulting in 3384.78 kt being used in primary energy supply. The 591.10 kt coking coal was used as transformation inputs in coking ovens whereas 1629.20 kt of other bituminous coals were used as transformation inputs for electricity generation or production resulting in 2220.30 kt of the hard coals produced being used as transformation inputs. Total hard coal consumption stood at 1 096.32 kt with 1 014.02, 13.30, 16.70, 6.40 and 45.90 kt having been consumed in industry, transport (rail), households, commercial and public services, and agriculture, forestry and fishing stood respectively. The unaccounted-for coal was 68.16 kt. The coal production and associated energy consumption are provided in Table 2.3 and Table 2.4 respectively with Figure 2.2 showing the percentage contribution of the different uses or sectors to the overall coal derived energy

Table 2.3: Coal Production, Imports and Exports, Transformation and Consumption Figures for 2022

ITEM	TOTAL HARD COAL (KT)	ANTHRACITE (KT)	COKING COAL (KT)	OTHER BITUMINOUS COAL (KT)
Production, imports and exports	3 941.12	0.12	591.10	3 899.24
Production	3 941.00		591.10	3 349.90
Imports	0.12	0.12	-	-
Exports	-	-	-	549.34
Transformation	2 220.30	-	591.10	1 629.20
Electricity generation	1 629.20			1 629.20
Coke production -coke ovens	591.10		591.10	
Consumption	1 096.32	0.12	-	1 096.20
Industry	1 014.02	0.12	-	1 013.90
Iron and steel	2.80	-	-	2.80
Chemical (including petrochemical)	5.00	-	-	5.00
Non-metallic minerals	250.00	-	-	250.00
Transport equipment	2.80	-	-	2.80
Machinery	5.30	-	-	5.30
Mining and quarrying	5.70	-	-	5.70
Food, beverages and tobacco	540.10	-	-	540.10
Paper, pulp and printing	54.20	-	-	54.20
Wood and wood products	88.60	-	-	88.60
Textiles and leather	7.80	-	-	7.80
Not elsewhere specified (Industry)	51.72	0.12	-	51.60
Transport	13.30	-	-	13.30
Rail	13.30	-	-	13.30
Household	16.70	-	-	16.70
Commercial and public services	6.40	-	-	6.40
Agriculture, forestry and fishing	45.90	-	-	45.90

Table 2.4: Coal Derived Energy Consumed during 2022

ITEM	TOTAL HARD COAL (GJ)	ANTHRACITE (GJ)	COKING COAL (GJ)	OTHER BITUMINOUS COAL (GJ)
Transformation	58 702 380.00	-	16 669 020.00	42 033 360.00
Electricity generation	42 033 360.00		-	42 033 360.00
Coke production - coke ovens	16 669 020.00		16 669 020.00	-
Consumption	28 285 164.00	3 204.00	-	28 281 960.00
Industry	26 161 824.00	3 204.00	-	26 158 620.00
Iron and steel	72 240.00	-	-	72 240.00
Chemical (including petrochemical)	129 000.00	-	-	129 000.00
Non-metallic minerals	6 450 000.00	-	-	6 450 000.00
Transport equipment	72 240.00	-	-	72 240.00
Machinery	136 740.00	-	-	136 740.00
Mining and quarrying	147 060.00	-	-	147 060.00
Food, beverages and tobacco	13 934 580.00	-	-	13 934 580.00
Paper, pulp and printing	1 398 360.00	-	-	1 398 360.00
Wood and wood products	2 285 880.00	-	-	2 285 880.00
Textiles and leather	201 240.00	-	-	201 240.00
Not elsewhere specified (Industry)	1 334 484.00	3 204.00	-	1 331 280.00
Transport	343 140.00	-	-	343 140.00
Rail	343 140.00	-	-	343 140.00
Household	430 860.00	-	-	430 860.00
Commercial and public services	165 120.00	-	-	165 120.00
Agriculture, forestry and fishing	1 184 220.00	-	-	1 184 220.00

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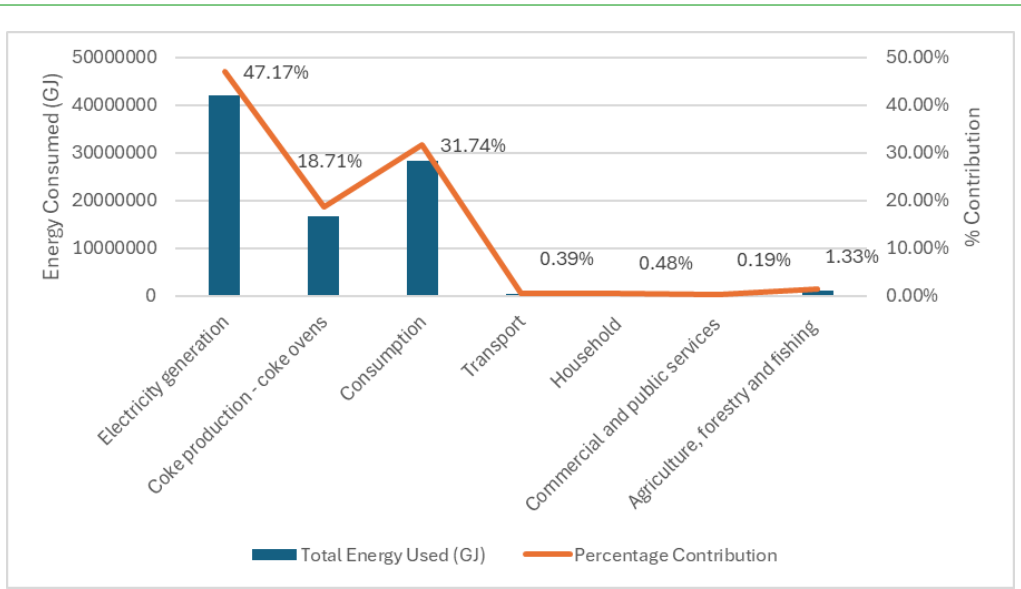
Figure 2.2: Sectoral Coal Derived Energy Consumption during 2022



Oil Products

Total primary energy supply from oil products for 2022 stood at 1547.90 kt comprised of 90.20 kt of liquefied petroleum gases (LPG), 480.40 kt of gasoline, 7.80 kt of Jet Kerosene, 1.30 kt of other Kerosene (e.g. lighting), 933.50 kt of diesel oil shown in Table 3. In addition, 0.10 kt of fuel oil, 27.1 kt of lubricants, 4.50 kt of bitumen, 1.60 kt of Paraffin waxes and 1.40 kt of other non-specified oil products were consumed in 2022. The amount of the major oil products (LPG, gasoline, jet kerosene and diesel) consumed during 2022 are provided in *Table* 2.5. The total sectorial energy consumption is provided in *Table* 2.6 and Figure 2.3

Table 2.5: Oil Products Consumed during the Financial Year 2022

OIL PRODUCT	LIQUEFIED PETROLEUM GASES LPG (KT)	GASOLINE INC. BLENDED BIOFUELS (KT)	JET KEROSENE INC. BLENDED BIOFUELS (KT)	GAS/DIESEL OIL INC. BLENDED BIOFUELS (KT)
Industry	20.10	92.94	-	275.61
Transport	-	326.39	6.40	389.25
Household	60.30	-	-	-
Commercial and public services	9.60	51.08	-	211.04
Agriculture, forestry and fishing	-	9.00	-	53.24
Total consumption (kt)	90.00	479.41	6.40	929.14

Table 2.6: Oil Products Derived Energy Used for the Different Sectors during 2022

OIL PRODUCTS ENERGY USE	TOTAL ENERGY USED (GJ)	PERCENTAGE CONTRIBUTION
Industry	16,919,202.00	25.74%
Transport	31,479,067.00	47.89%
Household	2,852,190.00	4.34%
Commercial and public services	11,791,644.00	17.94%
Agriculture, forestry and fishing	2,687,887.10	4.09%

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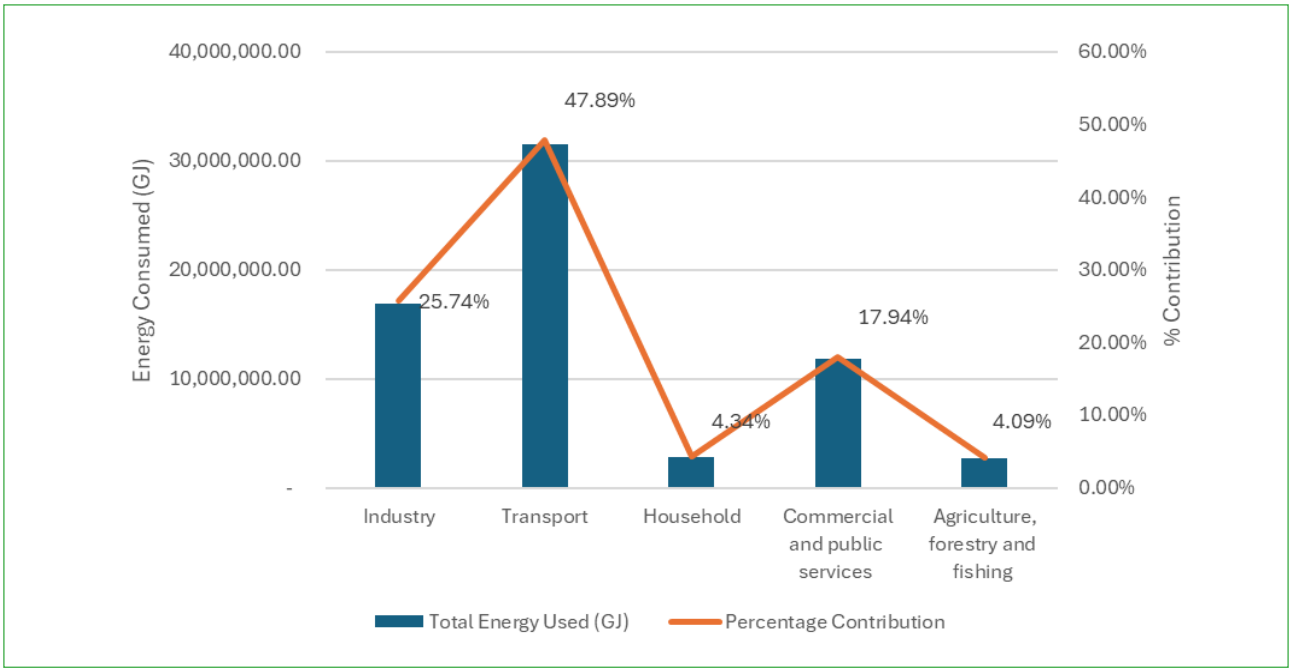
Figure 2.3: Sectoral Oil Products Derived Energy Consumption during 2022



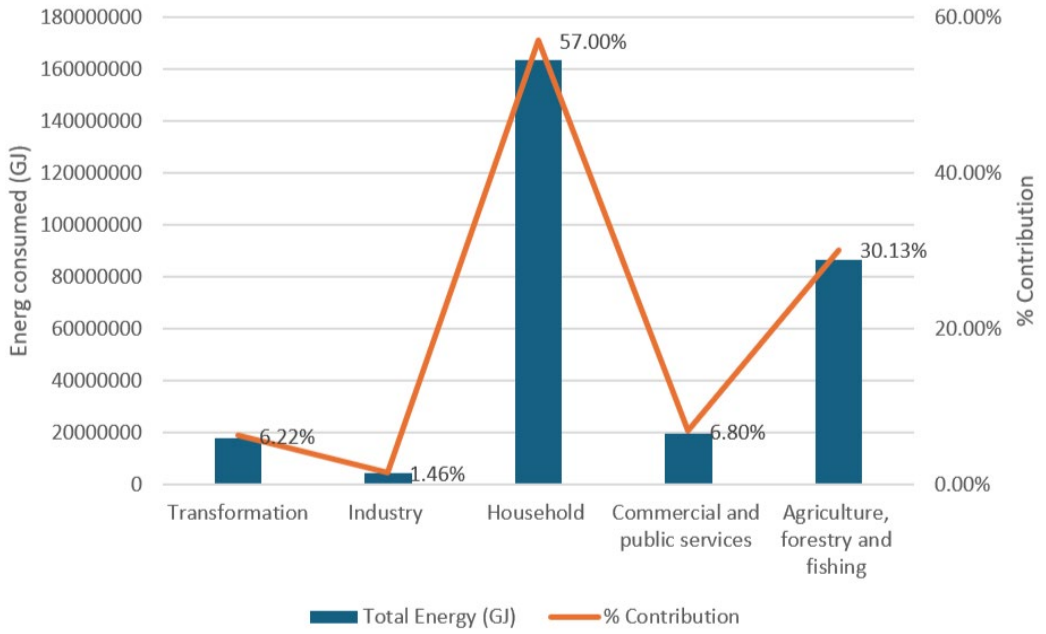
Biofuels

A total of 18 011.20, 125.30 and 157.70 kt of fuel wood, bagasse and charcoal were consumed in 2022 given in *Table 2.7*. The contribution of the different sectors to biofuels utilisation during 2022 is shown in Figure 2.4.

Table 2.7: Biofuels Used in 2022

BIOFUEL	FUEL WOOD (KT)	BAGASSE (KT)	CHARCOAL (KT)
Transformation	784.00	125.30	156.80
Industry	-		141.50
Household	10,442.70	-	15.20
Commercial and public services	1,250.00	-	-
Agriculture, forestry and fishing	5,534.50	-	-
Total consumption (kt)	18,011.20	125.30	157.70

Figure 2.4: Sectoral Biofuels Derived Energy Consumption during 2022



Electricity

The gross electricity supply in 2022 was 10,924.59 GWh as given in *Table* 2.8: Electricity Supply during 2022. Imports and exports of 2,303.92 and 395.12 GWh were realised. The electricity generation mix in 2022 was 34.03% from hard coal, 0.39% from bagasse, 65.41% from hydroelectric, 0.17% from solar PV shown in Figure 4. There was a net electricity supply of 10,778.54 GWh after considering the power and heat plants own use with 1,185.60 GWh having been lost as transmission and distribution losses. The resultant electricity uses or consumption per sector are given in Figure 2.5

Figure 2.5: Electricity Generation Mix

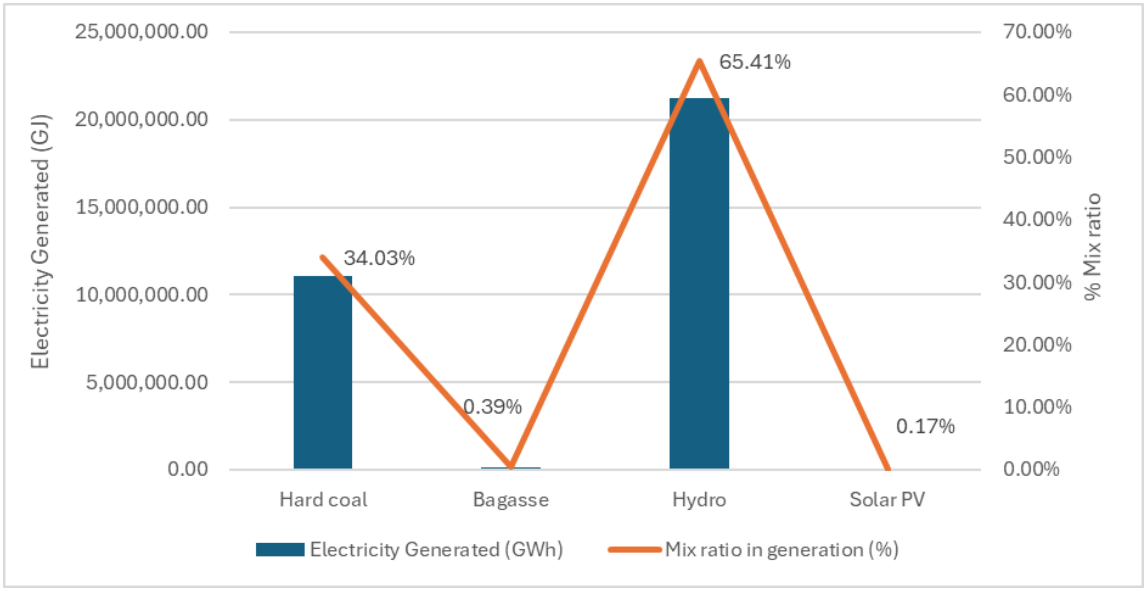


Table 2.8: Electricity Supply during 2022

ELECTRICITY SOURCE	ELECTRICITY SUPPLIED (GWH)	ELECTRICITY SUPPLIED (GJ)	MIX RATIO IN GENERATION (%)
Hard coal	3,067.90	11,044,440.00	34.03%
Bagasse	35.39	127,404.00	0.39%
Hydro	5,896.99	21,229,164.00	65.41%
Solar PV	15.52	55,872.00	0.17%
Exports	-395.12	-1,422,432.00	-
Imports	2,303.92	8,294,112.00	-
Gross supply	10,924.59	39,328,560.00	-

Table 2.9: Sector specific electricity consumption figures for 2022

SECTOR	ELECTRICITY USED (GWH)	ELECTRICITY USED (GJ)	% CONTRIBUTION
Industry	4,547.29	16,370,244.00	49.33%
Household	2,310.45	8,317,620.00	25.06%
Commercial and public services	1,825.80	6,572,880.00	19.80%
Agriculture, forestry and fishing	491.87	1,770,732.00	5.34%
Other not specified	43.50	156,600.00	0.47%

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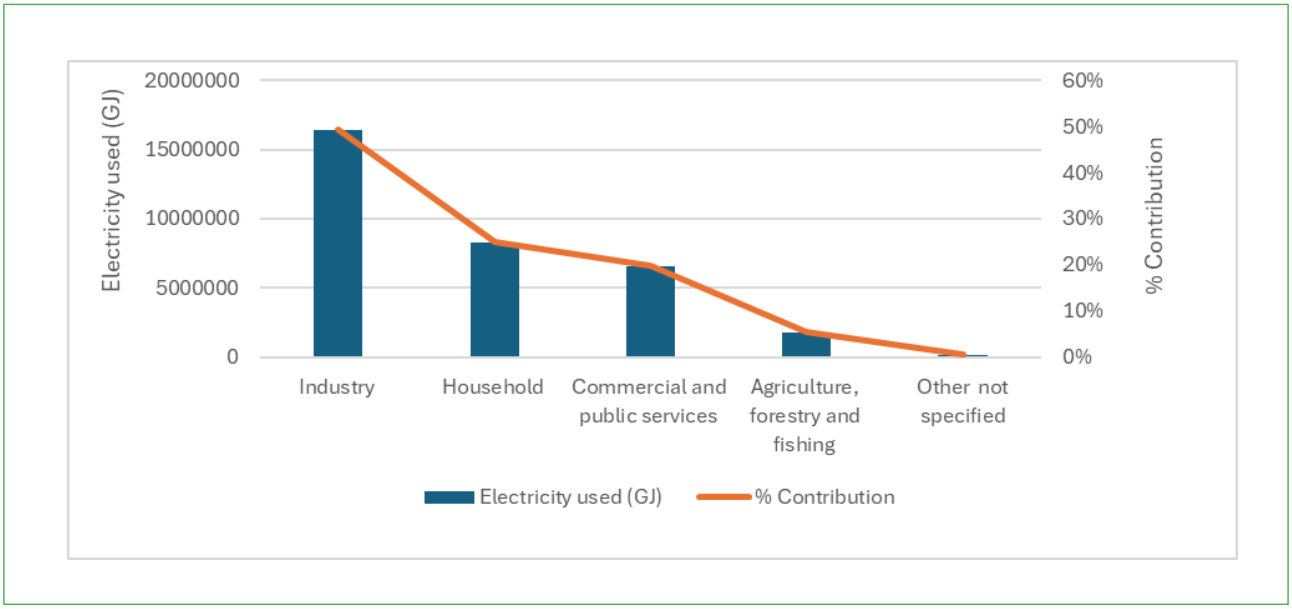
Figure 2.6: Sectoral Electricity Consumption during 2022



Overall energy generation mix

An estimated total of 449,066 090.10 GJ of energy were generated in 2022 with hard coal, oil products, fuel wood, hydro, solar PV, bagasse and charcoal contributing 16.80%, 14.64%, 62.57%, 4.73%, 0.01% 0,21% and 1.04% to the national energy generation mix as shown in *Table* 2.10 and Figure 2.7.

Table 2.10: Energy Generation Mix in 2022

ENERGY SOURCE	ENERGY USED (GJ)	% MIX
Hard coal	75,459,384.00	16.80%
Oil Products	65,729,990.10	14.64%
Fuel wood	280,974,720.00	62.57%
Hydro	21,229,164.00	4.73%
Solar PV	55,872.00	0.01%
Bagasse	964,810.00	0.21%
Charcoal	4, 652,150.00	1.04%
Total energy use	**449,066,090.10**	**100%**

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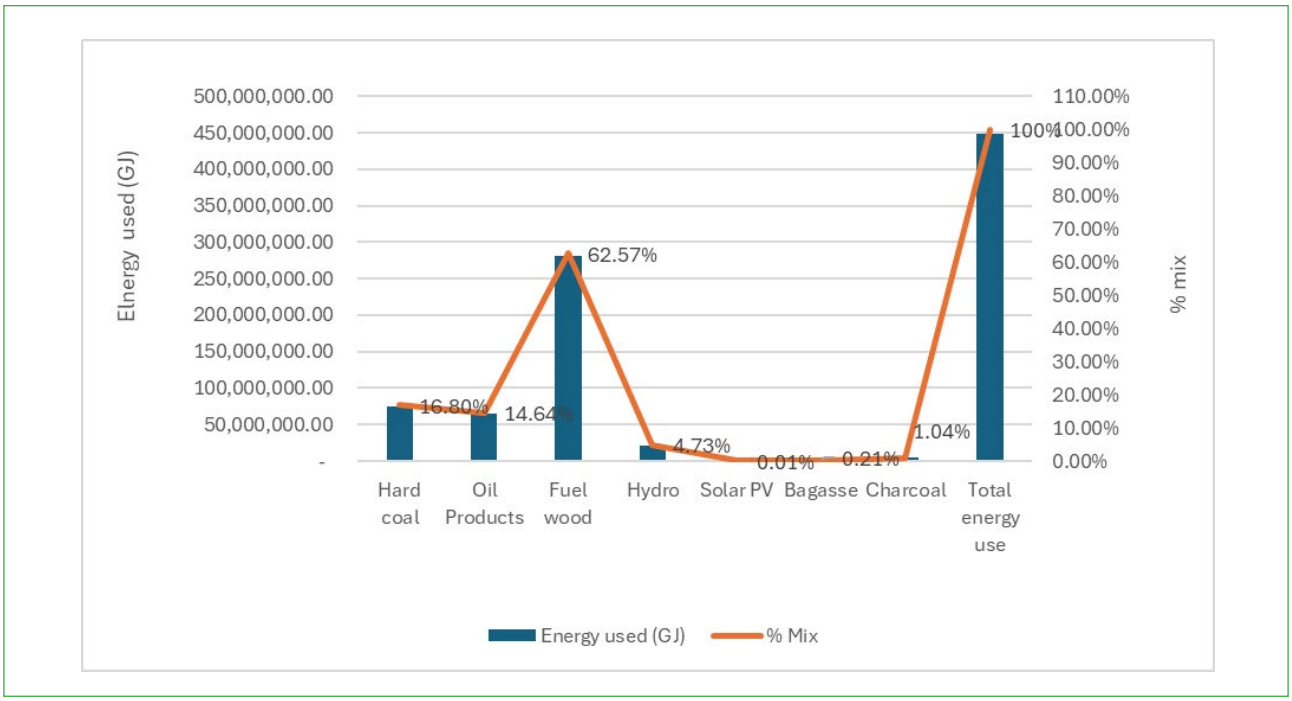
Figure 2.7: Energy Generation Mix in 2022



Waste

Only a minor percentage of national emissions are attributable to the waste sector. The waste sector's BAU emission patterns are influenced by both population growth and economic development (GDP). It is anticipated that GHG emissions will rise from 1.18 $MtCO_2eq$ in 2020 to 2.62 $MtCO_2eq$ in 2050. Flaring landfill gas and increasing composting are two important mitigation strategies that, when combined, could drastically cut emissions to just 0.08 MtCO2 e by 2050 (a decrease of more than 95% of sector emissions) according to the LEDS.

The waste sector was responsible for 0.75 million tons of CO_2 emissions (3.42%) of the country's 22.0 million tons of GHG emissions in 2006. Solid waste disposal sites (SWDS) and wastewater treatment in large cities are the primary sources of greenhouse gas emissions in the country's waste sector. Open burning emissions have increased over the years due to the low refuse collection rates by local authorities. The main climate change two mitigation actions cited in the NDCs are composting and waste to energy. The main policies and strategies that relate to waste management in Zimbabwe include National Environmental Policy and Strategies and Integrated Solid Waste Management Plan, the NDCs and LEDs. The main activity drivers for waste in Zimbabwe are population growth, urbanization, GDP, unsustainable consumption and poor waste management practices. Waste projections were based on population growth, waste generation rates and GDP. A waste collection rate of 80% was assumed to be achieved in 2020 and later increasing progressively to 100% by 2050. The involvement of corporates, small and medium enterprises remain critical in all aspects of solid waste management with both the mitigation actions being led by private entities. Under BAU, GHG emissions from solid waste and wastewater are projected to grow from around 1Mt/yr in 2020 to around 2.5Mt/yr in 2050 according to the LEDS.

2.2.2 Institutional Arrangements to Track Progress on NDC

The Ministry of Environment, Water and Climate is responsible for coordinating Zimbabwe's climate change efforts, including overseeing the implementation of the country's NDCs. This ministry plays a central role in tracking progress, coordinating national climate policies, and reporting to international bodies such as the UNFCCC.

2.2.2.1 National Institutional Arrangements

The High-Level Committee in the Office of the President and Cabinet (OPC) is responsible for oversight of all climate change activities at national level. The committee comprises permanent secretaries for all government ministries and is chaired by the OPC. The Ministry of Environment, Climate and Wildlife, through the Climate Change Management Department (CCMD) is mandated with coordinating and implementing national climate change programmes. The Department is responsible for the development of the National Communications and BTRs and is supported by a multi-sectoral National Climate Change Committee for sector-specific and cross-sector implementation, coordination, advice and guidance. The Climate Transparency and Compliance Unit within the Climate Change Management Department has been established to spearhead and coordinate climate transparency issues. Refer to Figure 0.2

2.2.2 Energy Sector IA

The Zimbabwe Energy Regulatory Agency is mandated through the Energy Regulatory Authority Act [Chapter 13;23] of 2011 and other ancillary instruments to achieve the following key result areas within the energy sector in Zimbabwe:

Increase Access and Security of Energy Supply

- To promote the procurement, production, transportation, transmission and distribution of energy in accordance with public demand and recognized international standards
- To ensure the maximization of access to energy by consumers that is affordable and environmentally sustainable and
- To promote coordination and integration in the importation, exportation and pooling of energy from any source in the SADC and COMESA region

Regulation and Licensing

- To regulate the procurement, production, transportation, transmission, distribution, importation and exportation of energy derived from any energy source
- To exercise licensing and regulatory functions in respect to the energy industry
- To ensure that prices charged by licensees are fair to consumers in the light of the need for prices to be sufficient to allow licensees to finance their activities and obtain reasonable earnings for their efficient operation and
- To establish or approve operating codes for safety, security, reliability, quality standards and any other sector related codes and standards for the energy industry or any sector thereof.

Energy Efficiency and the Environmental Protection

- To advise and educate consumers and licensees regarding the efficient use of energy and
- To assess, promote studies of and advise the Minister and licensees on the environmental impact of energy projects before licensing.

Market Reform and Competition

- To maintain and promote effective competition within the energy industry and
- To create, promote and preserve an efficient energy industry market for the provision of sufficient energy for domestic and industrial use.

Research and Development

- To promote, identify and encourage the employment and development of sources of renewable energy
- To undertake such other things which it considers is necessary or convenient for the better carrying out of or giving effect to the functions of the Authority and
- To promote and encourage the expansion of the energy industry and the advancement of technology relating thereto.

Key stakeholder Advisory

- To advise the minister on all matters relating to the energy industry
- To establish appropriate consumer rights and obligations regarding the provision of energy services
- To arbitrate and mediate disputes among and between licensees and consumers and
- To represent Zimbabwe internationally in matters relating to the energy industry

Electricity subsector

The electricity supply industry (ESI) is dominated by government owned utility, namely Zimbabwe Electricity Supply Authority (ZESA) Holdings with its subsidiaries: Zimbabwe Power Company (ZPC) and Zimbabwe Electricity Transmission & Distribution Company (ZETDC).

ZPC constructs, owns, operates and maintains power generation stations for the supply of electricity. It currently maintains four coal fired stations which are Hwange, Bulawayo, Munyati and Harare thermal stations and one hydro power station, Kariba South Power Station.

ZETDC carries out the system/network operator function. It is responsible for the transmission of electricity from power stations, the distribution of electricity as well as it retailing to the end users. ZETDC also conducts trade at regional level through the Southern African Power Pool (SAPP). There are some independent power producers who also operate through production for own consumption and trading ZERA regulates any person or private companies that operates an electricity undertaking which generates, transmits, distributes, or retails electricity for commercial purposes more than 100Kilowatts (KW). ZERA regulates through the issuance of the following licenses valid for a period of up to a maximum of thirty (30) years subject to satisfying periodic audits conducted by ZERA. These licences are issued subject to applicants satisfying the terms and conditions spelt out in the relevant Acts:

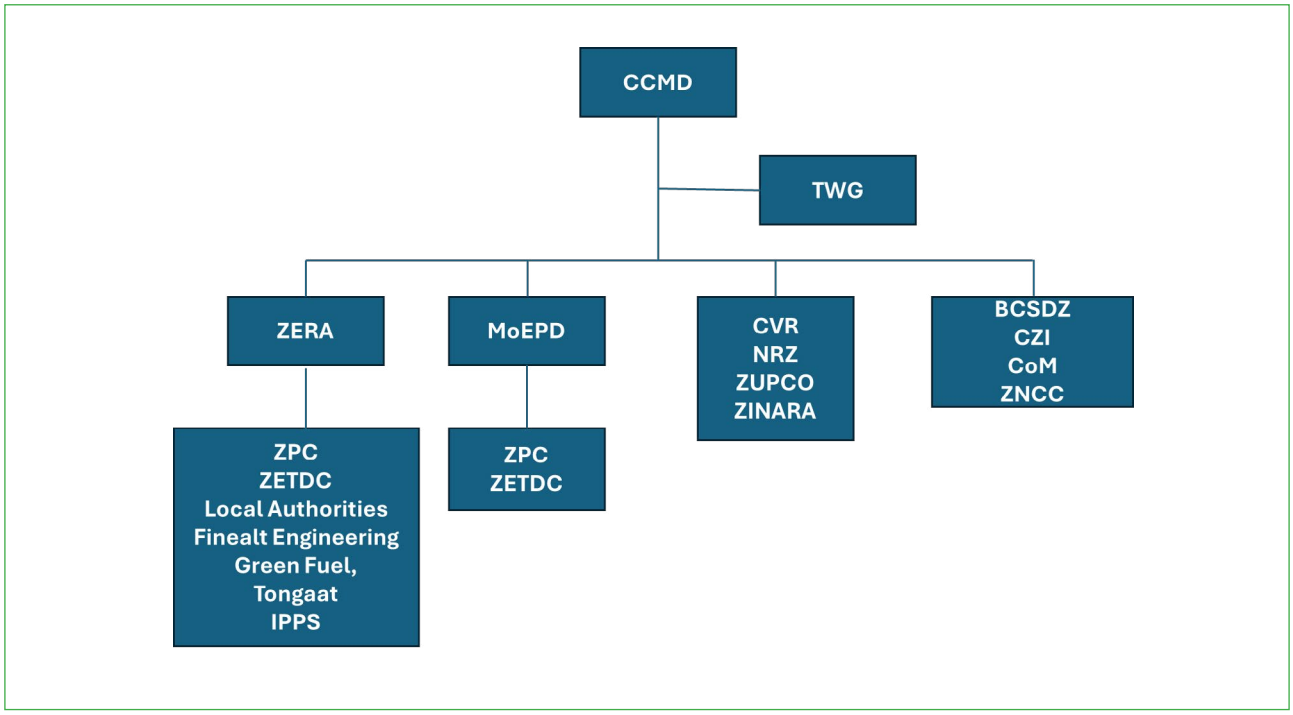
Generation license which authorizes the licensee to construct, own, operate and maintain a generation station for purposes of the generation and supply of electricity to any transmission, distribution or supply licensee who purchases electricity for resale to consumers. A holder of a generation license includes a generating company in Zimbabwe that is entitled under an arrangement approved by the Authority to sell power to Zimbabwean licensees or consumers

Transmission and bulk supply licenses authorize the licensee to carry out grid construction, operation and maintenance of transmission of facilities within Zimbabwe and to carry out the operation of an electric power network

Distribution and retail supply licenses authorize to construct, operate and maintain a distribution system and facilities including the connection of consumers for the purposes of receiving a supply of electricity, the installation, maintenance and reading of meters, billing and collection.

Further ZERA provides electricity sector technical and compliance audits, tariff setting, research and development, investment promotion, maintenance of registration of licenses, promotion and awareness raising of energy efficiency and renewable energy technologies, light handed regulation on power projects which are less than 100kw.

Figure 2.8: Institutional arrangements for NDC tracking in Energy sector



2.2.2.2 Agriculture and LULUCF Sector IA

The Forestry Commission advises the government in all forest matters. It is under the Ministry of Environment, Climate and Wildlife. It manages forests to preserve their health for future generations. Its authority comes from the Forest Act and the Communal Land and Forest Produce Act. The Commission oversees about 800,000 hectares of protected forests. It also runs national tree-planting programmes and other measures to reduce forest loss. It often collaborates with other agencies and private groups, providing technical support. The Commission participated in all three mitigation actions under the NDC implementation. It collects, processes, and monitors data, then reports to the Ministry of Environment, Climate and Wildlife.

Figure 2.9: Institutional Arrangements to Track Measure A1 and A2

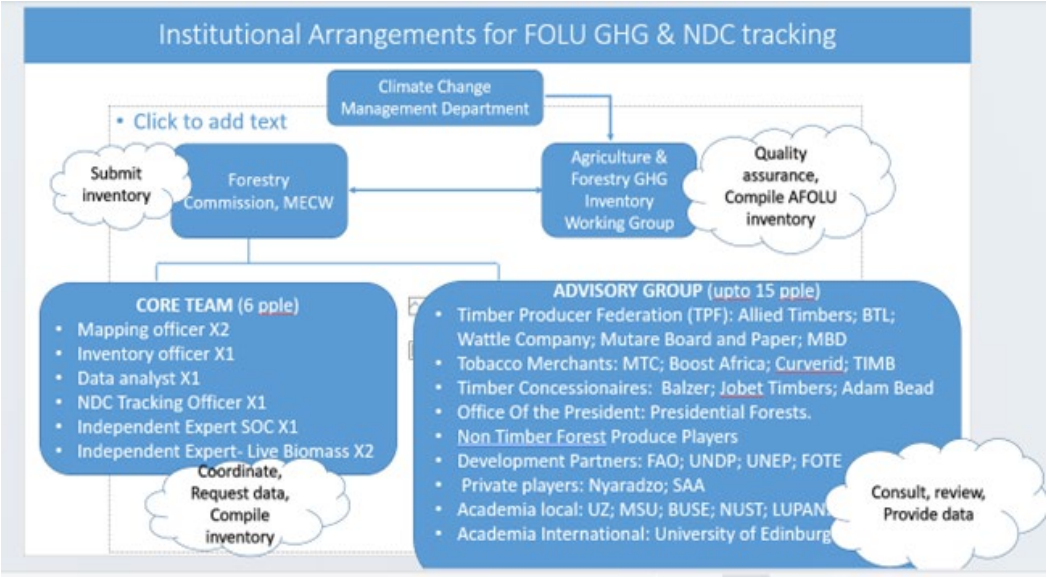
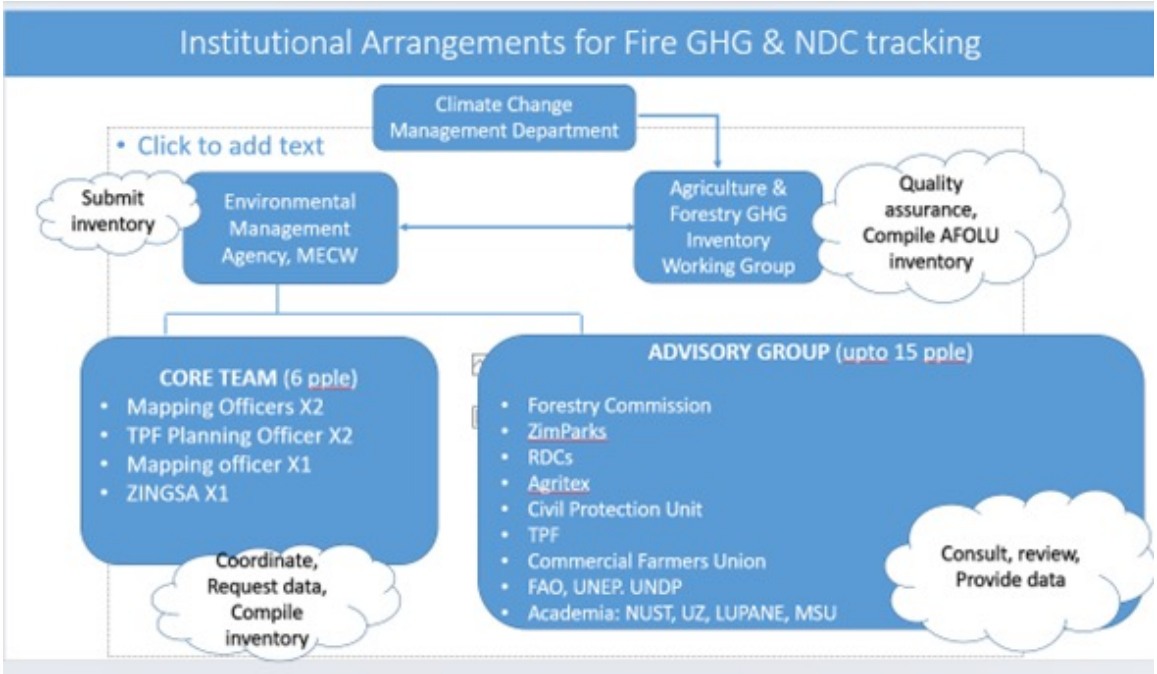


Figure 2.10: Institutional Arrangements to Track Progress on Reducing Area Burnt (A3)



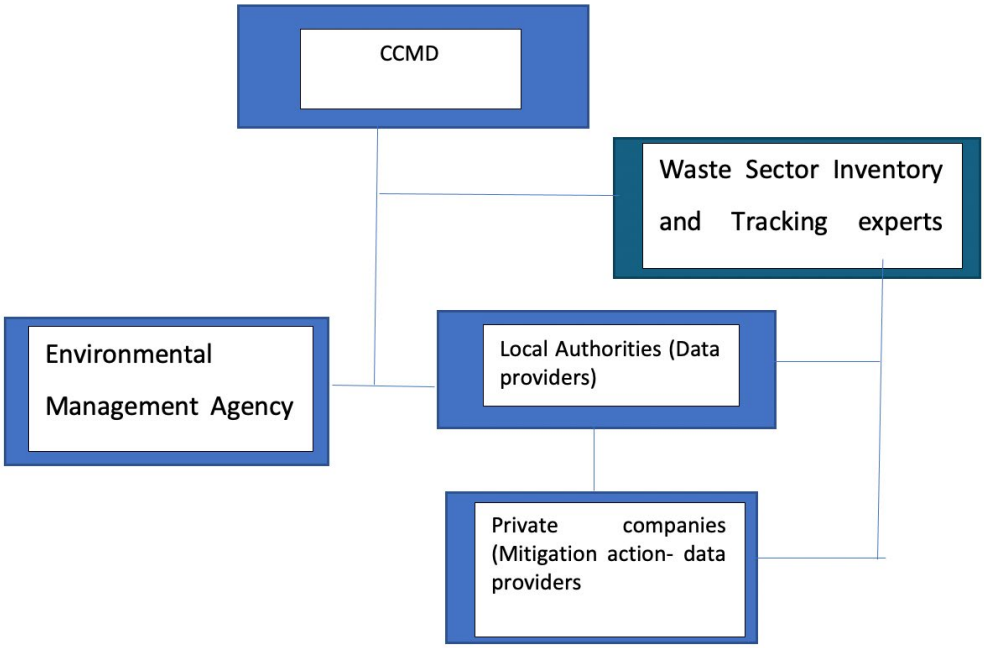
In Zimbabwe, the EMA and the Forestry Commission manage fire activities. They run awareness campaigns and collect fire data. Remote sensing technology helps map burnt areas and monitor fires. This data aids in decision-making and resource allocation. The agencies then develop strategies to prevent and control fires in high-risk zones. They also involve communities in fire management, empowering locals to help prevent fires. EMA sets up firebreaks, conducts controlled hay bailing and trains communities on fire management. It also trains them on early fire detection. These efforts in general have reduced wildfires, but challenges in resources and coverage remain. However in 2022 the area burnt almost doubled due to above-average rains in the 2021 -2022 cropping season that increased the risk of veld fires in the country with the presence of a huge biomass that stoke the fires.

2.2.2.3 Waste Sector IA

In the waste sector, the Urban Councils Act gives local authorities the responsibility of collecting, transporting and disposing waste in areas within their jurisdiction. The local authorities are the key data providers as they manage the major landfills in the country. The Environmental Management Agency (EMA) is a parastatal under the Ministry of Environment, Climate and Wildlife whose role is to regulate and monitor waste management in the country. EMA regulates, monitors and reviews environmental impact assessments (EIA), guides solid waste management through legislation which prohibits littering and the discharge of waste that causes environmental pollution. EMA also promotes sustainable waste management practices such as recycling and enforces the law through the 'Polluter pays Principles'. The Environmental Management Agency played a leading role in the formulation of the Integrated Solid Waste Management Plan which envisages a safe, secure and sustainable solid waste management system that will transform Zimbabwe into a clean, healthy and environmentally friendly country. Within the Environmental Management Act are statutory instruments that provide standards for solid. Liquid and effluent disposal.

Local Authorities work collaboratively with EMA as they collect, transport and dispose solid waste. Local authorities also run wastewater treatment plants that handle both domestic and industrial wastewater. Collaboratively, there is data collection and exchange between EMA and LAs which facilitates the process of NDC tracking in the waste sector. Some of the data needed to account for waste incinerated was obtained from the Ministry of Health which operates incinerators at health facilities. Additionally, information on pit latrines required sourcing from the WASH department under the Ministry of Health. This showed how the waste sector is also cross cutting as it required multiple stakeholders as it required multiple stakeholders to obtain the necessary information needed to track progress of the NDCs. The mitigation actions under the waste sector are run by private companies i.e. Zimbabwe sunshine Group and Geo-Pomona who were also critical stakeholders in terms of providing the necessary data to track progress.

Figure 2.11: Waste Sector Institutional Arrangements



2.3 DESCRIPTION OF A ZIMBABWE'S NATIONALLY DETERMINED CONTRIBUTION UNDER ARTICLE 4 OF THE PARIS AGREEMENT, INCLUDING UPDATES

2.3.1 Introduction

Zimbabwe's revised NDC under the Paris Agreement aims to reduce greenhouse gas emissions by 40% from 2010 levels by 2030. It focuses on energy, agriculture, waste IPPU and forestry. The country aims for renewable energy to be 16.5% by 2025. It will prioritise solar, hydro and wind projects. It also aims to expand forests and use sustainable land practices for carbon storage. The adaptation plan is to improve agriculture and water resilience. This will be done by better infrastructure and disaster management.

The NDC targets extend to 2030. They reflect long-term commitments to reduce emissions, boost resilience, and promote sustainability. Using 2010 as the base year for emissions, we aim for a 40% reduction by 2030 from business as usual. Adaptation objectives centre on building resilience in the agriculture, water and health sectors.
The timeline has three phases:

- Short-term (2021-2025): for initial actions and capacity building.
- Medium-term (2026-2030): for comprehensive policies and projects.
- Long-term (2031 and beyond): to achieve net-zero emissions by 2050. It will undergo periodic reviews to align with global climate goals.

Zimbabwe's revised NDCs commit to tackling climate change and reducing emissions. Key components include prioritising renewable energy and energy efficiency. Embracing sustainable practices, enhancing resilience, and reducing emissions in livestock and crop production.

- Forestry: management, afforestation, and reforestation to enhance carbon sinks.
- Waste Management: Emission reduction strategies, including methane capture from landfills.
- Mitigation measures encompass:
- Deployment of renewable energy technologies (solar, wind, biomass).
- Adoption of climate-smart agricultural practices
- Conservation and sustainable forest management
- Enhanced waste management systems

Major emission sources are energy production, transportation, agriculture, and industry. Critical sinks are forests and wetlands, with efforts to boost their capacity. The focus is on greenhouse gases: CO_2, CH_4, and N_2O. It considers carbon pools in biomass and soils.

Adaptation measures include climate resilience plans for agriculture, water resources, and health. The NDC also aims to use Internationally Transferred Mitigation Outcomes (ITMOs) to achieve climate targets. It promotes transparency, accountability and environmental integrity. It involves building skills to engage in cooperative approaches. This includes systems for monitoring, reporting, and verifying mitigation outcomes.
The revised NDC aligns climate actions with the SDGs. It aims to support social and economic development. It engages local communities and stakeholders to guarantee equitable benefits from ITMOs. Zimbabwe's updated NDC shows a commitment to using Article 6 of the Paris Agreement. It allows for cooperative mechanisms and ITMOs. It aims to boost climate resilience and sustainable development. It also seeks to meet global climate goals. However, the country is not yet ready to use ITMOs to meet its NDCs. Developing an Article 6 strategy and registry to track ITMOs is underway.

2.3.2.1 Energy sector

A total of 8 mitigation measures were identified and considered for mitigation analysis in the energy sector. Four of the mitigation measures are yet to start with no measures yet based on the implementation time frames. Such measures include the 4.1 MW biogas capacity projected to be added in 2024, Expansion of microgrids through the additional of 2.098 MW of capacity added through microgrids by 2028, Fuel economy policy and Fuel efficiency improvement earmarked to start in 2025 running through to 2030 and the 5% shift towards the use of public transport from private transport to start in 2025. However, only two mitigation measures in the energy sector ready for implementation were feasible as some could not meet the criteria for meaningful mitigation analysis.

Table 2.11: Mitigation Measures in the Energy Sector

NO.	MITIGATION MEASURE	SOURCE: PLAN/ STRATEGY/ REGULATION	PERCENT GHG REDUCTIONS VS 2030 BASELINE (%)	ABSOLUTE GHG EMISSION REDUCTION 2030 VS BASELINE (THOUSAND TONNES)
	Energy Sector			
1	Transmission and Distribution losses reduced from 18% in 2020 to 11% in 2025	National Development Strategy 1 (2021-25)	1.01	760
2	Expansion of Solar: 300 MW in 2025	System Development Plan 2017	0.61	460
3	Expansion of microgrids: Additional of 2.098 MW of capacity added through microgrids by 2028	REF 2021	0.004	3.27
4	4.1 MW biogas capacity added in 2024	ZERA annual report	0.01	9.31
5	Energy Efficiency Improvements: Agriculture: 12% savings (2030 compared to baseline scenario) Commercial: 16% savings Domestic: 22.08% savings Manufacturing: 18.63% savings Mining: 8% savings	ZERA energy efficiency audit	2.72	2048
6	2% biodiesel in fuel by 2030	Low Emissions Development Strategy (LEDS), 2020-50.	0.25	189
7	Fuel economy policy: Fuel efficiency improvement 2025-2030: Motorcycles: 2.2% per year, Light Duty Vehicles (LDVs): 2.9%/ year Buses: 2.6%/year, Heavy Duty Vehicles (HDVs): 2.5%/year	Low Emissions Development Strategy (LEDS), 2020-50.	0.73	554
8	Public transport (modal shift). 5% shift from private car to public transport in 2030	Low Emissions Development Strategy, (LEDS), 2020-50.	0.23	176
	Industrial Processes and Product Use (IPPU) Sector			

2.3.1.2 IPPU sector

Table 2.12: Mitigation Measures in the IPPU Sector

NO.	MITIGATION MEASURE	SOURCE: PLAN/ STRATEGY/ REGULATION	PERCENT GHG REDUCTIONS VS 2030 BASELINE (%)	ABSOLUTE GHG EMISSION REDUCTION 2030 VS BASELINE (THOUSAND TONNES)
9	Increased clinker substitution with fly ash (up to 16% by 2030, 20% by 2050).	Low Emissions Development Strategy (LEDS), 2020-50.	0.04	28.7
10	Increased clinker substitution with BFS (up to 16% by 2030, 20% by 2050).	Low Emissions Development Strategy (LEDS), 2020-50.	0.04	28.7
11	Decomposition of N2O emissions through use of a secondary catalyst. Selective De-N2O catalyst results in abatement of approximately 75% of all N2O emissions produced during nitric acid production. Implementation by 2023	Low Emissions Development Strategy (LEDS), 2020-50.	0.11	84.5
12	HFC Phasedown schedule Kigali Amendment (Freeze 2024, 2029, 10% reduction)	Kigali Amendment to the Montreal Protocol Phase down schedule	0.44	334

2.3.1.4 Agriculture sector

Several mitigation measures were identified and considered for mitigation analysis in the AFOLU sector. However, only three mitigation measures in the LULUCF sector were feasible in this first NDC revision as some could not meet the criteria for meaningful mitigation analysis.

2.3.1.5 LULUCF sector

Zimbabwe has a moderate woodland cover, with naturally regenerating forests which accounts for approximately 45% of the country's total land area. The country experienced an annual deforestation rate of 262 000 Ha.

Forestry contributes about 4% to country's GDP, with around 5.3 million individuals, mainly in rural regions, depending directly and indirectly on forest resources for their sustenance. As a result, forests face challenges from various land conversion activities, wood extraction for household energy, unsustainable commercial exploitation of native wood products, poor grazing methods, and wildfires.

In 2017, the Agriculture Forest and Other Land Use (AFOLU) sector was the main contributor to greenhouse gas (GHG) emissions in Zimbabwe, responsible for 54% of total emissions, with the majority originating from FOLU. The increasing need for agricultural land and settlement expansion, puts pressure on remaining forests. In addition, rising construction activities and global demand for valuable timber species

such as teak (*Baikiea plurijuga*) and mahogany (*Afzelia quanzensis*) have resulted in illegal logging and forest degradation.

While several mitigation measures were identified for the FOLU sector, only four were considered feasible for this initial NDC revision. Some measures failed to meet the criteria for meaningful mitigation analysis, such as lacking a clear local implementing agency or robust data for emissions estimates. This was particularly evident in the livestock and climate-smart agriculture subsector, despite their conceptual role in driving agricultural emissions.

Zimbabwe is dedicated to safeguarding its forests, recognizing their crucial role in climate change mitigation and adaptation. Forests are integral to the country's vision of achieving a middle-class economy by 2030, and consequently, numerous concrete measures have been established to ensure sustainable forest management practices are implemented and incorporated into development plans.

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In 2024, Zimbabwe established its inaugural Forest Reference Emission Level (FREL), which was submitted to the UNFCCC for technical evaluation. The nation intends to enhance its forest monitoring capabilities substantially and tackle the root causes of deforestation.

Zimbabwe has a substantial area under commercial forest plantation, predominantly growing exotic tree species, primarily Pines and Eucalyptus species. Over time, the rate of planting has not matched the rate of harvesting, resulting in extensive temporarily unplanted areas. Forest plantation has been identified as a key contributor to carbon dioxide sequestration; consequently, the government, in consultation with key sector stakeholders, has established a target of planting 10,000 hectares of land annually.

Table 2.13: Mitigation Measures in the LULUCF Sector

MITIGATION MEASURE	PLAN/ STRATEGY/ REGULATION	% GHG REDUCTION VS 2030 BASELINE	ABSOLUTE REDUCTION 2030 VS BASELINE (1000 TONNES)	ESTIMATED COST (MILLION USD)
Increase area of forest land from 9.9 million hectares to 10.4 million hectares by 2025: Add 100,000 hectares of natural forest land per year between 2021 and 2025 (Priority 1)	National Development Strategy	12.73%	9598.7	$ 0.81
Increase area of forest plantation from 68848 hectares to 118848 hectares by 2025: Add 10,000 hectares of plantation forest land per year between 2021 and 2025 (Priority 3)	National Development Strategy	1.33%	1000.7	$ 1,028.98
Reduce area burned by 500,000 hectares between 2020 and 2025 inclusive of agricultural production landscapes (Priority 2)	National Development Strategy	27.75%	20925.1	$ 49

2.3.1.6 Waste sector

The waste sector is a significant contributor to greenhouse gas emissions in the country. The first mitigation actions in this sector are the waste to energy projects in Harare, Bulawayo, Gweru and Mutare with a target of using 42% of the methane generated for energy production. Although under implementation, all four cities have not yet started generating energy hence there is no information available to track progress for this mitigation action. Each of the cities is at different levels of the project, for example Bulawayo is at the tender awarding stage.

The second mitigation action on composting 20% of organic waste in the long run is under implementation in the City of Harare and run by a private company called Zimbabwe Sunshine Group. Both mitigation actions under the waste sector are based on the Integrated Solid Waste Management Plan and the LEDS.

Table 2.14: Mitigation Measures in the Waste Sector

NO.	MITIGATION MEASURE	SOURCE: PLAN/ STRATEGY/ REGULATION	PERCENT GHG REDUCTIONS VS 2030 BASELINE (%)	ABSOLUTE GHG EMISSION REDUCTION 2030 VS BASELINE (THOUSAND TONNES)
16	Waste to Energy: It was assumed that 42% of the methane generated would be collected and used for energy production through waste to energy projects in Harare, Bulawayo, Mutare and Gweru	Low Emissions Development Strategy (LEDS), 2020-50.	1.26	947
17	20% of organic matter composted in the long term	Zimbabwe's Integrated Solid Waste Management Plan, Low Emissions Development Strategy	0.45	341

2.4 INFORMATION NECESSARY TO TRACK PROGRESS

2.4.1 Description of Selected Indicators

Under the MPGs of the Paris Agreement's ETF, Zimbabwe has set specific metrics to assess progress towards its NDC mitigation objectives. Metrics are measures that enable performance monitoring and progress tracking to demonstrate outcomes and guide adjustments. The MPGs allow countries to choose relevant indicators for their NDCs, which can be limited or comprehensive, qualitative, or quantitative. These metrics evaluate progress towards Zimbabwe's NDC aims. Zimbabwe has selected SMART indicators—specific, measurable, ambitious/achievable, relevant, and time-bound—to ensure effective monitoring and

evaluation. Zimbabwe's NDC includes sector-based conditional mitigation targets that depends on international support.

2.4.1.1 Energy Sector Indicators

Table 2.15 to *Table 2.22* show the details of the selected indicators for tracking progress towards NDC implementation under the Energy sector.

Table 2.15: Measure E1 Indicator Details

SECTOR	ENERGY
Mitigation measure	Transmission and Distribution losses reduced from 18% in 2020 to 11% in 2025
Indicators	Length of efficient transmission lines [not yet available] Number of efficient transformers [not yet available] GWh lost [data available] % losses [data available] Policies and Strategies [not yet available] GHG emissions [not yet available]
Reference year	2020
Characteristics	
Overview	The reduction of electricity transmission distribution losses will lead to increased energy efficiency with the avoided GWh losses translating to reduction in additional electricity generation to cover for the losses hence reduced GHG emissions. Therefore, reduction in transmission and distribution losses from 18% in 2020 to 11% by 2030 is projected to result in annual reduction in GHG emissions of 760 Gg CO2eq. Transmission and distribution losses for the year 2022 were estimated at 14% with annual GHG reduction of 412 GgCO2eq.
Unit of Measure	GWh lost, % transmission and distribution losses, ktCO2eq
Type of Indicator	Quantitative/Qualitative/GHG/Non-GHG
	Data Collection
Data requirements	GWh lost % losses
Data sources	ZETDC and ZERA Annual reports
Frequency of data collection	Annually
	Other Information
Limitations	The losses are estimated from the difference between electricity supplied and electricity sales
Observations	Transmission and distribution losses for the year 2022 were estimated at 14% with annual GHG reduction of 412 Gg CO2eq.

Table 2.16: Measure E2 Indicator Details

SECTOR	ENERGY
Mitigation measure	Expansion of Solar: 300 MW in 2025
Indicators	MW installed GWh generated Number of grid connected solar plants installed by size Policies and Strategies GHG emissions
Reference year	2020
Characteristics	
Overview	The development and installation of 300MW solar power grid tied capacity by 2025 is envisaged to generate 547.5GWh per annum leading to GHG emission reduction of 460 Gg CO2eq.
Unit of Measure	MW installed, GWh generated, Number of grid connected solar plants installed by size, Gg CO2eq
Type of Indicator	Quantitative/Qualitative/GHG/Non-GHG
	Data Collection
Data requirements	MW installed GWh generated Number of grid connected solar plants installed by size
Data sources	ZETDC and ZERA Annual reports
Frequency of data collection	Annually
	Other Information
Limitations	
Observations	A total of 12 grid tied solar plants were commissioned in 2022 with total installed capacity of 6.37 MW thus 2% of the targeted 300MW by 2025. This translates to annual GHG emission reduction of 7.72 Gg CO2eq against a target of 460 Gg CO2eq.

Table 2.17: Measure E3 Indicator Details

SECTOR	ENERGY
Mitigation measure	Expansion of microgrids: Additional 2.098 MW of capacity added through microgrids by 2028
Indicators	KW/MW installed GWh generated Number of solar plants installed by size Policies and Strategies GHG emissions
Reference year	2020
Characteristics	
Overview	The development and installation of 2.098 MW solar power micro grids capacity by 2028 is envisaged to generate 3.83 GWh per annum leading to GHG emission reduction of 3.27 Gg CO2eq.
Unit of Measure	KW/MW installed, GWh generated, Number of solar plants installed by size, Gg CO2eq
Type of Indicator	Quantitative/Qualitative/GHG/Non-GHG
	Data Collection
Data requirements	KW/MW installed GWh generated Number of solar plants installed by size
Data sources	ZETDC and ZERA Annual reports
Frequency of data collection	Annually
	Other Information
Limitations	
Observations	No grid tied solar plants were commissioned in 2022.

Table 2.18: Measure E4 Indicator Details

SECTOR	ENERGY
Mitigation measure	4.1 MW biogas capacity added in 2024
Indicators	Number of biogas plants established Amount of biogas generated Installed capacities in MW Amount of electricity generated in MW/GWh Policies and Strategies GHG emissions
Reference year	2020
Characteristics	
Overview	The development of a 4.1 MW biogas plant at Firle wastewater treatment plant in Harare, is projected to reduce GHG emissions by 9.31 Gg CO2eq per annum by 2024.
Unit of Measure	Installed capacity (MW), Amount of electricity generated (GWh), Gg CO2eq
Type of Indicator	Quantitative/Qualitative/GHG/Non-GHG
	Data Collection
Data requirements	Number of biogas plants established Amount of biogas generated Installed capacities in MW Amount of electricity generated in MW/GWh
Data sources	City of Harare; ZETDC and ZERA Annual reports
Frequency of data collection	Annually
	Other Information
Limitations	
Observations	The project is still at planning stage. Scheduled to start in 2024 with a duration of 7 years.

Table 2.19: Measure E5 Indicator Details

SECTOR	ENERGY
Mitigation measure	Energy Efficiency Improvements: Agriculture: 12% savings (2030 compared to baseline scenario); Commercial: 16% savings; Domestic: 22.08% savings; Manufacturing: 18.63% savings; Mining: 8% savings
Indicators	Percentage energy savings [not yet available] Sector specific energy intensity (MJ/GDP$) [not yet available] Number of energy efficient initiatives per sector [not yet available] Policies and Strategies [not yet available] GHG emissions [not yet available] Percentage energy savings [not yet available] Sector specific energy intensity (MJ/GDP$) [not yet available] Number of energy efficient initiatives per sector [not yet available] Policies and Strategies [not yet available] GHG emissions [not yet available]
Reference year	2020
Characteristics	
Overview	Improvements in energy efficiency will result in reduction in energy use and subsequently GHG emissions estimated at 2048 Gg CO2eq per annum by 2030
Unit of Measure	Percentage energy savings [not yet available], Sector specific energy intensity (MJ/GDP$) [not yet available], Gg CO2eq [not yet available]
Type of Indicator	Quantitative/Qualitative/GHG/Non-GHG
	Data Collection
Data requirements	Percentage energy savings [not yet available] Sector specific energy intensity (MJ/GDP$) [not yet available] Number of energy efficient initiatives per sector [not yet available]
Data sources	ZETDC and ZERA Annual reports
Frequency of data collection	Annually
	Other Information
Limitations	Unavailability of data on sector specific energy use efficiencies with the available data being that of the national energy efficiency audit of 2015.
Observations	Data not available. However, the country has developed the National Energy Efficiency Policy envisaged to support and promote energy efficiency in the country.

Table 2.20: Measure E6 Indicator Details

SECTOR	ENERGY
Mitigation measure	2% biodiesel in fuel by 2030
Indicators	Area under biodiesel feedstock in Ha Number of biodiesel processing plants Capacity of biodiesel processing plants Annual feedstock production Amount of biodiesel produced Percentage of biodiesel blended in fuel Policies and Strategies GHG emissions Area under biodiesel feedstock in Ha Number of biodiesel processing plants Capacity of biodiesel processing plants Annual feedstock production Amount of biodiesel produced Percentage of biodiesel blended in fuel Policies and Strategies GHG emissions
Reference year	2020
Characteristics	
Overview	2% biodiesel in fuel by 2030 is projected to reduce annual GHG emissions by 189 Gg CO2eq.
Unit of Measure	Amount of biodiesel produced, Percentage of biodiesel blended in fuel, ktCO2eq
Type of Indicator	Quantitative/Qualitative/GHG/Non-GHG
	Data Collection
Data requirements	Area under biodiesel feedstock in Ha Number of biodiesel processing plants Capacity of biodiesel processing plants Annual feedstock production Amount of biodiesel produced Percentage of biodiesel blended in fuel
Data sources	ZETDC and ZERA Annual reports
Frequency of data collection	Annually
	Other Information
Limitations	Data availability.
Observations	Data not yet available.

Table 2.21: Measure E7 Indicator Details

SECTOR	ENERGY
Mitigation measure	Transport fuel economy policy / Fuel efficiency improvement 2025-2030: Motorcycles: 2.2% per year; LDVs: 2.9%/ year; Buses: 2.6%/year; HDVs: 2.5%/ year
Indicators	Number of efficient vehicles by class Policies and strategies developed Fuel intensity Number of efficient vehicles by class Policies and strategies developed Fuel intensity
Reference year	2020
Characteristics	
Overview	The adoption of Transport fuel economy policy / Fuel efficiency improvement between 2025 and 2030 will lead to annual reduction in GHG emissions of 554 Gg CO2eq
Unit of Measure	Number of efficient vehicles by class, Gg CO2eq
Type of Indicator	Quantitative/Qualitative/GHG/Non-GHG
	Data Collection
Data requirements	Number of efficient vehicles by class
Data sources	CVR, ZINARA and ZUPCO records
Frequency of data collection	Annually
	Other Information
Limitations	
Observations	This measure is earmarked to start in 2025. Data not yet available

Table 2.22: Measure E8 Indicator Details

SECTOR	ENERGY
Mitigation measure	Public transport 5% shift from private car to public transport in 2030
Indicators	Number of people using public transport Proportion of public transport Policies and Strategies GHG emissions
Reference year	2020
Characteristics	
Overview	5% shift from private transport to public transport by 2030 will result in annual GHG emission reduction of 176 Gg CO2eq.
Unit of Measure	Number of people using public transport Proportion of public transport
Type of Indicator	Quantitative/Qualitative/GHG/Non-GHG
	Data Collection
Data requirements	Number of people using public transport Proportion of public transport
Data sources	ZUPCO records
Frequency of data collection	Annually
	Other Information
Limitations	Availability of data.
Observations	Data not yet available as the project is scheduled to start in 2025 with a duration of 6 years

Assessment of achievement of NDC targets
Project/ Mitigation Measure: Transmission and Distribution losses reduced from 18% in 2020 to 11% in 2025

Mitigation Target: 0.01% national total GHG reduction vs 2030 BAU

During the year 2022, 14% transmission and distribution losses were realised leading to GHG emissions reduction of 412 Gg CO2eq thus 54% of the annual target projected to be achieved by 2025. Details are provided in Table 2.23

Table 2.23: GHG removal under transmission and distribution losses reduction measure

YEAR	NET ELECTRICITY SUPPLIED	NET ELECTRICITY SALES	TRANSMISSION AND DISTRIBUTION LOSSES	% LOSSES	2020 BASELINE	CHANGE	GWH SAVED	GHG EMISSION REDUCED (GG CO2EQ)
2022	10710	9225	1499	14.00	18%	4%	429	412
2021	10193	8439	1754	17.21	18%	1%	81	78

Project/ Mitigation Measure: Expansion of Solar:300 MW in 2025

Mitigation Target: 0.61% national total GHG reduction vs 2030 BAU

During the year 2022, 6.37 MW of grid tied solar plants were installed generating 8.04 GWh of energy and subsequently leading to annual GHG reductions of 7.72 Gg CO2eq which translates to 2% of the annual target of 460 Gg CO2eq by 2030. Details are provided in Table 2.24

Table 2.24: GHG removal under solar expansion measure

SOLAR PLANT NUMBER	COMPANY/INVESTOR	VALIDITY	COMMISSIONED CAPACITY (MW)	ESTIMATED NUMBER OF DAYS OPERATIONAL IN 2022	MWH GENERATED
1	Econet Wireless Zimbabwe Ltd	25 years	0.105	341.00	179.03
2	Econet Wireless Zimbabwe Ltd	25 years	0.10176	341.00	173.50
3	Econet Wireless Zimbabwe Ltd	25 years	0.1089	341.00	185.67
4	Luxaflor Roses P/L	25 years	0.1184	341.00	201.87
5	MD De Chassart & Son P/L t/a Surrey Abattoir	25 years	0.117	341.00	199.49
6	Schweppes Zimbabwe Limited	25 years	0.564	341.00	961.62

SOLAR PLANT NUMBER	COMPANY/INVESTOR	VALIDITY	COMMISSIONED CAPACITY (MW)	ESTIMATED NUMBER OF DAYS OPERATIONAL IN 2022	MWH GENERATED
7	Tanganda Tea Company Limited	25 years	1.8	269.00	2421.00
8	Dormervale (Private) Limited	25 years	0.382	269.00	513.79
9	Nottingham Estates (Private) Limited	25 years	2.25	196.00	2205.00
10	Infrastructure Fund Zimbabwe	25 years	0.15	89.00	66.75
11	Rift Valley Properties (Pvt) Ltd	25 years	0.5	341.00	852.50
12	Moores Farming	25 years	0.175	89.00	77.88
Total Capacity (MW)	6.37				
Total energy generated (GWh)	8.04				
GHG emissions reduced (Gg CO2eq)	7.72				

2.4.1.2 IPPU Sector Indicators

Table 2.25 show the details of the selected indicators for tracking progress towards NDC implementation under the IPPU sector.

Table 2.25: Measure I1 Indicator Details

SECTOR	IPPU
Mitigation measure	Increased clinker substitution with fly ash. Up to 16% by 2030, 20% by 2050
Indicators	Amount of clinker used (t) Amount of fly ash used (t) Amount of clinker substituted (t) Amount of cement produced (t) Proportion of clinker in cement (t) Proportion of fly ash in cement Policies and Strategies GHG emissions

Reference year	2020
Characteristics	
Overview	The substitution of clinker with fly ash is partially implemented and 25% of the cement companies have started clinker substitution with fly ash whilst some have started the trials to ascertain the quality and specifications of the produced cement.
Unit of Measure	CO2 emission reduction (tCO2eq)
Type of Indicator	Quantitative/Qualitative/GHG/Non-GHG
	Data Collection
Data requirements	Amount of clinker substituted (t) Amount of cement produced (t) Proportion of clinker in cement (t) Proportion of fly ash in cement
Data sources	Khayah, PPC, Diamond, Sino, and other cement manufactures
Frequency of data collection	Annually
	Other Information
Limitations	Cement companies consider clinker substitution confidential data
Observations	Reduction in GHG emissions through clinker substitution with fly ash will increase once trials being done by other companies is finalised.

Table 2.26: Measure I2 Indicator Details

Sector	IPPU
Mitigation measure	Increased clinker substitution with blast furnace slag (BFS). Up to 16% by 2030, 20% by 2050
Indicators	Amount of clinker used (t) Amount of blast furnace slag used (t) Amount of clinker substituted (t) Amount of cement produced (t) Proportion of clinker in cement (t) Proportion of blast furnace slag in cement Policies and Strategies GHG emissions
Reference year	2020
Characteristics	
Overview	The substitution of clinker with blast furnace slag is partially implemented and 3 out of the 4 cement companies have started clinker substitution with blast furnace slag whilst some have started the trials to ascertain the quality and specifications of the produced cement.
Unit of Measure	CO2 emission reduction (tCO2eq)
Type of Indicator	Quantitative/Qualitative/GHG/Non-GHG

	Data Collection
Data requirements	Amount of clinker used (t) Amount of blast furnace slag used (t) Amount of clinker substituted (t) Amount of cement produced (t)
Data sources	Khayah, PPC, Diamond, Sino, and other cement manufactures
Frequency of data collection	Annually
	Other Information
Limitations	Cement companies consider clinker substitution confidential data
Observations	Reduction in GHG emissions through clinker substitution with blast furnace will increase once trials being done by other companies is finalised.

Table 2.27: Measure I3 Indicator Details

SECTOR	IPPU
Mitigation measure	Decomposition of N2O through use of a tertiary catalyst. Selective De-N2O catalyst results in abatement of approximately 75% of all N2O emissions produced during nitric acid production. Implementation by 2024
Indicators	Abatement and monitoring equipment installed and commissioned Amount of N2O produced Amount nitric acid produced N2O percentage decomposed Policies and Strategies GHG emissions
Reference year	2020
Characteristics	
Overview	The planned abatement project comprises of 2 parts, Abatement Technology (AT) and Monitoring Equipment (ME). The ME is set to be installed quarter 1, 2025, as the equipment was received in the country in October 2024. Procurement of the Tertiary Abatement technology would be done in early 2026.
Unit of Measure	N2O emission reduction (Gg- N2O)
Type of Indicator	Quantitative/Qualitative/GHG/Non-GHG
	Data Collection
Data requirements	Amount of N2O produced Amount nitric acid produced N2O percentage reduction
Data sources	Sable Chemicals P/L
Frequency of data collection	Annually
	Other Information

Limitations	The Monitoring Equipment (ME) is set to be installed quarter 1, 2025, as the equipment was received in the country in October 2024. Procurement of the Tertiary Abatement technology would be done in early 2026.
Observations	Emission reduction to be monitored once the monitoring equipment and tertiary abatement technology equipment are installed.

Table 2.28: Measure I4 Indicator Details

SECTOR	IPPU
Mitigation measure	HFC Phasedown schedule Kigali Amendment. Freeze 2024, 2029, 10% reduction from baseline
Indicators	Policies and Strategies Quantity of gas imported
Reference year	2020
Characteristics	
Overview	The objective is to eliminate the use of Ozone Depleting Substances HFC-134a in the domestic manufacturing of refrigerators and freezers in Zimbabwe by the adoption of isobutane (HC-600a) as a refrigerant. HC-600a is non-ODS, low GWP alternative to HFC - 134a and adoption of HC-600a will contribute to reducing the environment impact of refrigeration and freezer production on global warming both in terms of manufacturing process and the operating life of appliances.
Unit of Measure	Quantity of HFC equipment and type of gas used
Type of Indicator	Quantitative/Qualitative/GHG/Non-GHG
	Data Collection
Data requirements	Policies and Strategies Quantity of gas imported
Data sources	CAPRI, Owners of HFC appliances, ZIMRA, RAC Association, CCMD
Frequency of data collection	Annually
	Other Information
Limitations	Project implemented through programme Z010P4 and sub-programme Z010P4SP1- Agricultural Advisory & Rural Development Services), however, data not yet obtained to ascertain the progress towards HFC phasedown.
Observations	HFC emissions were at a steady state from 2019 to 2022.

Assessment of achievement of NDC targets
Project/ Mitigation Measure: Increased clinker substitution with fly ash. Up to 16% by 2030, 20% by 2050
Mitigation Target: 0.04% GHG reduction vs 2030 BAU

Table 2.29: Fly ash Production

Amount of fly ash used (t)	2021	2022	Comments
	15,218.24	30,530.72	Partially implemented: 25% of the cement companies have started clinker substitution with fly ash. Some have started the trials

The substitution of clinker with fly ash is partially implemented and 1 out of 4 of the cement companies have started clinker substitution with fly ash whilst some have started the trials to ascertain the quality and specifications of the produced cement. For the period 2021 to 2022, 14.52% CO_2 emissions reduction has been achieved.

Project/ Mitigation Measure: Increased clinker substitution with blast furnace slag (BFS). Up to 16% by 2030, 20% by 2050

Mitigation Target: 0.04% GHG reduction vs 2030 BAU

Table 2.30: Blast Furnace Slag

	2021	2022	Comments
Amount of BFS used (t)	71,207.40	71,034.40	Partially implemented: 75% of the cement companies have started substitution with blast furnace slag.

The substitution of clinker with blast furnace slag is partially implemented and 3 out of 4 of the cement companies have started clinker substitution with blast furnace slag whilst some have started the trials to ascertain the quality and specifications of the produced cement. For the period 2021 to 2022, 14.52% CO_2 emissions reduction has been achieved.

Project/ Mitigation Measure: Decomposition of N_2O emissions through use of a secondary catalyst. Selective De-N_2O catalyst results in abatement of approximately 75% of all N_2O emissions produced during nitric acid production.

Mitigation Target: 0.11% GHG reduction vs 2030 BAU

The Monitoring Equipment (ME) is set to be installed quarter 1, 2025, as the equipment was received in the country in October 2024. Procurement of the Tertiary Abatement technology would be done in early 2026.

Project/ Mitigation Measure: HFC Phasedown schedule Kigali Amendment. Freeze 2024, 2029, 10% reduction from baseline

Mitigation Target: 0.44% GHG reduction vs 2030 BAU

2.4.1.3 Agriculture and LULUCF Sector Indicator

Through a collaborative process involving FOLU sector experts, indicators for monitoring mitigation in the FOLU were developed. These indicators are mostly quantitative and can be readily expressed in terms of CO_2 equivalent. However, some indicators necessitate highly

detailed data breakdowns. *Hence*, during the assessment, not all indicators could be tracked due to insufficient data disaggregation and issues with the available data quality. The lack of comprehensive data poses challenges in accurately evaluating the effectiveness of mitigation efforts in the FOLU sector. To address this issue, it is crucial to enhance data collection methods and improve the quality of available information. Future assessments should prioritize the development of more robust data gathering techniques and the implementation of standardized reporting mechanisms across the FOLU sector.

Definitions needed to understand its NDC under Article 4

Degraded forest - A degraded forest is a forest that has lost its ability to provide goods and services to people and nature. This can happen due to human activities or natural disasters

Restoring a degraded forest is the process of improving the condition of a forest that has been damaged or lost productivity, which includes tree planting, assisted farmer management practices and woodland management

A forest area planted is a forest that is made up of trees that were established through human intervention, such as planting or seeding. Planted forests can include semi-natural forests with native species, as well as plantation forests with introduced species. The plantation planted pines and eucalyptus tree species.

Area Burnt - The area burned is the area of land affected by a wildfire

Table 2.31 and *Table* 2.32show the details of the selected indicators for tracking progress towards NDC implementation under the Agriculture and LULUCF Sectors.

Table 2.31: Measure A2 Indicator Details

SECTOR	LULUCF
Mitigation measure	Increase area of forest plantation from 68848 hectares to 118848 hectares by 2025: Add 10,000 hectares of plantation forest land per year between 2021 and 2025 (Priority 3)
Indicators	Forest plantation area planted.
Reference year	2030
baseline(s)	2030 baseline
base year(s)	2010
starting point(s)	2021
Characteristics	
Overview	Zimbabwe, under the Forest Act Chapter 19:05, Communal Lands Forest Produce Act Chapter 19:04 and Statutory Instrument 116 of 2012, promotes afforestation and reforestation initiatives by both public and private entities, ensuring increased forest cover. The timber industry in the country possesses a significant area that is temporarily unplanted. The objective is to plant all areas that are not temporarily planted using exotic tree species and meet timber demands in various sectors of the economy.
Unit of Measure and Metrics	Hectares

Type of Indicator	Quantitative
	Data Collection
Data requirements and key parameters	Landcover Statistics. Biomass data
Data sources	Zimbabwe Forestry Commission, Timber Producers Federation and FAOSTATS.
Frequency of data collection	Annually
	Other Information
Limitations	There are some private timber growers that are not registered to the Timber Producers Federation which has affected the completeness of the data set.
Observations and Recent information	A significant area was planted between 2020 and 2022

Table 2.32: Measure A3 Indicator Details

SECTOR	AGRICULTURE AND LULUCF
Mitigation measure	Reduce area burned by 500,000 hectares between 2020 and 2025 inclusive of agricultural production landscapes (Priority 2).
Indicators	Area burnt per year
Reference year	2030
baseline(s)	2030 baseline
base year(s)	2010
starting point(s)	2020
Characteristics	
Overview	Zimbabwe under the Forest Act Chapter 19:05 and Environmental Management Act Chapter 20: 27 regulates Fires within the country. Veld fires have influenced the forest structure within protected areas, communal areas, resettlement areas and private land.
Unit of Measure and metrics	Hectares
Type of Indicator	Quantitative
	Data Collection
Data requirements and key parameters	Burnt area Statistics.
Data sources	Zimbabwe Forestry Commission and Environmental Management Agency
Frequency of data collection	Annually
	Other Information
Limitations	Fire data was collected from 2010 due to limitations in Technology and Capacity.
Observations and recent information	Area burnt in 2021 and 2022 increased as compared to baseline year. To reduce area there is need to provide financial and technical support to institutional and other stakeholders

Assessment of achievement of NDC targets

Zimbabwe is actively addressing climate change in various sectors, including forestry. This work spans both national and local levels. The country asserts its efforts in sustainable forest management have met NDC goals. For details on this progress, please refer to Annex I of this document. It includes the additional CTF Table 4.

The country has restored over 11,000 hectares of degraded forests with a GEF 6 project. Numerous small initiatives have also begun nationwide. In the tobacco industry, projects are growing fast trees for wood energy. The commercial sector is reforesting unplanted areas as per NDC mitigation strategies. Additionally, a GEF 7 project is set to restore over 130,000 hectares of forests.

2.4.1.4 Waste Sector Indicators

The tables below show the details of the selected indicators for tracking progress towards NDC implementation under the Waste sector

Table 2.33: Measure W1 Indicator Details

SECTOR	WASTE
Mitigation measure	Waste to Energy: 42% of the methane generated would be collected in 2030 and used for energy production through waste to energy projects in 4 major cities
Indicators	Amount of methane generated within the landfill in kilotonnes Amount of methane recovered to generate energy in kilotonnes Policies and Strategies
Reference year	2020
Characteristics	
Overview	Waste to energy projects is earmarked for the four major cities, Harare, Bulawayo, Gweru and Mutare. Methane gas will be collected to generate electricity, and waste will be diverted from landfilling and used towards energy production
Unit of Measure	MW
Type of Indicator	Quantitative/Qualitative/GHG/Non-GHG
	Data Collection
Data requirements	Amount of waste landfilled in tonnes Amount of methane generated Amount of methane captured
Data sources	EMA, CCMD, Geo-Pomona, Harare, Bulawayo , Gweru, Mutare LAs
Frequency of data collection	Annually
	Other Information
Limitations	Missing historic information Data gaps
Observations	Need for training of private sector data providers and improved data archiving system

Table 2.34: Measure W2 Indicator Details

SECTOR	WASTE
Mitigation measure	20% of organic matter composted in the long-term
Indicators	Amount of waste composted (tonnes) Policies and Strategies GHG emissions
Reference year	2020
Characteristics	
Overview	Zimbabwe Sunshine Group is a private entity that is running a composting project which is diverting compostable waste from landfilling by producing an organic fertiliser.
Unit of Measure	Tonnes and tCO2eq
Type of Indicator	Quantitative/Qualitative/GHG/Non-GHG
	Data Collection
Data requirements	Tonnes of waste composted tCO2eq of methane mitigated
Data sources	CCMD and Zimbabwe Sunshine Records
Frequency of data collection	Annually
	Other Information
Limitations	tCO2eq of methane mitigated form the project not estimated due to lack of technical expertise

Assessment of achievement of NDCs

Mitigation measure : 42% of methane captured in landfills to be used for energy production

The waste to energy projects has not yet commenced generating energy hence there is no information available to track the 42% methane captured indicator. The projects are at different stages of the life cycle with the City of Hare being at the most advanced stage compared to the other 3 cities.

Mitigation measures: 20% of organic waste composted in the long terms

The composting project run by the Zimbabwe Sunshine Group is under implementation in Harare. Information necessary to track NDC progress was collected from ZSG to assess the progress of the report compared to the BAU scenario

According to the NDCs, 20% of the waste to be composted in the long term which will lead to a 0.45% reduction in emissions. Calculations were done using the IPCC default values and data collected from the Zimbabwe Sunshine Group records on the amounts of waste composted from 20202 to 2022. The IPCC software was used to determine emission reduction rates from the composting projects.

According to the IPCC default values, food waste and garden waste account for a cumulative 48% of waste disposed at SWDs. The population and the waste generation rate default value of

0.29tonnes per annum was used to calculate the waste disposed by the CoH at their disposal site. Food and garden waste constitute 48% of waste at SWDs according to the 2006 IOCC default values used in the inventory. As such the compostable waste disposed at the CoH SWD from 2020 to 2022 is shown below in comparison to the amount of waste composted by the Zimbabwe sunshine group.

Table 2.35: Composted waste in 2020-2022

YEAR	WASTE COMPOSTED BY ZSG (TONNES)
2020	100
2021	109
2022	143
Total	352

Table 2.36: Estimated emissions reduction

YEAR	AMOUNT COMPOSTED (IN TONNES)	EMISSIONS FROM SWDS (IN GG)	EMISSIONS FROM COMPOSTING	EMISSION REDUCTION
2020	100	0.0622969	0.0004	0.06189
2021	109	0.0679362	0.000436	0.06750
2022	143	0.089	0.000572	0.088248

In terms of emissions, the composting mitigation project has reduced emissions by 0.088248 Gg of CO2 equivalent in 2022. Cumulatively, the project has reduced emissions by 0.217 Gg.

2.4.2 Methodologies and Accounting Approaches for Tracking Progress toward Implementing and Achieving the NDC

2.4.2.1 Methodologies and Accounting Approaches in Energy Sector

Methodological Calculations for Avoided Emissions for Energy Sector

Reduction in transmission and distribution losses from 18% in 2020 to 11% in 2025

The difference between the energy supplies to the grid and the totals energy sales provided the transmission and distribution losses. The percentage change in transmission and distribution losses was estimated using Equation 1

Where X_i is the transmission and distribution losses for year 2021, 2022, 2023 etc. X_{20} is the baseline transmission and distribution losses for year 2020.

The saved energy Es in GWh for the respective year was calculated using Equation 2

Where E is the total energy supplied to the grid during the respective year.

The avoided emissions (G) in $GgCO_2$ from the energy savings were therefore calculated using the product of the Es and the grid emission factor (GEF) as shown in Equation 3. A GEF of 0.96 $GgCO_2$/GWh was assumed. (source: SAPP).

The, x, X_i, X_{20}, E_s, E and G values are given in Table 1.

Table 2.37: Avoided GHG emissions from reduction in transmission and distribution losses.

YEAR	NET ELECTRICITY SUPPLIED (E) (GWH)	NET ELECTRICITY SALES (S) (GWH)	TRANSMISSION AND DISTRIBUTION LOSSES (XI)	% LOSSES (XI)	2020 BASELINE (X20)	%CHANGE (X)	ENERGY SAVED (ES) (GWH)	AVOIDED GHG EMISSION (G) (GG CO2)
2022	10710	9225	1499	14.00%	18%	4%	429	412
2021	10193	8439	1754	17.21%	18%	1%	81	78
2020	8664	6929	1735	18.00%	18%	0%	0	0
2019	8719	7751	968	11.10%	18%	7%	601	577
2018	9748	8505	1243	12.75%	18%	5%	512	491

Expansion of Solar derived energy by 300 MW by 2025

The annual energy generated by a grid tied solar plant in 2022 was estimated using Equation 4.

$$E_i = c_i * t * h * pv\ generator\ efficiency \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 4$$

Where E is the MWh generated per annum for grid tied solar plant I, c is the size of the grid tied solar plant I, t is number of days grid tied solar plant, i was operational since 2022 and h is the number of operating hours.

The total capacity (C) in MW and energy generated from grid tied solar plants (E) in GWh were calculated as the sum of all the capacities (c_i) and energy generated (E_i) from the individual plants given by equations 5 and 6 respectively

$$C = \sum_{i=1}^{n} c_i \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 5$$

$$E = \sum_{i=1}^{n} E_i \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 6$$

Therefore, C and E values of 6.37 MW and 8.08 GWh were estimated as provided Table 2.

The avoided GHG emissions from the use of energy derived from the grid tied solar plants in 2022 were estimated using equation 7.

$$G = 0.96 * E \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 7$$

Where 0.96 is the grid emission factor in $GgCO_2$/GWh giving a G value of 7.72 $GgCO_2$.

2.4.2.2 Methodologies and Accounting Approaches in IPPU Sector

The GHG emissions inventory was compiled using the 2006 IPCC Guidelines (Volume 3). Zimbabwe's revised mitigation scenario was developed through an evaluation of the GHG emission reduction potential of key plans and policies that have been put in place in Zimbabwe since 2015.

The specific activity data, emission factors and methodologies used to quantify emissions in each source sectors are defined according to international guidelines on the quantification of GHG and air pollutant emissions. Specifically, the methodologies follow the Intergovernmental Panel on Climate Change (IPCC) 2006 emission inventory guidelines. The IPCC 2006 guidelines provide methodologies for the quantification of GHG emissions. They also recommend that for other pollutants, the European Monitoring and Evaluation Programme/European Environment Agency (EMEP/EEA) air pollution emission inventory guidebook is used.

2.4.2.3 Methodologies and Accounting Approaches in LULUCF Sector

Zimbabwe used the Nationally Determined Contribution Expert Tool (NEXT) to evaluate climate policies, actions, plans, and mitigation measures within its Nationally Determined Contribution (NDC), aiding in the reduction of greenhouse gas emissions. NEXT is in accordance with the Enhanced Transparency Framework (ETF), particularly the modalities, procedures, and guidelines (MPGs), national inventory report of anthropogenic emissions by sources and removals by the sink of greenhouse gases (GHGs) and monitoring the progress of NDC implementation and achievement under Article 4 of the Paris Agreement.

NEXT utilises a land-based accounting approach to quantify annual carbon stock changes per hectare, and methane (CH_4) *and nitrous oxide* (N_2O) emissions, expressed in tons of carbon dioxide equivalent per year (tCO_2eq/yr) over a 30-year period. It provides an estimation of the climate mitigation potential of the strategies compared to a reference scenario. NEXT was created using the Intergovernmental Panel on Climate Change (IPCC) Guidelines for National Greenhouse Gas Inventories 2006 (IPCC, 2006) and the 2013 Supplement to the 2006 IPCC (IPCC, 2013), Guidelines for National Greenhouse Gas Inventories 2006 (IPCC, 2019). The tool allows users to choose between IPCC 2006 supplemented with IPCC 2013 and IPCC 2019 supplemented with IPCC 2013. The implementation of NEXT in Zimbabwe demonstrates the country's commitment to addressing climate change and aligning it with international standards for greenhouse gas reporting. Using this tool, Zimbabwe can more accurately assess the effectiveness of its climate policies and make data-driven decisions to enhance its mitigation efforts. This approach not only supports Zimbabwe's compliance with the Paris Agreement but also provides valuable insights for policymakers and stakeholders in shaping future climate strategies. The tool was used to assess progress in addressing deforestation, afforestation, and forest fires. The tool is appropriate for tracking the indicators developed by a country to measure its progress in emission reduction.

2.4.2.4 Methodologies and Accounting Approaches in Waste Sector

The 2006 IPCC Guidelines and the IPCC software were used in accounting for emissions indicated in the inventory and for determining the emission reduction values for the composting mitigation action. Methane (CH) emissions from solid waste disposal sites (SWDS) arise from the anaerobic decomposition of organic materials. The control, placement, and management of waste at SWDSs significantly

influence CH generation, as reflected by the Methane Correction Factor (MCF). The MCF accounts for site management practices and structure, recognizing that unmanaged SWDSs typically produce less CH compared to well-managed anaerobic sites. According to the 2006 IPCC Guidelines, CH emissions from SWDS are estimated using the First-Order Decay (FOD) method, which considers the slow degradation of organic waste over several decades, generating CH and CO , along with smaller quantities of N O, NMVOCs, NO , and CO. The methodology calculates actual annual CH emissions, accounting for the prolonged decay process and the associated environmental impacts of waste management practices. Tier 1 methodology which makes use of default values was used in accounting for emissions reduction in the composting mitigation action.

2.5 MITIGATION POLICIES AND MEASURES, ACTIONS AND PLANS

Table 2.38: Policies and Measures, Actions and Plans related to mitigation

NAME	DESCRIPTION	OBJECTIVES	TYPE OF INSTRUMENT	STATUS	IPCC SECTOR	GASES	START YEAR	IMPLEMENTING ENTITY
National Constitution (Amendment No. 20)	The supreme law of Zimbabwe	Accords every person the right to an environment that is not harmful to their health and wellbeing and to have the environment protected for the benefit of the present and future generation	Regulatory	Implemented	Energy, IPPU, Agriculture, LULUCF, Waste	All	2013	Government of Zimbabwe
National Development Strategy 2021-2025	Five-year medium-term plan of Zimbabwe towards Vision 2030	Provide strategies and pathways that ensure sustainable and inclusive growth and development towards upper-middle income status by 2030	Regulatory	Implemented	Energy, IPPU, Agriculture, LULUCF, Waste	All	2021	Government of Zimbabwe
National Climate Policy	Promotes sustainability in all IPCC sector through strategies that prioritize adaptation and emissions reduction.	Create a pathway towards a climate resilient and low carbon development economy in which the people have adaptive capacity and continue to develop in harmony with the environment	Regulatory	Implemented	Energy, IPPU, Agriculture, LULUCF, Waste	All	2017	Ministry of Environment, Climate and Wildlife
National Environmental Policy and Strategy	Sets out the government's objectives and strategies for environmental protection, conservation, and sustainable development.	To ensure sustainable management of natural resources	Policy	Implemented	Energy, IPPU, Agriculture, LULUCF, Waste	All	2009	Ministry of Environment, Climate and Wildlife

NAME	DESCRIPTION	OBJECTIVES	TYPE OF INSTRUMENT	STATUS	IPCC SECTOR	GASES	START YEAR	IMPLEMENTING ENTITY
National Energy Policy (2012)	Provides a framework for the exploitation, distribution and utilisation of energy resources in Zimbabwe	Increasing access to affordable energy services Stimulating sustainable economic growth by promoting efficiency Promoting research and development in the energy sector and using of other renewable sources of energy	Regulatory	Implemented	Energy	CO2, CH4, N2O	2012	MoEPD
National Renewable Energy Policy (2020-2030)	The policy is there to increase access to clean and affordable energy	Establishing an institutional and regulatory framework for promoting uptake of Renewable Energy Improving electrification levels in a sustainable way and establishing a robust financing mechanism for funding capital intensive RE projects	Regulatory	Implemented	Energy	CO2, CH4, N2O	2020	MoEPD, ZERA
Biofuels Policy (2020)	Provides for a 2% target in the production and use of liquid bio-fuels in the transport sector up to year 2030.	Improve the viability and long term growth and sustainability of the bio-fuels sector. Ensure the maintenance of bio-fuel product quality and standards Improve the productivity and economic viability of bio-fuel feedstock production. Implement development trajectories that balance bio-fuel investments with biodiversity maintenance and water and air pollution. Implement production models that increase community benefits from bio-fuel investments and foster institutional cooperation and	Regulatory	Implemented	Energy	CO2, CH4, N2O	2020	MoEPD, ZERA

		coordination						
National Transport Master Plan (2018)	The plan was developed to support the government's goals of growth and wealth creation, and to ensure that the transport system is compatible with environmental concerns	Provide the government with a plan to sustainably develop transportation infrastructure and services Support growth and job creation Help the government plan interventions in the transport sector efficiently Provide the country with efficient and sustainable means of transporting goods and services	Regulatory	Implemented	Energy	CO2, CH4, N2O	2018	Ministry pf Transport, CVR
System development plan (ZETDC, 2017)	Provides for the development and expansion of power generation	Power supply expansion	Other, sectoral plan	Implemented	Energy	CO2, CH4, N2O	2017	MoEPD, ZERA, ZETDC
Electricity Act (Chapter 13:19)	Provides for the establishment of the Zimbabwe Electricity Regulatory Commission and for its functions and management	Create, promote, and preserve efficient industry and market structures for the provision of electricity services	Regulatory	Implemented	Energy	CO2, CH4, N2O	2003	MoEPD, ZERA, ZETDC
The Zimbabwe Energy Regulatory Authority Act (Chapter 13:23)	Provide for the establishment of the Zimbabwe Energy Regulatory Authority and Board thereof; to provide for its functions and management	Regulate the procurement, production, transportation, transmission, distribution, importation and exportation of energy derived from any energy source. create, promote and preserve an efficient energy industry market for the provision of sufficient energy	Regulatory	Implemented	Energy	CO2, CH4, N2O	2011	MoEPD, ZERA

NAME	DESCRIPTION	OBJECTIVES	TYPE OF INSTRUMENT	STATUS	IPCC SECTOR	GASES	START YEAR	IMPLEMENTING ENTITY
Rural Electrification Fund Act (Chapter 13:20)	Act for rural electrification, collection of the levy to provide for the allocation and disbursement of money from the Rural Electrification Fund.	Establish the Rural Electrification Fund and to provide for its objects, management and control Extension of the main grid Establishment of Mini grid in rural areas	Economic	Implemented	Energy	CO2, CH4, N2O	2002	MoEPD, REA
Environmental Management Act Chapter 20:27	The Act includes the right to a clean environment that is not harmful to health and to protect the environment and implementation of measures that prevent pollution.	Prevention of air pollution and environmental degradation Reduction and phasing out of F-gases	Regulatory	Adopted	IPPU Waste LULUCF	CO2, CH4, N2O, HFCs, PFC,	2003	Environmental Management Agency
Low GHG Emissions Development Strategy (LEDS)	Identifies the sources of Zimbabwe's GHG emissions and prioritises options for their mitigation in the long-term	Sets the course for reducing emissions, while at the same time ensuring sustainable socio-economic development for the country.	Other, strategy	Implemented	IPPU		2020	Ministry of Environment, Climate and Wildlife

NAME	DESCRIPTION	OBJECTIVES	TYPE OF INSTRUMENT	STATUS	IPCC SECTOR	GASES	START YEAR	IMPLEMENTING ENTITY
The Forest Act [Chapter 19:05] and the Forest Amendment Act No 4 of 2021.	Recognizes the role of forests and trees in climate change and highlights their unique ability to contribute to both climate change adaptation and mitigation.	Sustainable management of forestry resources	Regulatory	Implemented	LULUCF	CO2, CH4, N2O	2021	Forestry Commission
Urban Councils Act Chapter 29:15	Empowers urban councils to establish and enforce by-laws for proper waste management and disposal.	Councils are responsible for sewage, drainage, and waste treatment systems to prevent pollution Align with public health standards and minimize pollution, promoting sustainable urban living	Regulatory	Implemented	Waste	CO2, CH4, N2O	2005	Local Authorities

2.6 SUMMARY OF GHG EMISSIONS AND REMOVALS

Refer to Chapter 1

2.7 PROJECTIONS OF GHG EMISSIONS AND REMOVALS

Due to capacity constraints the projections of GHG emissions and removals could not be completed in accordance with Annex 3 Paragraph 92 of the MPGs. However, Zimbabwe envisages to conduct the projections in the next cycle of reporting (due December 2026).

INFORMATION RELATED TO CLIMATE CHANGE IMPACTS AND ADAPTATION UNDER ARTICLE 7 OF THE PARIS AGREEMENT

3.1 NATIONAL CIRCUMSTANCES, INSTITUTIONAL ARRANGEMENTS, POLICY & LEGISLATIVE FRAMEWORK

3.1.1 National Circumstances

The geographic characteristics, population, governance systems, and socioeconomic standing are highlighted in the preamble.

3.1.1 Institutional Arrangements

The CCMD is responsible for the development of the National Communications (NCs) and BTRs. The NCs and BTRs are coordinated by the National Coordinator who reports to the Director in the CCMD. The Vulnerability, Impacts and Adaptation chapter is coordinated by a Team leader appointed by the Government of Zimbabwe. The team leader is working with four experts from research, academia and the private sector under a Technical Working Group arrangement. In Zimbabwe, the NCs and BTR reports begin with a series of stocktaking exercises to gather relevant information as well as carry out an assessment of institutional, technical, human and financial capacity. Stakeholders from all the ten provinces participate in these consultative workshops. The issues and concerns raised in the consultative workshops are captured and fed into the final stocktaking report. The stocktaking workshops and subsequent workshops conducted during the compilation and validation of the reports follow a gender-responsive, fully participatory, transparent consultative process, considering the need of vulnerable groups, communities and ecosystems, and make use of the best available science and where appropriate harnesses indigenous knowledge systems.

3.1.2 Legislative and Policy framework and Regulation

3.1.2.1 Policy, Plans and Strategies

The Zimbabwe National Adaptation Plan (NAP) was approved by the Government of Zimbabwe on 31st July 2024 and subsequently submitted to the UNFCCC on the 25th of October 2024. The goal of the NAP is to increase the country's adaptive capacity by mainstreaming climate change into national and sub-national development planning processes. Further, the plan aims to strengthen institutional structures, coordination procedures, research, resource mobilization and implementation of adaptation options for enhanced climate resilience.

Apart from the NAP, Zimbabwe submitted her Initial Adaptation Communication to the United Nations Framework Convention on Climate Change in line with the provisions of the Paris Agreement Article 7, paragraphs 9, 10, 11 and guided by Decision 9/CMA.1. The goal of Zimbabwe Initial Adaptation Communication is to increase the country's visibility on climate change adaptation as well as to communicate progress on climate change mainstreaming in development planning.

3.2 NATIONAL LEVEL IMPACTS, RISKS & VULNERABILITIES

The economy of Zimbabwe is largely dependent on climate-sensitive sectors, making it more vulnerable to the vagaries of climate change and its impacts. Climate change is already posing a major threat to economic development, livelihoods and human well-being, impeding the realization of Vision 2030 and the Sustainable Development Goals (SDG). Realizing the threat posed by climate change and in line with the provision of the Paris Agreement, the country developed the NAP, to mainstream climate change in development planning and enhance the country's resilience to the adverse impacts of climate change. The NAP (2024) assessed vulnerability and impacts and prioritized adaptation options across seven (7) sectors namely: agriculture, water, health, tourism, forest and biodiversity, infrastructure and human settlements. In the following section, the climate hazards, vulnerabilities and the associated impacts for the seven sectors are briefly outlined.

The vulnerability was assessed based on climate hazards, exposure, sensitivity and adaptive capacity.

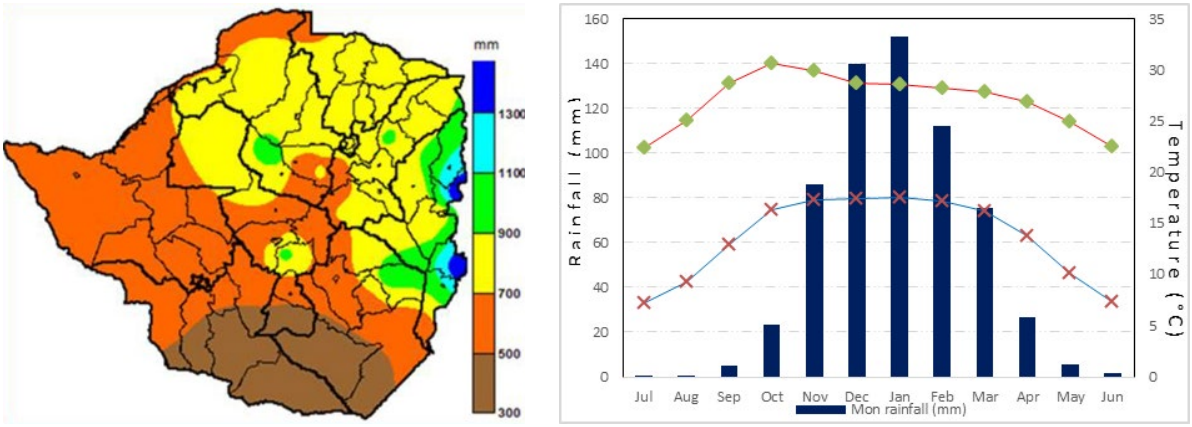
3.2.1 Zimbabwe's Climate

To conduct a climate vulnerability assessment, an in-depth appreciation of the national variation in climate is vital. This section provides a detailed assessment of Zimbabwe's past, current and future rainfall and temperature variability and patterns. Climate extremes' temporal and spatial trends, and their impacts on agriculture, water resources, forestry and biodiversity, infrastructure and human settlements, and human health are also discussed.

3.2.1.1 Rainfall

The rainfall in Zimbabwe exhibits high spatial and temporal variation in terms of intensity, distribution, frequency, time and place. The average annual rainfall is 650mm but spatially ranges from around 350 to 450mm per year in the south-eastern Lowveld to above 1,000mm per year in the Eastern Highlands. Zimbabwe has a dry season (May to September) and the wet season (Oct to Apr); However, of late there have been a shift in the start and end dates of the rainy season, as well as a rise in the frequency of intra-seasonal dry periods and general reduction in seasonal lengths. The annual rainfall over Zimbabwe has declined by about 5% since 1900 (NAP 2024).

Figure 3.1: Rainfall Spatial Distribution



(National annual rainfall (left panel) and national average monthly rainfall (bars) and monthly mean maximum and minimum temperature (lines) (right panel) for Zimbabwe for the period 1960-2019.

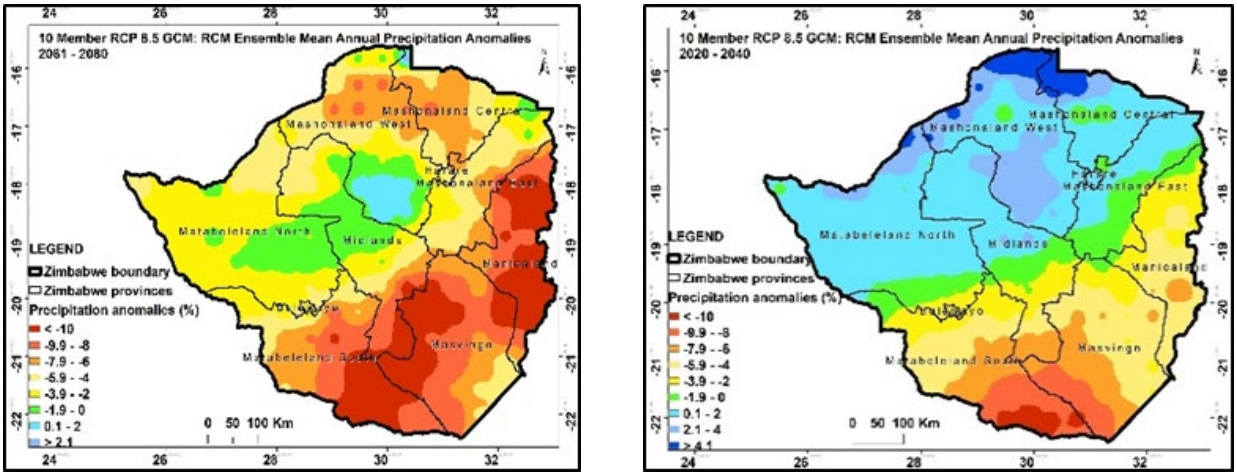
There is also a noticeable downward trend of the number of rainfall days. Additionally, there is evidence that since the late 1960s, the country's rainfall variability has grown both within and between seasons, and that droughts have become more common, severe, and extensive. However, flooding has become more common because of intense, brief, and heavy rainfall spells.

Future Rainfall Projections

a. projections of annual precipitation

Zimbabwe rainfall simulations predict that the mean annual precipitation will drop by about 10% when compared to the 1986–2005 baseline across the three future periods (2020–2040, 2041–2060, and 2061–2080) Figure 3.2

Figure 3.2: Worst Case Scenario Precipitation Predictions



Spatial distribution of Zimbabwe future change (per cent) in mean annual precipitation anomalies for the periods of 2020-2040 (panel 1) and 2061-2080 (panel 2).

The regions with the biggest decreases in precipitation are the western, southern, and south-eastern ones, which include Matabeleland, Masvingo, and the southern portions of Manicaland Province.

b. Projected Seasonal Rainfall

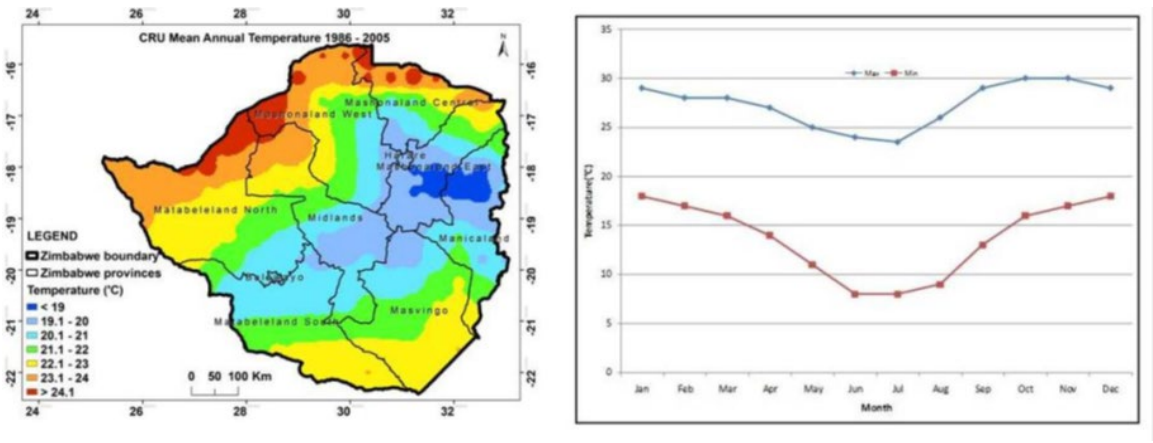
According to future September-October-November (SON) climate forecasts, precipitation across a large portion of the country is expected to reduce by around 5% between 2020 and 2040, 5% to 15% between 2041 and 1960, and Approximately 25% between 2061 and 2080. This suggests that the start of the rainfall season in November may occasionally be delayed. Precipitation is expected to decrease by 5 to 10 % during the December-January-February (DJF) season in each of the three future periods, with the country's southeast regions experiencing the biggest decrease. In the northern portion of the nation, the ensemble mean indicates a minor increase in precipitation between 2020 and 2040 (about 5%). Over much of the nation, the March-April-May (MAM) season often has a propensity for greater precipitation in all three subsequent seasons. Only the extreme southern and eastern regions of the country suffer a precipitation reduction below 5 % over 2020-2040 and 2041-2060. The results of this study point to a potential late cessation during the MAM season.

3.2.1.2 Temperature

The mean annual temperature across the country is influenced by topography. The average temperature in the low-lying regions in the southeast and north is 25°C, whereas the Eastern Highlands have mean temperatures below 19ºC. Temperature varies seasonally in both space and time, with the highest maximum temperatures occurring in October through December and the lowest minimum temperatures occurring in June or July.

In comparison to the baseline period of 1986 to 2005, the country's mean annual surface temperature increased by almost 0.9ºC between 1900 and 2018. This results in an average warming rate of 0.1ºC per ten years. Over the same time span, the national average maximum temperature has increased by roughly 1ºC. There is proof that there are more hotter days and fewer cooler days than there used to be. The warmest era in the instrument record has occurred from 1980 to the present. Cold days and freezing nights have become less common.

Figure 3.3: Temperature Variations In (A) Mean Annual Temperature and (B) Tmean Monthly Maximum and Minimum Temperature for Zimbabwe



(Source of data: Climatic Research Unit, University of East Anglia and Meteorological Services Department, Zimbabwe)

Temperature Projections

According to the global simulation models, Zimbabwe has been warming and is expected to continue warming until the 2080s. For all regions of Zimbabwe, there is extremely high confidence that mean daily minimum and daily maximum temperatures will continue to rise between 2020 and 2080. The southern and western parts of the country are projected to experience the most warming. In addition, there will be longer and more frequent heat waves, as well as more hot days and warmer nights.

The expected increase in the national average temperature by 1.5 to 3.5°C by 2080 is in line with the current trend of 0.1°C warming every decade.

3.2.1.3 Climate Extremes

Extreme climatic disasters (heatwaves, floods, and droughts) can have a big effect on socioeconomic systems.

Table 3.1 : Extreme Climate in Zimbabwe

EVENT	CURRENT	FUTURE
Drought	Drought exposure and vulnerability vary substantially throughout the country with dire consequences on communities depending on climate sensitive natural resources. Recent droughts were experienced in 2012-13, 2015-16, 2018-19 and 2023-24 seasons.	There is a significant possibility of increased occurrence of droughts with greater severity due to climate change.
Floods	Floods occur in low lying areas, overflowing dams, river confluences, and upstream (as backlash), and tropical cyclones paths (Figure 3.6, Figure 3.7). Occurrence of floods has spread to areas that were previously unaffected. Zimbabwe has been badly impacted by tropical cyclones Eline (2000), Japhet (2003), Dineo (2017), Idai 2019; tropical storms Chalene 2020, Eloise 2021, Ana 2022, and Freddy 2023.	With anticipated increase in the incidence and intensity of tropical cyclones, thunderstorms and hailstorms floods and flash floods are expected to be on the rise especially over the low-lying areas.
Heatwaves	Maximum, minimum and mean temperatures have warmed since 2000. This has resulted in prolonged hot spells that have led to very high maximum daily temperature, resulting in heat related diseases such as headaches, dizziness, heat rash.	The expected increase in the national average temperature by 1.5 to 3.5°C by 2080 result in a higher incidence of heatwaves.
Strong winds and Severe storms	According to recent meteorological observations, there has been a rise in the frequency of strong winds and severe storms that are occasionally followed by hailstones that destroy property, crops, infrastructure, and even kill people and livestock.	It is anticipated that strong winds, thunderstorms and hailstorms will occur more frequently and with greater intensity.

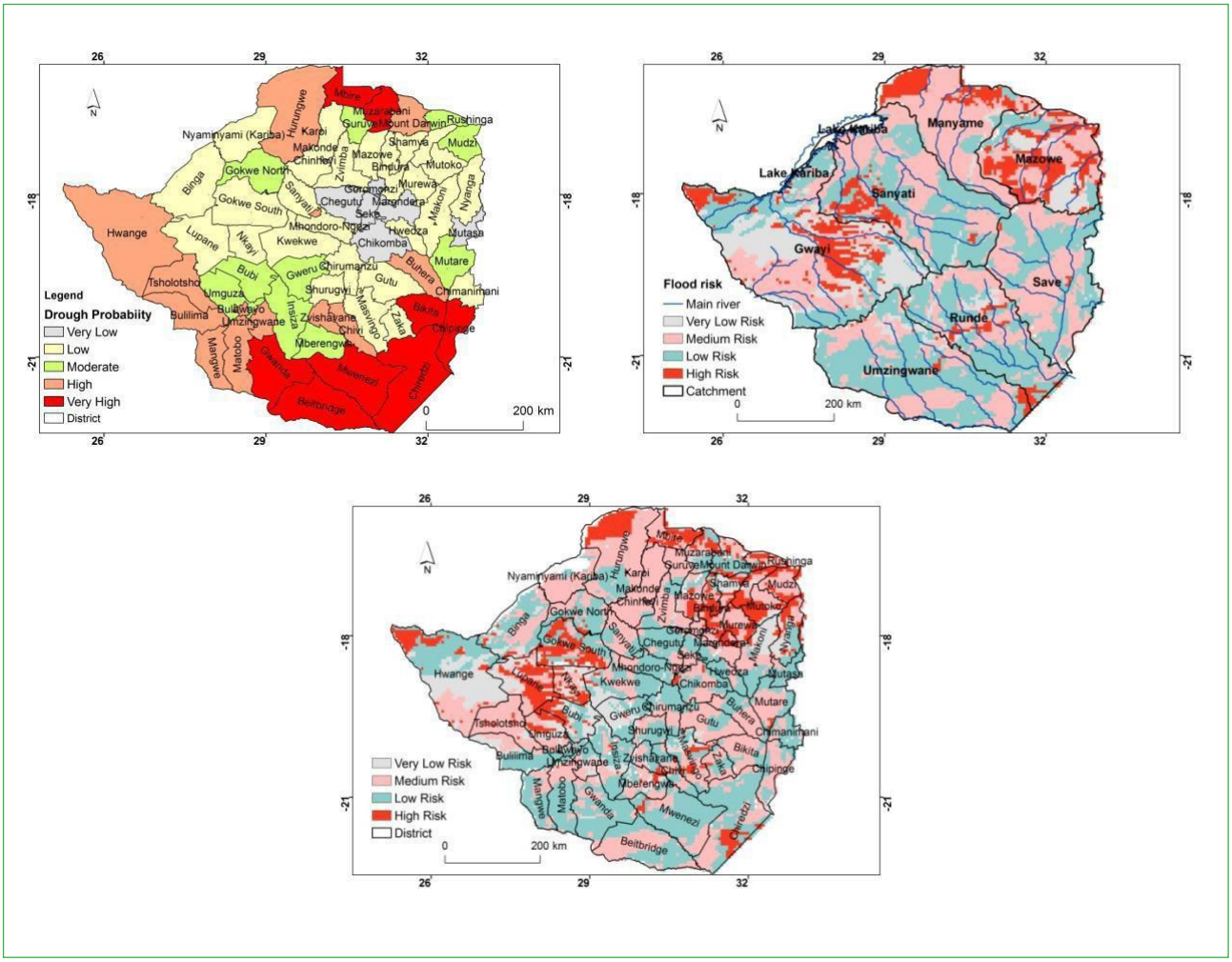
Box 3.1: Heatwaves

A heatwave is defined as a period where local excess heat accumulates over a sequence of unusually hot days and nights over a period of five days (WMO).

3.2.1.4 Assessment of Climate Hazards

Climate hazards were assessed by the frequency of exposure to drought and floods. A multi-hazard index was calculated based on the current exposure to the two hazards. As shown in Figure 3.5 the analysis revealed that the areas in southwest and northern parts of Zimbabwe are drought prone regions while areas in the northern central parts of the country are considered less prone to droughts. On the other hand, the flood probability mapping revealed that most of the areas prone to flooding are in the northeast and southern parts of the country (Figure 3.4).

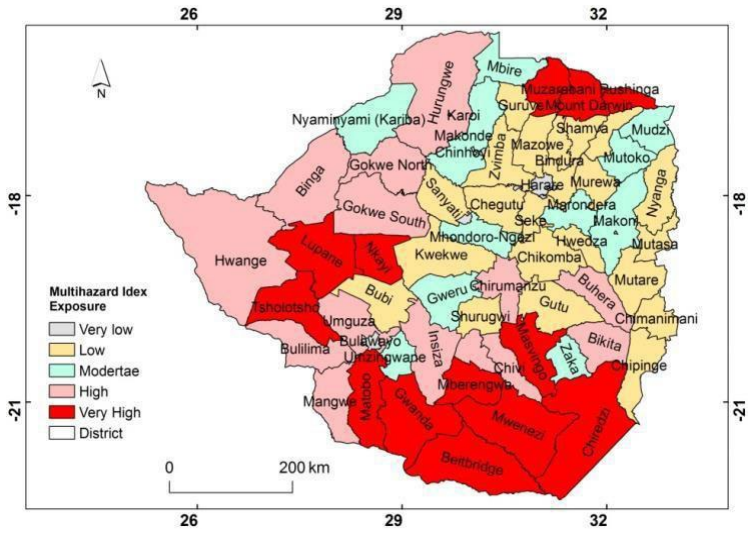
Figure 3.4 : Climate Hazard (Droughts and Floods) Maps for Zimbabwe Drought probability (top left panel); flood risk (top right panel) and flood risk per catchment (bottom panel)



[Source: National Adaptation Plan, 2024]

When the flooding and drought maps are combined into a single map, the results in Figure 3.5 show that areas in the eastern regions have the least exposure whilst the central watershed had moderate exposure. Moreover, areas located in the southern districts and the western districts, including those along the Zambezi River display relatively high vulnerability.

Figure 3.5: Spatial Variation in Exposure Based on Drought & Flood Hazard.



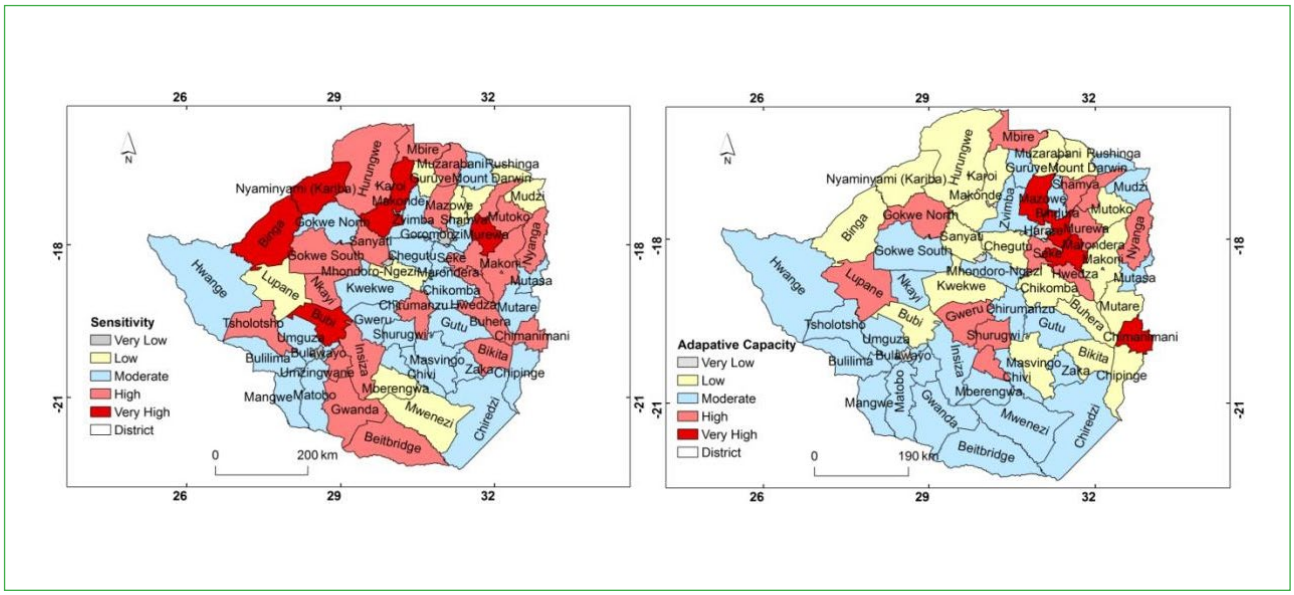
[Source: National Adaptation Plan, 2024]

3.2.1.5 Current Sensitivity and Adaptive Capacity

Vulnerability to climate change is shaped by exposure, sensitivity and adaptive capacity. Thus, to fully understand the vulnerability, it is important to consider the system sensitivity and adaptive capacity, which constitute the social vulnerability elements. In the NAP vulnerability assessment, the sensitivity index was measured from district income, and poverty indices. Meanwhile, the literacy rate and infrastructural assets, particularly accessibility to water, were used to assess the adaptive capacity. These adaptive capacity and sensitivity were determined through an inclusive, fully participatory and transparent process in line with the NCP and the Paris Agreement.

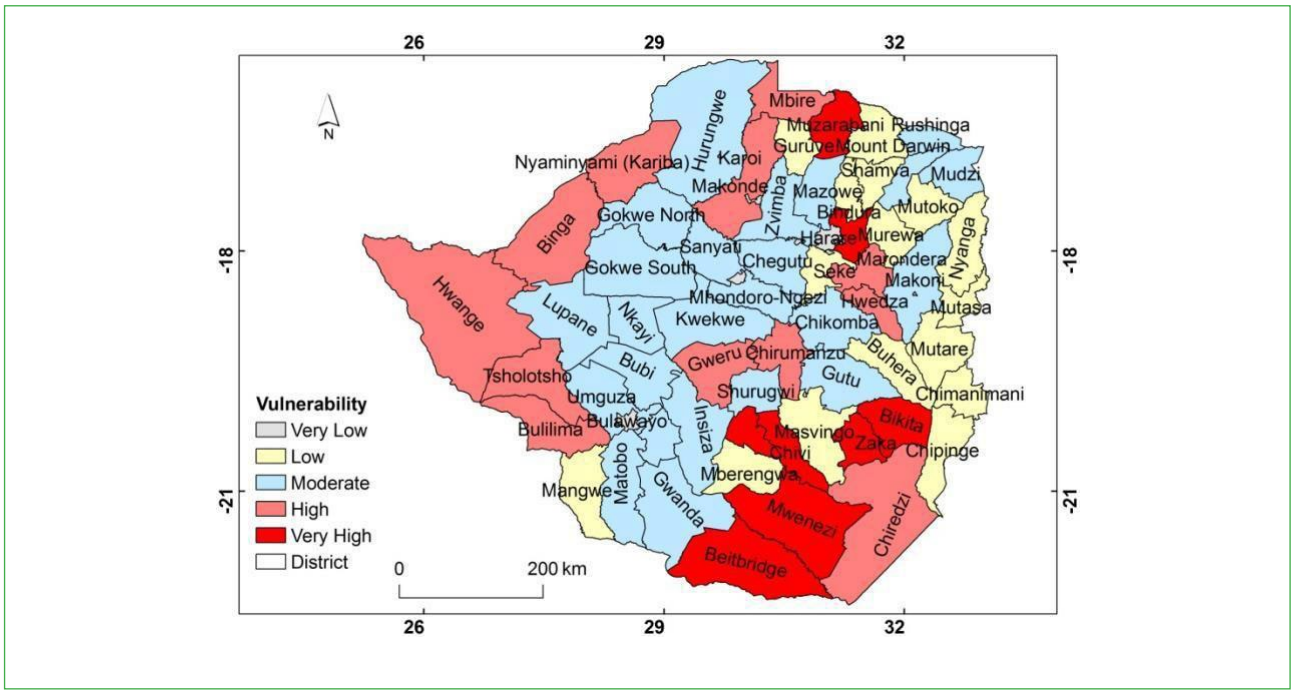
As can be observed from Figure 3.6, the results of the assessment reveal that Binga, Bubi, Kariba, and Murewa districts had the highest sensitivity, while Bindura and Shamva were among some of the districts with the lowest sensitivity. On the other hand, Gweru, Shurugwi and Lupane were some of districts with high adaptive capacity, while Sanyati, Muzarabani and Hurungwe are among some of the districts with the lowest adaptive capacity.

Figure 3.6: Variability Spatial Variation in Current sensitivity (left panel) and adaptive capacity per district (right panel)



[Source: National Adaptation Plan, 2024]

Figure 3.7: Spatial Variation in Vulnerability based on Current Climate



[Source: National Adaptation Plan, 2024]

To calculate the final vulnerability index, the NAP used vulnerability scenarios, which provide inter-linkages among the different vulnerability components. The results in Figure 3.7 show that most of the districts with a relatively high vulnerability are found in the southern and south-eastern parts of the country. They include Beitbridge, Umguza, Insiza, Hwange, Mangwe and Chirumhanzu districts. These are typically areas where high sensitivity coincides with high hazard index values, putting the districts in a dual jeopardy. The vulnerability map also

shows that generally the areas located in the central part of the country have low to moderate vulnerability.

3.2.1.6 Climate Change Vulnerabilities by Key Sectors

Water Resources

Water is a critical resource for the sustenance of livelihoods and economic development. The unavailability and scarcity of water has a ripple effect on the whole economy as it cuts across all sectors. For instance, in the agriculture sector, water is important for crop and livestock production. In the health sector, water is critical for human health to maintain good sanitation and hygiene practices. In the energy sector, water is also central to the generation of energy, predominantly thermal and hydropower energy. This energy is used to drive all the sectors of the economy. Thus, the availability and quantity of water in the inland and international rivers is important to drive the country's economy. The largest thermal and hydropower plants are in the Zambezi basin. The Zambezi River and Kariba dam also support other economic activities such as fishing, recreation and tourism, thus generating income for the tourism industry.

Evidence suggests that across all the catchments, climate change has significantly affected river discharge as some of the perennial rivers are now characterized by seasonal flows. At the same time, model projections show a general decrease in water discharge during the summer because of climate change. for all the seven catchments. This decline in summer flows will affect ecosystems and ecosystem services especially in Gwayi and Mzingwane catchments. It is very likely that other sectors, including human settlements, agriculture and industry, will be negatively affected by the water shortages. In addition to water shortages, periods of intense rainfall leading to flooding, can also cause extensive damage to water infrastructure

.

The main climate hazards identified in the water sectors include increased temperature and heat waves, frequency, length and magnitude of dry droughts and dry spells, extended dry spells; incidence of intense rainfall; erratic rainfall patterns, frequency of cyclonic activity and strong winds and spatio-temporal trends of rainfall as well as a decline in seasonal rainfall amount and length of rainfall season. The observed vulnerability from these climate hazards includes increased in a) evaporation rates, b) flooding and water logging, c) rate of siltation of reservoirs, d) water demand and e) variability of water in reservoirs and destruction of water impoundments. Other notable vulnerabilities include a decrease in a) water table, river flows, groundwater recharge and water quality.

The main impacts due to these climate hazards are a) increased damage to water infrastructure and decrease in a) quality of surface and groundwater for domestic use and b) quantity of water available for irrigation, hydropower generation and industrial use.

Human Settlements and Infrastructure

Different settlement types and infrastructure are vulnerable *to* climate hazards across the country. The vulnerability is influenced by *the* type of material used and location of the infrastructure or settlement. For districts which are prone to cyclones, infrastructure and human settlements are prone to flooding. *Table* 3.2 shows the schools and houses that were damaged during cyclone Dineo in 2017 as a result of flooding.

Table 3.2: Infrastructure damaged during Cyclone Dineo in 2017 across different Provinces

PROVINCE	SCHOOLS DAMAGED	HOUSES / HUTS
Manicaland	46	1,146
Masvingo	390	29,944
Midlands	43	4,268
Mat South	96	23,829
Total	573	59,187

In 2019, cyclone induced flooding and mudflows resulted in the destruction of 17,608 houses, while 12 health facilities, 139 schools were damaged. As a result, 33 primary and 10 secondary schools were temporarily closed while water, sanitation and hygiene infrastructure were damaged. At the beginning of the 2024/2025 season, the Department of Civil Protection reported that 59 schools had been destroyed by climate-related hazards, with Midlands Province (27) and Masvingo Province (19) being the most affected, where about 7 health facilities were also destroyed.

The destruction of bridges and roads results increases inaccessibility to essential services such as schools, health facilities and shopping centres. These facilities and infrastructure provide communities with socio-economic goods and services, especially in the rural areas, where good road networks are key to increasing productivity and profitability of the agricultural sector and accessing social services to improve the welfare of people. *Climate* change-induced flooding impedes sustainable development by decreasing the lifespan of most infrastructure and increasing rehabilitation and maintenance costs. Against this background, infrastructure and human settlements were prioritized as key pillars in the Zimbabwe NCCRS (2014). The government has already piloted climate-resilient rural housing model structures in Ward 5, Tsholotsho district, where communities that were displaced by Cyclone Dineo- induced floods of 2017.

In addition to the negative effects caused by cyclone induced flooding strong winds and intense thunderstorms and hailstorms also result in the destruction of settlements and infrastructure. For example, strong winds resulted the blowing off of roofs of schools and health facilities. In urban areas high rainfall associated with intense thunderstorms has exacerbated flooding due to decreased drainage capacity and e) land/mudslides and rock falls.

Agriculture

The agricultural sector (production of food crops, cash crops, horticultural and livestock products) is one of the sectors at the heart of Zimbabwe's economy. Yet, the sector is climate sensitive. The main climate hazards in the agricultural sector include increase in a) day & night temperatures and heat waves, b) winter temperatures, c) length of dry spells d) severity and frequency of droughts and floods e) occurrence of intense rainfall events f) cyclonic activity and strong winds. There are also shifts in the start and end of the rainfall seasons leading to shorter seasons. The agricultural sector is threatened and affected by droughts whose frequency and severity has increased recently. The drought frequency is now higher compared to the 1990 – 2000 decade This may be responsible for the depressed average national yield of the main cereal crop (maize) of 1.39t/ha. The impacts of droughts are exacerbated by low and fragmented uptake of climate smart agricultural practices as

well as unsustainable land use practices (for instance deforestation, overgrazing and cultivation on steep slopes). Such practices are the main drivers of land degradation which reduces the land's suitability for crop production. Soil erosion was reported to cause annual average loss of 1.6M tones of nitrogen, 15.6M tonnes of organic matter and 0.24M tonnes of phosphorous in the country. Since approximately 80% of agricultural production in Zimbabwe is rain-fed, the sector is very prone to climate change impacts. The recent El Niño induced drought led to decrease in food crop production of 77% compared to the 2022/ 23 season. This drought also led to 908,004 ha of maize being written off. Consequently, 58 out of 60 districts in the country had insufficient food to last until the next harvest

Extreme weather events such as flooding also result in significant loss of arable land, crop losses, and damage to infrastructure, including irrigation and dams. Examples include Makwakwa irrigation scheme in Mangwe district where infrastructure worth US$25,000 was destroyed and Mutema irrigation scheme that was destroyed by cyclone Eline resulting in the scheme operating at 10% capacity. Floods induced by cyclone Dineo led to the breaching of more than 140 community and private dams in Matabeleland North, Matabeleland South and Midlands provinces. Farmers also lose crops and livestock because of floods. Floods that were induced by tropical cyclone Ana caused crop losses of up to 80% in 12 districts over 5 provinces in the country. The main vulnerabilities related to these hazards include increased a) heat stress on crops and livestock, b) damage to agricultural infrastructure, crops arable lands, increased evaporation rates, prevalence of crops and livestock pests and weed density, rates of runoff and soil erosion and incidences of waterlogging. A decline in surface and ground water availability for irrigation and livestock watering, soil moisture availability, soil quality and length of growing period has also been observed. The main impacts of such hazards in the agricultural sector are livestock lean season deaths and crop losses. The hazards have also resulted in decline in crop and livestock productivity, the soil productivity, availability and quality of livestock feed, animal and crop health with dire consequences of rural livelihood incomes, food and nutritional security.

Forestry and Biodiversity

Zimbabwe's forests cover various ecological zones and play a vital role in biodiversity, carbon sequestration, and providing resources like timber and non-timber products. The country has a mix of miombo, mopane, teak woodlands and montane forests, which are crucial for local communities and wildlife. However, climate change poses a substantial threat to this biodiversity through affecting key phenological processes, shifts in species distributions and migrations patterns. Zimbabwe has seen a rising frequency of extreme events, including droughts, floods, and heatwaves, over the years. These have had profound effects on forestry and ecosystems. For instance, droughts have led to degradation of wetlands through unsustainable agricultural practices. This is especially concerning given that 60 % of Zimbabwe's wetlands are in communal and resettlement areas where overgrazing and unsustainable cultivation practices are prevalent. Moreover, non-climate stressors that include veld fires (*Table* 3.3), agricultural expansion, deforestation, mining activities, urbanization and poaching significantly impact forests as well as biodiversity in the country.

Table 3.3: Trends in Fire Incidences, Area Burnt, and Human Lives Lost due to Fire in Zimbabwe Between 2010 and 2023

YEAR	FIRE INCIDENCES	HECTARAGE (HA)	DEATHS RECORDED
2010	9,361	1,152,413	25
2011	6,780	713,770	5
2012	1,861	1,320,325	16
2013	1,981	1,179,274	4
2014	2,575	1,653,822	12
2015	2,464	1,510,342	16
2016	1,652	1,197,336	7
2017	2,705	1 268,534	6
2018	1,595	1,190,175	5
2019	1,508	1,158,292	4
2020	1,178	806, 458	4
2021	7,511	1, 033 ,723	8
2022	3,717	1, 753, 055	18
2023	7,511	858, 362	1

The main impacts of the climate and non-climatic hazards in the sector include increase in; a) Biodiversity loss and extinction of species; b) human-wildlife conflict; c) drying out of wetlands; forest die-back and migration of species. Additional impacts include decline in; a) ecosystem goods and services, b) availability of water for flora, fauna, ecosystem services and environmental flows; c) biodiversity richness and d) habitat and forage loss. Additional impacts include a) decreased ecosystem goods and services, b) reduced water availability for flora, fauna, and environmental flows, c) loss of biodiversity, and d) habitat and forage depletion.

Health sector

The Constitution of Zimbabwe guarantees the right to health care in Section 76. In addition, human health is a key component of the Sustainable Development Goals particularly SDG 3 and aims to ensure health and well-being for all people at every stage of life. Climate change has both direct and indirect impacts on human health. The direct impacts include heat stress, skin diseases, water-borne diseases such as cholera and diarrhoea. Indirectly, climate change threatens human health by reducing food production. For example, the increase in the frequency of droughts reduces food production in the agricultural sector resulting in increased food insecurity which is associated with high malnutrition levels manifesting itself in stunted growth and kwashiorkor. In addition, drought results in scarcity of water resulting in poor hygiene and sanitation increasing disease incidence in the country. In addition, climate change alters the range and breeding season of disease carrying vectors resulting in high disease burden such as malaria and bilharzia thereby straining already fragile public health systems.

In areas which experience flooding, there is displacement of people which may affect their mental health and increase outbreak of waterborne disease such as cholera and

diarrhoea. The impact of the health risks depends on the ability of public health systems to prepare for these changing threats. The impacts of climate change on health also depends on the extent to which other sectors which are directly linked to heath are affected.

Tourism

The tourism sector plays a significant role in the economic development of the country through employment creation, foreign currency generation and stimulating investment in infrastructure. However, the sector faces significant challenges due to climate change, which is impacting natural resources, wildlife habitats, and overall visitor experiences. For instance, rising temperatures and altered precipitation patterns are affecting the availability of water for wildlife in conservation areas such as Hwange National Park. The 2023-2024 rainfall season saw more than 160 elephants dying from an El nino induced drought. Such droughts do not only affect wildlife but other sectors, ultimately impacting attractions and general tourist experiences.

Key vulnerabilities in the sector include an increase in a) degradation of natural ecosystems and biodiversity; b) drying out of water bodies; c) damage to tourism infrastructure and d) probability of disasters. Some of the observed impacts of climate change on the sector relates to an increase in a) destination risk rating; b) migration of wildlife; c) species extinction and; decrease in a) scenic attractions and aesthetic value; b) cultural assets; c) recreational activities; d) accessibility to recreational facilities and tourist attractions; and e) revenue.

3.3 NATIONAL ADAPTATION PRIORITIES, STRATEGIES, POLICIES, PLANS, GOALS & ACTIONS TO INTEGRATE ADAPTATION INTO NATIONAL POLICIES & STRATEGIES

3.3.1 National Development Strategy 1

Zimbabwe has made substantial progress in integrating climate change into the national development processes. Zimbabwe's Vision 2030 aspiration to attain an "Empowered and Prosperous Upper Middle-Income Society by 2030" will be attained if climate change is integrated across different sectors. This however requires taking urgent action to address climate change related impacts as these might be a handicap to realise Vision 20230. Thus, the Zimbabwe National Development Strategy 1 recognises environmental protection, climate resilience and natural resources management as key enablers for the realization of Vision 2030 and the sustainable development agenda. The focus of environmental protection, climate resilience and natural resource management is on sustainable management of wetlands, the rehabilitation of degraded mined areas, climate change adaptation and mitigation and sustainable management of natural resources.

3.3.2 National Adaptation Plan

In addition, the NDS 1 prioritises mainstreaming of climate change in all national development programmes, including the national budgeting processes. The Government of Zimbabwe has since developed the National Adaptation Plan as a transformative strategy in addressing climate change by taking climate consideration in planning, budgeting, decision making in all developmental processes. The goal of the NAP is to integrate Climate change adaptation in development policies, strategies, plans programmes and activities. The two strategic priorities of NAP are i) Climate change adaptation mainstreamed and sustained; and ii) Effective

and efficient climate risk management. The NAP identified 18 priority adaptation outputs in seven sectors namely: agriculture, water, health, tourism, forest and biodiversity, infrastructure and human settlements. *Table* 3.4 shows of these priority adaptation outputs.

Table 3.4: Sectorial Adaptation Priority Outputs Identified in the NAP

SECTOR	ADAPTATION PRIORITY OUTPUTS
Agriculture	Improved weather access and to climate information services
	Climate Smart Agriculture practices adopted
	Agriculture technologies promoted
	Frameworks for sustainable intensification and commercialization of agriculture developed
	Efficient value chains and markets for crop and livestock established.
Water	Water resources developed and sustainably managed including catchment management and wetlands protection
	Water use efficient systems adopted and
Health	Integrate climate change, weather and climate information into the health surveillance and information system
	Improved research and response to climate-related diseases
Infrastructure	Increased integration of climate in spatial planning
	Populations at risk from climate related hazards relocated
Ecosystems and biodiversity	Enhanced alternative natural resource-based livelihoods options and
	Improved biodiversity and reduced habitat loss.
Tourism	promotion of Climate Smart infrastructure products and facilities
	Establishment and or support of Eco-tourism enterprises
	Adoption of Circular economy practices by the hospitality industry.

According to the National Adaptation Plan (2024) Zimbabwe requires ~USD 10,3 billion or USD 1.3 billion annually for implementing the adaptation actions between 2023 and 2030. This amount is over and above the finances that the country is receiving from treasury, bilateral and multilateral sources of funds, grants, innovative finances among others. As the Government of Zimbabwe implements its National Adaptation Plan, which is hinged on mainstreaming climate change in development planning, Treasury has, since 2022, consistently set aside budgetary allocations for climate change management.

3.3.3 Adaptation Actions Leading to Mitigation Co-Benefits

Adaptation to a changing climate is an over-riding priority issue for Zimbabwe considering its high climate risk profile. Thus, in the Zimbabwe Revised NDC (2021) the country has prioritized four adaptation measures, all of which have some mitigation co-benefits. The following section provides an overview of the adaptation actions and the corresponding mitigation co-benefits.

a) Develop, implement and scale-up climate smart agriculture solutions and strengthen the resilience of agricultural value chains and markets

Under this priority, Zimbabwe is promoting the widespread adoption of Climate Smart Agricultural practices and strengthening the resilience of agricultural value chains and markets to build the resilience of the agricultural systems to climate change. This action will improve the adaptive capacity of agricultural systems through increasing resource use efficiency in agricultural production and providing anticipatory planning in agriculture by using weather and climate forecasts and tailoring agricultural production accordingly. These actions have mitigation co-benefits. The widespread and sustained adoption of CSA would increase resource-use efficiency and increase the capacity of soils to sequester carbon. At the same time, the incorporation of legumes will reduce nitrogen fertilizer requirement, leading to decrease in nitrous oxide emissions.

b) Enhance early warning and climate-related disaster risk reduction systems (including information management systems)

Under this measure, adaptive capacity will be improved through improved access to information on future climate events as well as improving capacity to anticipate, prevent and manage the consequences of climate shocks. This would reduce the impacts of climate hazards among the vulnerable groups in disaster-prone areas.

c) Ensure climate-resilient infrastructure and design

This measure is expected to increase the resilience of infrastructure across all sectors through climate-proofing the infrastructure design and development. The measure has mitigation co-benefits as the actions are expected to reduce the costs of refurbishment and reconstruction, thus avoiding emissions in these actions. Apart from this, this measure promotes the use of renewable energy sources.

d) Develop and promote resilient water resources management

The above measure is expected to build institutional and technical capacity to better manage water resources and reduce the sensitivity of the water sector to climate change. Women, who are responsible for fetching water for household use, spend a significant amount of time fetching water, thus depriving them of the opportunity to do other essential income generating activities. If water is available, women will be freed to do other productive activities, thus improving their welfare. This action has mitigation co-benefits. If water is available, there is energy saving in water provision. At the same time, if water is available, the health of pastures and vegetation in general would be improved, leading to improved carbon sequestration capacity.

3.3.4 Adaptation Challenges, Gaps, and Barriers to Adaptation

Despite the country making significant progress in adaptation to the impacts of climate change, substantial gaps still exist and require attention. *Table* 3.5 shows adaptation barriers and possible solutions to address these constraints:

Table 3.5: Adaptation Barriers and Possible Solutions to Address these Constraints

BARRIERS, GAPS & CONSTRAINTS	POSSIBLE SOLUTIONS
Limited knowledge and awareness about climate change and its impacts	Raise stakeholder awareness about climate change and its impacts
Limited capacity by stakeholders to mainstream climate change in sectoral development plans	Continue to train and strengthen capacity to mainstream climate change in developmental planning at national and sub-national levels in Government Ministries, Departments and Agencies, local authorities, Provinces and Districts and other key actors.
Limited financial resources to implement adaptation actions	Mobilize climate financial resources to implement adaptation actions through designing a comprehensive domestic and international resource mobilization strategy.
Limited private sector participation in adaptation initiatives	Explore opportunities for more business streams in adaptation and incentivise private sector for their efforts in climate adaptation
Limited technical capacity to generate, analyse, interpret and utilize data to inform adaptation analysis and costing	Build capacity to generate, analyse, interpret and utilize data to inform adaptation analysis and costing
Limited multi-disciplinary, citizen-led adaptation research, innovation and technology development and transfer	Enhanced multi-disciplinary, citizen-led climate change adaptation research, innovation and technology development and transfer

3.3.4 Monitoring and Evaluation and Progress on implementation of Adaptation Actions

Zimbabwe has a National Monitoring and Evaluation System under the Office of the President and Cabinet. The National Monitoring and Evaluation System monitors and evaluates the implementation of all projects and programs in the country. However, given that the current system is project based, the NAP M&E will be used to track progress in the implementation of the adaptation options identified for all the sectors. Efforts are currently under way to strengthen institutional arrangements for data collection under the CBIT Phase 2 project to enhance the country's reporting capacity under the ETF. The M&E can be used to inform best practices, drawing lessons learnt from "road-tested" adaptation actions across all sectors.

3.3.5 Cooperation, good practices and lessons learnt

3.3.5.1 Science, planning and policies relevant to adaptation

The Zimbabwe National Climate acknowledges that adaptation should be country-driven and should be based on sound scientific knowledge, including Indigenous Knowledge Systems (IKS).

3.3.5.2 Integration of adaptation actions into planning at different levels

The NDS recognises the importance of improved climate action for building the resilience of ecosystems and communities that are vulnerable to climate change. At the same time, the Zimbabwe's adaptation is guided by the National Adaptation Planning, which seeks to integrate climate change into development planning, decision-making, planning and budgeting.

3.3.5.3 Cooperation to share information and to strengthen science, institutions and adaptation

In 2024, Zimbabwe hosted the Inaugural Climate and Health Africa Conference (CHAC2024). The conference was organised by the Centre for Sexual Health and HIV/AIDS Research (CeSHHAR) in collaboration with the Ministry of Environment, Climate and Wildlife and the Ministry of Health and Child Care. The conference, which ran under the theme "Cultivating resilience in health: towards unified equitable strategies for climate adaptation and mitigation in Africa", was to share innovations, lessons, best practices, and solutions that enhance climate-resilience in health systems.

Zimbabwe acknowledges the importance of cooperation and shared planning for equitable and sustainable futures not just internally but across national boundaries. For instance, Zimbabwe is a signatory to the SADC Revised Protocol on Shared Watercourses of 2000 which is aimed at fostering co-operation among members for the judicious, sustainable and co-ordinated management, protection and utilisation of shared watercourses. The country is also party to three river basin organisations in which it actively participates. These are the Limpopo Watercourse Commission (LIMCOM) for the Limpopo basin shared between Botswana, Mozambique, South Africa and Zimbabwe, the Zambezi Watercourse Commission (ZAMCOM) for the Zambezi River Basin shared between Angola, Botswana, Malawi, Mozambique, Namibia, Tanzania, Zambia and Zimbabwe and finally, the Buzi, Pungwe and Save (BUPUSA) Watercourses Commission for the three basins shared between Mozambique and Zimbabwe. The country is also party to the Joint Water Commissions with Mozambique and South Africa, and these have been instrumental in driving cooperation between the countries. This includes the recent Agreement between South Africa and Zimbabwe on the transfer of treated water from Beitbridge Water Treatment Works in Beitbridge Town to Musina Town in South Africa which demonstrates the importance of water cooperation through facilitation of water transfer schemes across borders. Zimbabwe is also an active member of the "African Minister's Council on Water" (AMCOW) and has been nominated to be the Southern Africa Regional Chair starting from 2025 both at the ministerial and technical levels. This regional cooperation is a vital tool for the creation of vast opportunities particularly in convergent development pathways, inclusive of the holistic water management approach through regional integration and shared valuation of the suite of water resources values.

3.3.5.4 Research and systematic observation and early warning systems, to inform climate services and decision-making;

Zimbabwe contribution to the global hydrometeorological networks, which is vital for strengthening a coordinated responses to climate extremes, thus increasing adaptive capacity and reducing vulnerability is covered in detail Chapter 6 of this report. Zimbabwe is signatory to the SADC Climate Change Strategy and Action Plan, which among other action seeks to develop a regional framework for research to increase climate-resilience.

3.3.5.5 Monitoring and evaluation

In 2024, the 44th SADC Summit was held in Zimbabwe. In his acceptance speech as the SADC Chairperson during the SADC Summit held in Harare on 17th August 2024, the President of the Republic of Zimbabwe, His Excellency Dr. Emmerson Dambudzo Mnangagwa, urged member states to build robust climate change adaptation strategies as well as climate-proofing all the climate-sensitive sectors, including agriculture, manufacturing, tourism and Small and Medium Scale Enterprises. Furthermore, the SADC Summit "urged Member States to continue monitoring weather and climate risks, including the forecasted La Niña event and develop contingency measures to mitigate the impact of disasters".

3.4 CASE STUDY: TSHOLOTSHO DISTRICT IMPACTS, RISKS & VULNERABILITY

3.4.1 Introduction

The Second National Communication (SNC) assessed climate change vulnerability, impacts and adaptation strategies in Zimbabwe and identified hotspot in the country. Based on the identified hotspots, the Government then decided that each subsequent NC should have a detailed focus on one hotspot area where in-depth vulnerability, impacts and adaptation in strategies will be assessed. Subsequently, the Third National Communication (TNC) assessed climate change vulnerabilities, impacts and adaptation strategies in Zimbabwe, with a detailed focus on Chiredzi district in Masvingo Province. The Fourth National Communication had a special focus on Muzarabani district located in Mashonaland Central Province, northern Zimbabwe. Thus, this Fifth NC focuses on Tsholotsho District located in Matabeleland North Province, northwest Zimbabwe.

The decision by the Government of Zimbabwe to focus on specific climate change hotspots was to enable context-specific resilience and adaptation programming. This aligns with the country's devolution agenda. Such an approach enables the mainstreaming of climate change in development planning at the lowest administrative level (i.e., ward) particularly, climate-proofing investments, through developing ward-based adaptation measures. Moreover, the results can be used by funding agencies for accessing funding instruments (for instance, the Green Climate Fund). Lastly, these assessments are critical to the formulation of national climate policies which adequately address the county's vulnerability to climate change.

3.4.2 Study Area

Tsholotsho district, located in Matabeleland North province, is made up of twenty-two (22) administrative wards with approximately 26 668 households and an average household size of 4.3 people. The total population in the district was approximately 115,782 (46.5% male) and 53.5% female) according to the population and housing census of 2022. The district lies predominantly in the agro-ecological region IV characterised by a semi-arid climate, receiving between 450 to 550 mm of rainfall annually. This region primarily supports the cultivation of drought-tolerant crops such as millet, sorghum, and the ultra-early maturing maize varieties. Most soils, save for those in low-lying areas along the flood-prone areas, are often considered marginal for agriculture. The district is exposed to extreme climate events such as droughts and floods. Floods have especially affected communities located in very low-lying areas along the riverbanks of Gwayi, Manzamnyama and Zombani rivers. Thus, adoption of climate smart management practices is critical for sustaining agricultural productivity in this district.

Climate change is one of the drivers for migration of communities in Tsholotsho district. The preferred destinations in southern Africa are Botswana and South Africa. However, at national level the top five preferred destination countries are South Africa, the UK, Malawi, Australia, and Botswana. Although figures are not available at the district level, at national level, the remittances are making substantial contribution to foreign currency receipts. For instance, remittances have played a pivotal role in the increased in export receipts received in the first half of 2024. These remittances, which are deployed in the areas of food security, hard infrastructure development especially construction of houses, play an important role in improving human welfare in Tsholotsho district.

3.4.3 Data collection

A combination of data collection approaches was used to characterise vulnerability, impacts and risks across sectors in Tsholotsho. These included Focus Group Discussions, Key Informant Interviews, secondary data sources such as published reports and databases. The study also included participatory mapping exercises to visualize the geographical distribution of vulnerabilities and risks. In conducting the FGDs and Key Informant Interviews, the interviewers ensured that issues of gender and inclusivity were considered through representation of different social groups including youth, men, women, and people living with disabilities. Community members actively engaged in identifying key resources, hazards, and coping strategies, which provided invaluable local insights that complemented the qualitative and quantitative data gathered through the other methods.

3.4.3.1 Data Sources

Table 3.6 provides a list of data sources used in undertaking the vulnerability, Impact and risk assessment for the focal district.

Table 3.6: Data and Data Sources

DATA	DATA SOURCES
Climate data (Rainfall, Runoff, Evaporation, droughts and flooding	ZINWA, Master Plan (draft), MSD
Water sources	ZINWA, Tsholotsho RIDA, Nata and Upper Gwayi Subcatchment Councils
Water supply	ZINWA, SDGs, interviews
Borehole yields	ZINWA, Rural Wash Information System (RWIMS), RIDA, Nata and Upper Gwayi Subcatchment Councils, interviews
Socio-Economic	ZIMSTAT (2022), interviews
Crop pests and diseases	Ministry of Lands, Agriculture, Fisheries, Agricultural and Rural Development Advisory Services, Interviews
Livestock pests and diseases	Veterinary Services Department, Interviews
Grain yield	Ministry of Lands, Agriculture, Fisheries, Water and Rural Development, Agricultural and Rural Development Advisory Services, Interviews

DATA	DATA SOURCES
Cattle lean season deaths	Veterinary Services Department, Ministry of Lands, Agriculture, Fisheries, Water and Rural Development, Interviews
Condition of pastures	Veterinary Services Department, Ministry of Lands, Agriculture, Fisheries, Water and Rural Development, Agricultural and Rural Development Advisory Services, Interviews, personal observation
Agricultural insurance	Interviews
Gender asymmetric	ZIMSTAT, Interviews, Ministry of Women Affairs, Community Small and Medium and Enterprise Development
Human-wildlife conflict	Agricultural and Rural Development Advisory Services, Interviews, Tsholotsho RDC)
Socio-economic status	ZIMSTAT (2022), Social Services Department, Interviews
Health sector	
Diseases occurrence	Ministry of Health, interviews, literature review, observations,
Health infrastructure	Ministry of Health, Rural Infrastructure Development Agency, interviews, literature review, observations,
Access to WASH	Ministry of Health, Rural Infrastructure Development Agency, interviews, literature review, observations,
Socioeconomic	Social Services Department, Interviews
Infrastructure and Human settlements	
Socioeconomic	Social Services Department, Interviews
Infrastructure exposure, impacts and adaptation	Local Authority, Social Services Department, Interviews
Ecosystems and Wildlife	
Socioeconomic	ZIMSTAT (2022), Social Services Department, Interviews
Exposure, impacts, vulnerability and adaptation	Forestry Commission, EMA, local authority and interviews
Climate	
TMAX	CRU Dataset University of Anglia/Zimbabwe Meteorological Services Department, interviews
TMIN	CRU Dataset University of Anglia/Zimbabwe Meteorological Services Department, interviews
PRE	CRU Dataset University of Anglia/ CHIRPS Dataset /Zimbabwe Meteorological Services Department, interviews
Maps	NAP Report

3.4.4 Vulnerability, Impact and Risk Assessment

The vulnerability of different sectors to climate change was characterised using the IPCC Vulnerability Framework (Vulnerability= (Exposure + Sensitivity)-Adaptive capacity). This evaluation approach has been used in the NAP for Zimbabwe, Second, Third and Fourth National Communication reports. For the Forestry and Biodiversity sector, the vulnerability was assessed following the method by Sajjad et al., 2024. After an evaluation of the vulnerability of each sector, key priority interventions were identified through stakeholder engagement.

3.4.5 Climate Profile

Tsholotsho is characterised by a subtropical climate with distinct seasonal variations. The climate is influenced by its location in the Kalahari Basin, with cold air masses from the south and warm air from the equator. The elevation ranges from 900 to 1,200 meters. Rainfall and temperature characteristics in the districts are highlighted in *Table 3.7*

Table 3.7: Tsholotsho Climate Characteristics

SEASON	PERIOD	RAINFALL CHARACTERISTICS	TEMPERATURE CHARACTERISTICS
Summer	November to March	Most rainfall occurs during this season, ranging from 450-550mm.	Hot, with average highs around 32°C and lows around 20°C.
Winter	June to August	Driest season, with minimal rainfall.	Cool, with average highs around 22°C and lows around 8°C.
Autumn	April to May	Mostly dry	Mild, with average highs around 25°C and lows around 15°C
Spring	September to October	Dry season	Mild, with average highs around 25°C and lows around 15°C

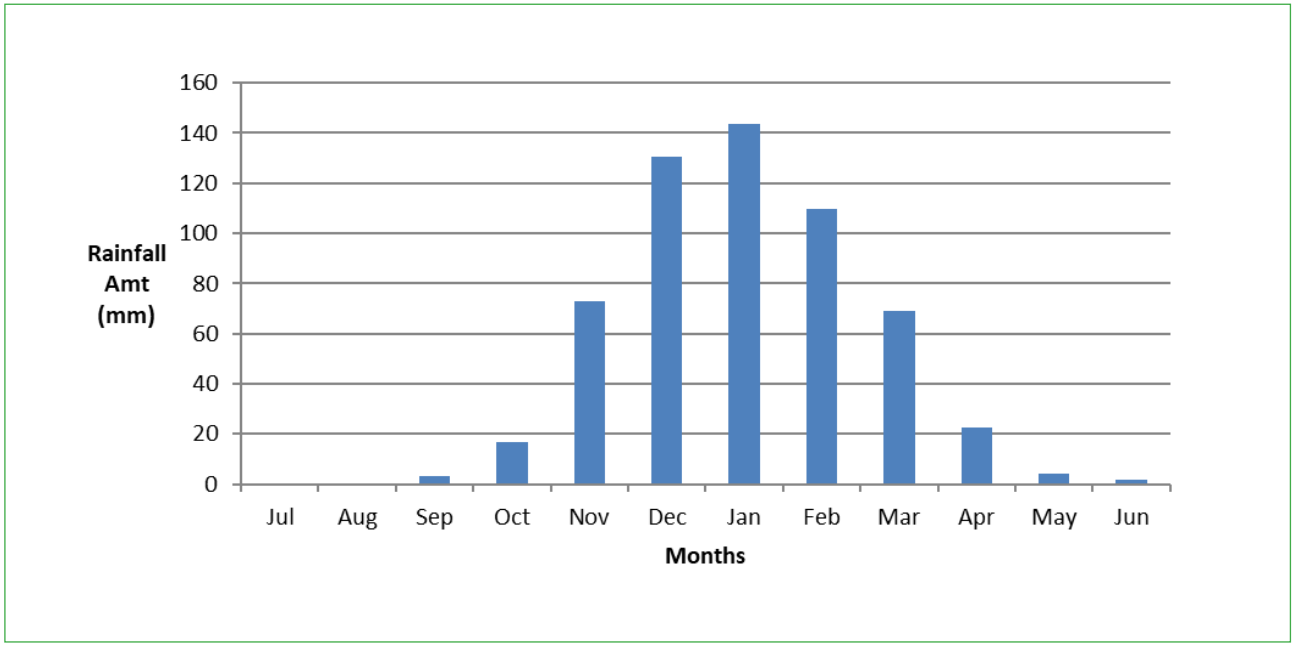
The historical and future projections for both rainfall and temperature are depicted in *Table 3.8*

Table 3.8: Tsholotsho District Climate Change - Current and Future Projections:

METEOROLOGICAL PARAMETER	CURRENT	FUTURE PROJECTIONS
Rainfall	Decrease in rainfall due to high incidences of droughts and prolonged dry spells (length 10 to 19 days). They are notable shifts in start of season and end of season dates. This is supported by the findings from the FGDs and KIs that acknowledge that the lengths of rainy seasons have shortened because of late start to the seasons and early cessation of the rains.	Decreases of 15% by 2060 and 25% by 2080. Rainfall patterns are projected to become more unpredictable, with longer dry spells and increased frequency of flooding. The onset of the rains is expected to change, with the rains coming in late most of the times.
Temperature	Mean temperature has been observed to have a warming trend. The communities have also observed warmer temperature.	Mean Temperature is projected to warm by 1.5 to 3.5°C by 2080. Temperatures in Zimbabwe are expected to rise, with both maximum and minimum temperatures increasing.

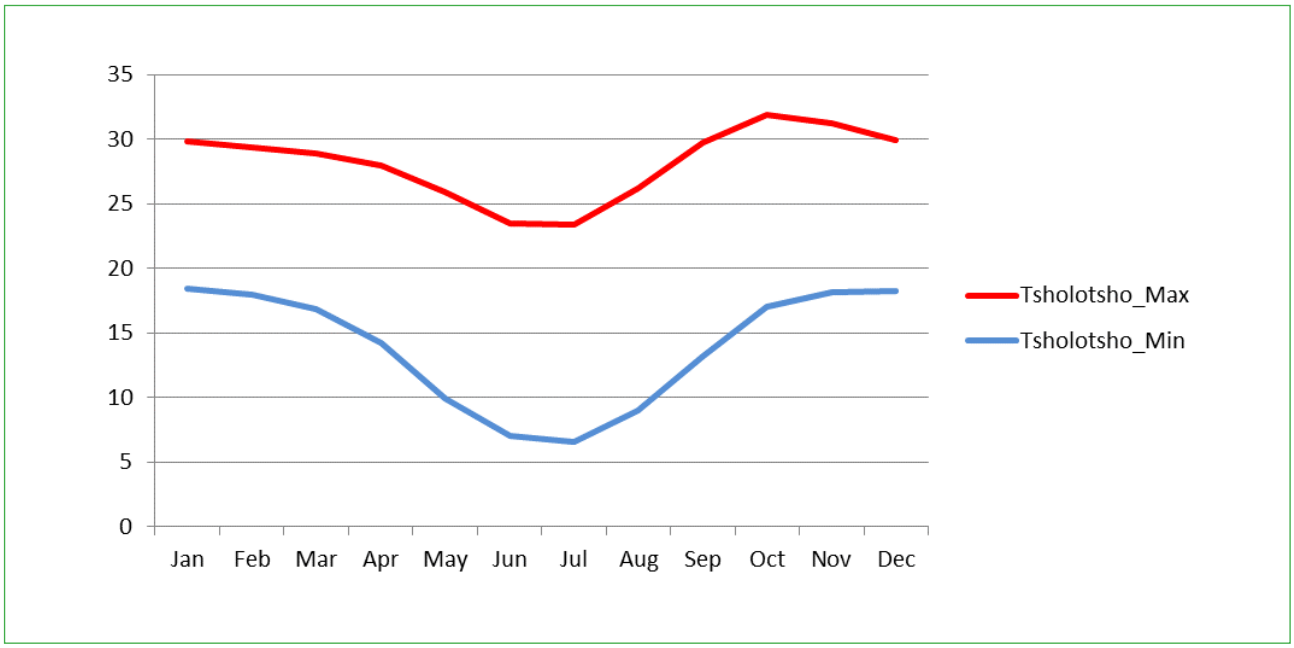
The temporal mean seasonal rainfall for Tsholotsho is presented *Figure 3.8*. Tsholotsho district receives about 70% of its rainfall from December through to February (DJF season), coinciding with the prevailing north-westerly flow peak in the area.

Figure 3.8: Tsholotsho Mean Seasonal Rainfall (1980-2022 seasons based on CRU dataset)



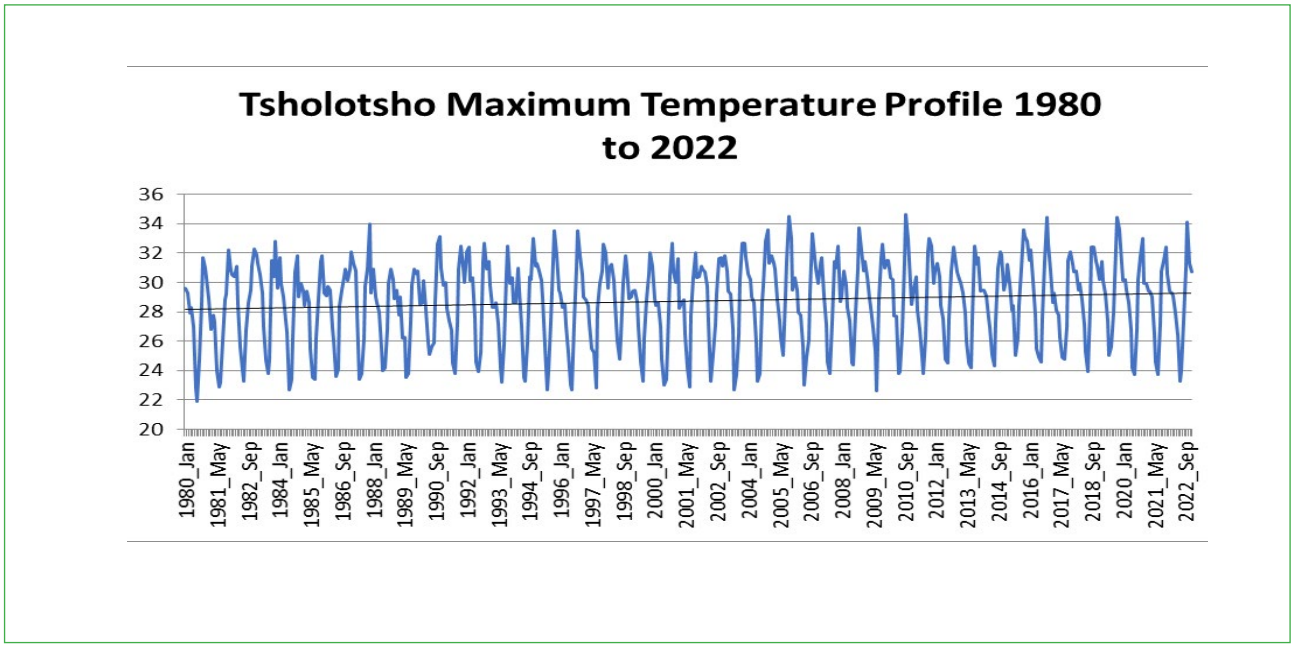
The temporal maximum and minimum temperature variations are depicted in Figure 3.9. Lower minimum and maximum temperature values are recorded from June to July, and higher values October through to November.

Figure 3.9: Tsholotsho Maximum and Minimum Temperature (1980-2022 CRU dataset)



The maximum temperatures in the district show a warming trend according to recent meteorological data from the Zimbabwe Meteorological Services and CRU data analysed for the period 1980 to 2022

Figure 3.10: Tsholotsho Warming Trend from 1980 to 2022 using Maximum Temperature Profile



Mean monthly maximum temperatures above 34 degrees Celsius have become more frequent since 2005.

3.4.6 Climate Hazards & Risks

Tsholotsho District is one of the climate hotspots in Zimbabwe. The district experiences acute climate extremes (*Table 3.9*). The district is exposed to climate change hazards such as droughts. floods. heatwaves. severe thunderstorms and strong winds. (*Table 3.7*). These climate hazards affect the agriculture, water, health, tourism, human settlements and infrastructure, ecosystems and biodiversity.

Apart from the low flows because of reduced rainfall and perennial drought, the district is also experiencing floods as mentioned earlier. Most of the floods are concentrated along the Gwayi and Manzamnyama rivers. Villagers in ward 5 along Gwayi river had to be relocated and had new houses built in Ward 4. However, the same villagers who were relocated to higher ground have since returned to the low- lying villages due to availability of fertile soil and moisture from the Gwayi river which supports subsistence agriculture. Gariya dam, was also breached by floods cause by the same cyclone

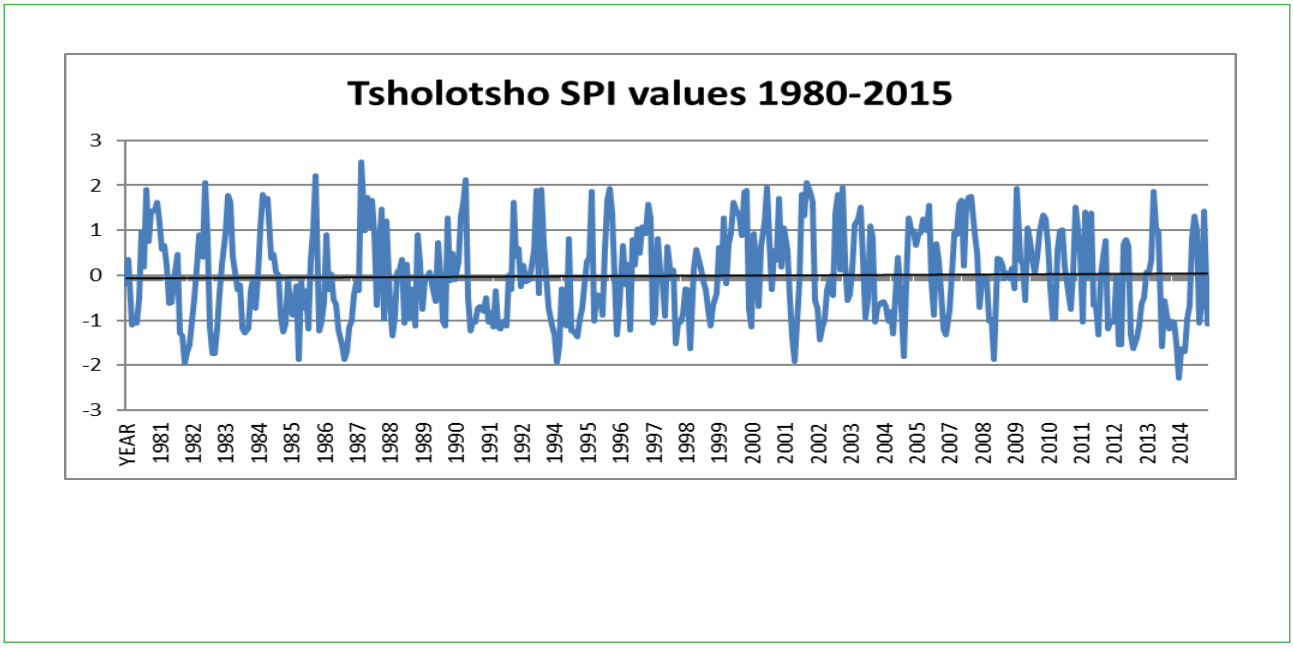
Table 3.9: Main Climate hazards affecting Tsholotsho District

MAIN CLIMATE HAZARDS	CURRENT	FUTURE PROJECTIONS
Floods	Floods are prone in the low-lying areas and along the Gwayi Riverbanks. The district has been affected by floods since 1974. The 2013-14 and 2016-17 seasons floods are the most recent to affect the area.	Increase in flooding due to likely increase in violent thunderstorms, hailstorms activities in and around the district.
Cyclones	Cyclones are now a recurrent phenomenon in the district. In 2017, cyclone Dineo caused flooding in the district, where people and livestock were marooned and infrastructure such as roads dams and houses were destroyed	Cyclones are anticipated to increase in frequency and severity.
Drought	According to meteorological records the district has a high probability of experiencing droughts. The district was recently affected by droughts, for example, in the 2012-13, 2015-16, 2018-19 and 2023-24 seasons. This was also reiterated by the community members who strongly agreed that the district experiences frequent droughts.	Droughts are likely to be on the increase in terms of frequency and intensity. The local communities perceive increases in droughts.
Dry spells	Long dry spells (lengths of 10 to 19 days) are experienced in the district. This was corroborated by the locals through the FGDs and KIs interviews.	With the projected decrease in the rainfall amounts, incidence of prolonged dry spells is likely.

MAIN CLIMATE HAZARDS	CURRENT	FUTURE PROJECTIONS
Heat waves	Maximum temperatures have been observed to be increasing thereby giving rise to heatwaves. The FDGs and KIs findings also support this assertation.	With warming, an increase in the frequency of heatwaves is very likely in future.
Strong winds	Strong destructive winds are common in the district. The communities identify wind belts in their areas. At least one school in each of the study areas had a roof blown off.	These are likely to continue affecting the district with increased frequency and intensity.

The severity of droughts in the district was characterised by the standardised precipitation index (SPI). The index is a standard anomaly from the long-term mean. Positive values indicate rainfall amounts above the long term mean which indicates a good season while the negative values indicate a drought condition. The higher the negative deviation, the more severe the drought.

Figure 3.11: The Occurrence of Drought Severity using Standardized Precipitation Index (SPI)



Communities in Tsholotsho have limited access to meteorological forecasts. However, the communities use various IKS to forecast weather. For instance, the behaviour of birds, wind direction and wild fruits are some of the indicators used to forecast the season. In a wet year, the presence, singing and movement of white stocks indicate the coming of heavy rains. Moreover, the abundance of wild fruits such as untundulula (*Facourtia indica*), umhakawuwe

(*Securinga virosa*), and isigogwane (*Pappea capensis*) just before the rainy season signifies wet season. On the contrary, in a drought year, farmers do not observe any signing nor movement of the white stocks. At the same time, very few, if any wild fruits are available prior to the start of season.

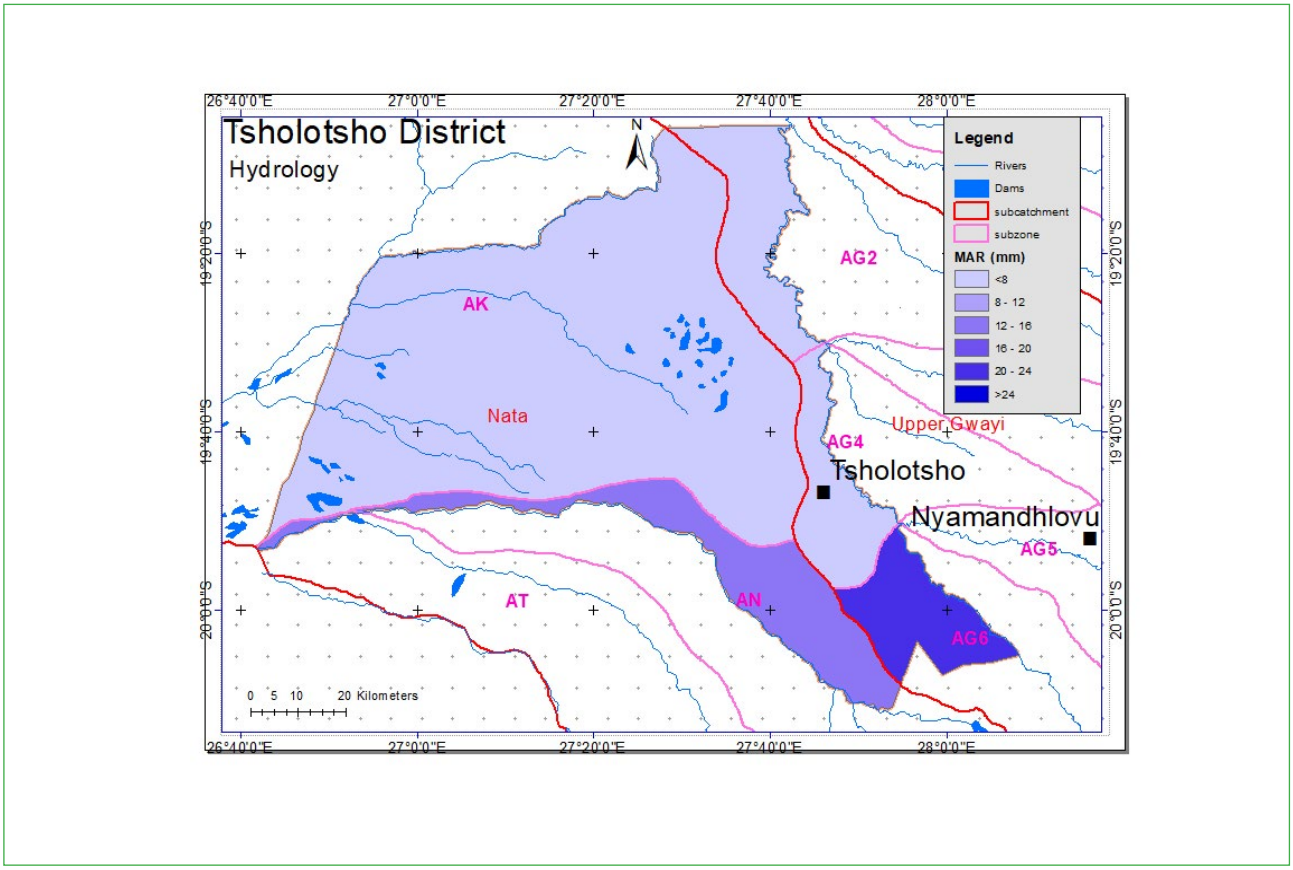
Therefore, to build locally led and co-produce climate adaptation and resilience building programmes in line with the National Climate Policy, it becomes critical to integrate IKS in formal scientific forecasts. However, communities indicated that IKS is under threat due to limited documentation, disappearance of some key biological indicators, and lack of recognition of IKS, particularly by the youths.

3.4.7 Sector Vulnerability, Impacts & Adaptation in Tsholotsho district

3.4.7.1 Water Resources

Tsholotsho district falls within Upper Gwayi and Nata subcatchments of the Gwayi catchment. There are four subzones which make up the 2 subcatchments in the district. The district receives 573mm (CV of 33%) of rainfall and experience evaporation of 1,950mm per annum. The annual runoff in the district ranges from 5mm (Gwabazaboya) to 26mm (Mgusa) with a mean of 16mm. The average runoff across the country is about 61mm per annum while the maximum is 585mm which is received in the Pungwe subcatchment.

Figure 3.12: Tsholotsho District Water Resources



(Source: Data obtained from ZINWA)

The baseflow index for the subzones in the district ranges from 0.16 to 0.28 which indicates an absence of perennial rivers. Upper Gwayi surface water resources are over 80% utilized while Nata is at 10%, indicating more room for water developments in the later. There are only two pronounced rivers that flow within the district i.e., Gwayi and Manzamnyama. As a result of the limited surface water, most of the district relies heavily on groundwater

Communities also utilize shallow water pans for domestic and livestock requirements. The naturally occurring pans have average heights of below two meters. However, due to high evaporation rates and high infiltration in the Kalahari sands, these pans dry up midway during the season exposing communities and their livestock to hunger and starvation

Figure 3.13: Dried Watwe Pan in Ward 7

Kalahari sands dominate most of the district. The thickness of these sands can extend to depths of between 100 to 150m. The Kalahari sands have primary porosity and aquifers occurring in these sands are of a regional nature and generally considered to possess the largest groundwater resources in Zimbabwe. Borehole yields generally vary from 100 to 1000 m^3/day. The Kalahari aquifers are considered to thicken to the northwest towards the Makadgikadgi.

The Nyamandlovu pumping station east of the district, is the country's largest groundwater extraction project with a capacity to draw out 5ML per day.

The Gwayi catchment through Nata and Upper Gwayi subcatchments, together with ZINWA manage water resources in the district as required by section 21 of the Zimbabwe Water Act [20:24]. The two subcatchments have offices

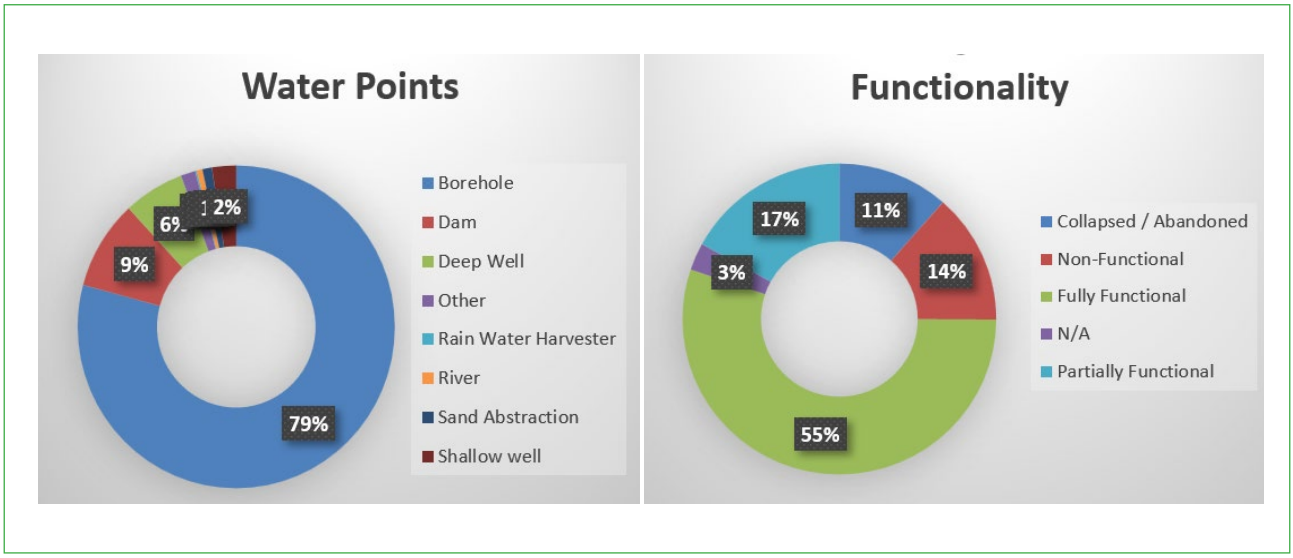
in Tsholotsho and Bulawayo respectively while the ZINWA sub office in Tsholotsho is managed from the Lupane service centre which reports to the Gwayi catchment office in Bulawayo

Water Supply and Demand

Access to water and vulnerability to water resources due to reduced annual rainfall, runoff and infiltration pattern, and increased frequency of droughts and floods are some of the worst challenges being faced by the Tsholotsho district. ZINWA supplies water to Tsholotsho, Mbamba (schools and clinic) and Dinyane (schools and business centre) service centres only. Tsholotsho is supplied from boreholes and abstraction from the Gwayi river while the two other centres are serviced through boreholes. Gariya dam, which has a capacity of 779ML supply part of the southwestern part of the district through a canal system. This dam was breached by floods caused by Cyclone Dineo in 2017 but has since been repaired

Only water supplies for Tsholotsho town are partially treated. All the other centres in the district are serviced directly through boreholes which are operated by RIDA. There are 1,341 water points in the district of which 1,062 are boreholes. 55% of the water points are functional. 75% of the borehole are equipped with bush pumps while boreholes with submersible pumps only constitute 5%. Some of the boreholes where bush pumps are employed are too heavy, requiring at least 6 women for pumping. Spares for solar submersible pumping systems are not readily available, resulting in some communities in Ward 7 resorting to use of expensive petrol generators

Figure 3.14: Status of Water Points and Functionality in the District



(Source: rwims.ddns.net, 12/11/2024)

The reduced water supply in the district has been outstripped by demand. Locals queue for long hours (at times the whole day) to get a few backets of water. In some areas, especially ward 7 and Ward 1, the same water points are used for domestic and accessed by wildlife creating a serious water conflict. 28% of the boreholes in the district are seasonal and the number is increasing. Water rationing is experienced at most of the water points after July/August annually. Some of the local communities also walk at most 10km to get their domestic water supply and water their livestock.

Figure 3.15: Queuing for Water in Siphilasengwe (Ward 7) at a Bush Pump Equipped Borehole

Water Quality

There are no current water monitoring points in the district. Water from 49% of the boreholes in the district has been found to be saline. The situation is mainly prevalent in wards 1, 7, parts of 12 and 16 where some of the boreholes have been rendered unusable by both human and livestock

Vulnerability of Water Supply

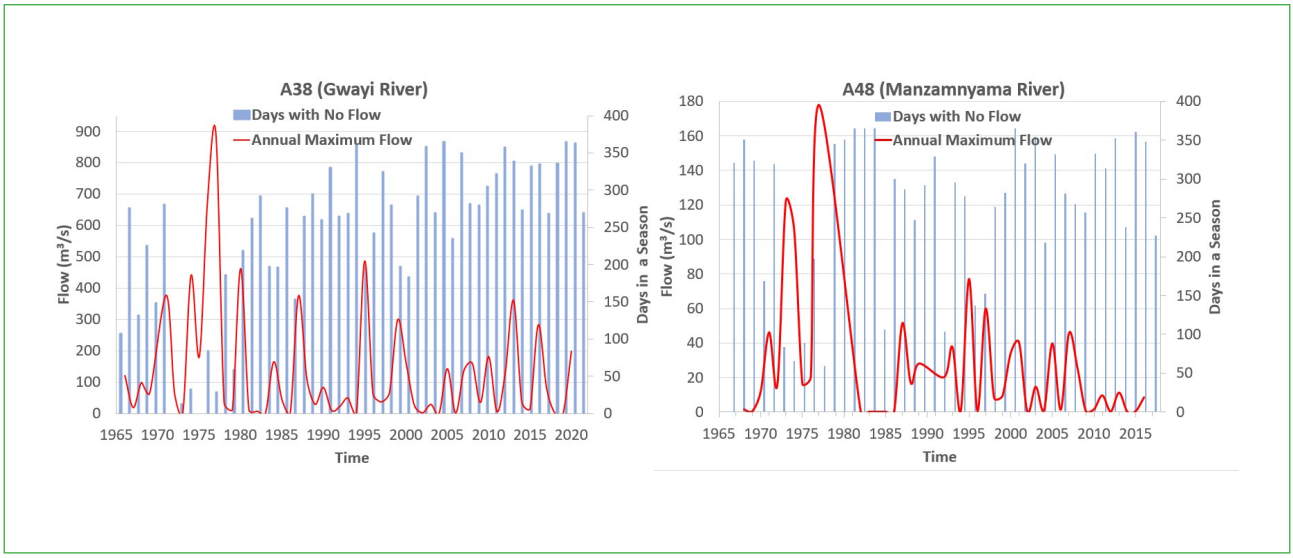
Water resources in the district have shown to be highly vulnerable to effects of climate change over time. The district is now experiencing below normal rains, increased frequency of floods droughts, intra season rainfall variability and heavy rains almost annually. Most of the floods in the district have been experienced along the Gwayi river down to Sipepa

According to the interviews held at district level from wards 7, 5,6 and 12, the amount of rainfall received has been reduced over the years. Almost all the communities interviewed agreed that climate change had a negative impact on their district rainfall pattern. Seasons have become shorter and rivers no longer perennial. Borehole water strikes which used to be around 60m are going deeper to beyond 90m on average.

This was corroborated from river flow data from Gwayi river which flows east of the district and Manzamnyama river which flows west of the district. The river flows from both gauging stations A38 on Gwayi river further downstream of Tsholotsho district and A48 (Manzamnyama river) show a declining trend on river flows and an increase in days with no flows (Figure 3.16). Since 2000, both stations have recorded at least 200 days of no flows annually. At the time

of visit in September 2024, there were no flows in all rivers in the district. The predicted global temperature rise will also increase evaporation from open impoundments and transpiration further increasing pressure on the limited resources.

Figure 3.16: River flows in the District



(Trends in Annual Maximum Flow and Days with no Flow (A38 Gwayi river representing Upper Gwayi subcatchment and A48 in Nata Subcatchment)

Also based on the information obtained from ward interviews, in terms of water scarcity and vulnerability, Ward 7 was found to be the most vulnerable followed by 1,8.10 and 16. This is mostly due to their proximity to wildlife environment, creating competition and conflict. Borehole depth can be around 120m in these wards. Most of the ground water is salty with no meaningful rivers for surface water development and abstractions

Monitoring

There are two rainfall stations in the district. There is no water quality monitoring in the district. Water quality is being carried out by the ministry responsible for health when there is water borne disease outbreak. The gauging station A53 on the Gwayi river close to Tsholotsho has been closed for over 30 years. There is no borehole monitoring within the district, though it is taking place in Nyamandlovu, east of the district.

Prioritised Adaptation Options for Water Resources

i) All manually pumped boreholes require new foot (non-return) valves to enable continuous pumping and making them lighter;
ii) Replace all boreholes currently with bush pumps and diesel engines with solar pumping systems and open nutritional gardens at each water point to increase both water and food security;
iii) Taping from the Zambezi Matabeleland water project. Tsholotsho district can also benefit from the project since the proposed pipeline passe through the eastern district boundary. Off take points, reservoirs and transfer distribution systems will need to be constructed to tap water from the pipeline;
iv) Construction of piped water schemes (communal standpipes) to reduce distance travelled and time taken to fetch water;
v) Desalination of some of the salty water from

boreholes to ensure the water becomes palatable. Desalination is still expensive and may not be affordable at household level. However, this might be a better option in the western parts of the district where there are no other feasible and permanent water supply options;

vi) Dam development at basin level. There are two dam sites in Tsholotsho which can be developed to benefit the district and surrounding areas. These proposed dam sites are Patalika with 1,700ML and Gwayi-Mguza at 195,000ML. The two dams apart from supplying domestic water, they have capacity to open close to 2,000ha of irrigable land. Water from these sites can also be transferred to other wards with limited resources. This will ensure SDG6 objectives are met;

vii) Increase early warning and monitoring systems. In terms of WMO standard, the district catchment requires at least operational river flow gauging station. The gauging station A53 needs to be recited and equipped real time monitoring equipment. The station just needs minor repairs on the leaking embankments, The district must avail early warning systems to all locals; and

viii) Both surface and groundwater require systematic and consistent monitoring. Tsholotsho centre, which was granted town status in 2023, will require more water for developments and expansion. Waste water from the centre which can easily contaminate boreholes will need to be properly treated, disposed and monitored.

3.4.7.2 Agriculture

Agriculture in the district is predominantly small-scale communal farming although there are some small plots in ward 20 and an ARDA estate. The main crops grown in the district are maize, sorghum, pearl millet, finger millet, round nuts, cowpeas, groundnuts, bambara nuts and watermelons. Although on a small scale, there is horticultural production consisting of tomatoes, onions and cabbages. Livestock production consists of cattle, goats, donkeys, poultry and to a lesser extend sheep and pigs. Agriculture productivity in the district is hindered by the semi-arid climate and persistent droughts where the net primary production is precipitation limited.

There is a general dearth of water resources for sustainable agricultural production in the district. The only exception are wards that are adjacent to the Gwayi and Manzamnyama *rivers* which are at the boarders of the district, but they are also very prone to riverine floods. During favourable seasons, these farmers can produce enough food for subsistence and even sell the surplus to the Grain Marketing Board. There is only one 20ha irrigation scheme (Eluhlaza) in the district but currently only 6ha is fully functional due to water challenges. Crop production is therefore mainly rain-fed, which is highly susceptible to drought and dry spells.

In the district the migration of the economically active population has meant old people, especially women are mostly involved in farming which reduces agricultural production. There is a problem of poor road and mobile network coverage in some wards e.g. 7 which affects access to early warning information and the distribution of agricultural inputs from GMB. The crops grown and livestock that are reared by communal farmers in Zimbabwe do not vary significantly. Most communal farmers in the country predominantly practice rain fed agriculture using low levels of farming technology. The poor socio-economic status across the nation is the precursor to depressed access to agricultural financing and low coping strategies to the impacts of climate change.

Vulnerability and Risks

Farmers in the district are highly vulnerable to recurrent droughts which occur once in every two years. The main impediment to agriculture production is water scarcity resulting from low rainfall and high evaporation rates. Overall, the sensitivity ranges from moderate to high (average index of 0.67), the exposure is very high (average index of 1.0) and the adaptive capacity is low (average index of 0.8). Ultimately, agricultural vulnerability to climate change is very high in the district (average index of 0.87). The limited availability of water means the communities shares water with livestock and wild animals from dugout ponds/pans e.g. Luphahla and Sifulasengwe "dams". Water from these ponds is rarely adequate to sustain agriculture and lasts for a few months after the rainfall season. Water storage is also affected by high sedimentation and evaporation rates. When these ponds dry up, the only source of water will be boreholes, which are scattered. Access to this water is also affected by the frequent breakdowns of boreholes. In ward 7, more than 1500 cattle, 800 donkeys and 2000 goats compete with approximately 420 households for water from 3 boreholes. In Mpilo village, more than 4000 people and their livestock share water from 2 boreholes. The water is also very saline and cannot be used for sustainable crop and livestock production. Irrigated agriculture is therefore not applicable under such a precarious situation. Crop production is ultimately rain fed but productivity is very low due to the poor-quality rainfall seasons. Rainfall seasons are now shorter and there is high frequency of mid-season dry spells.

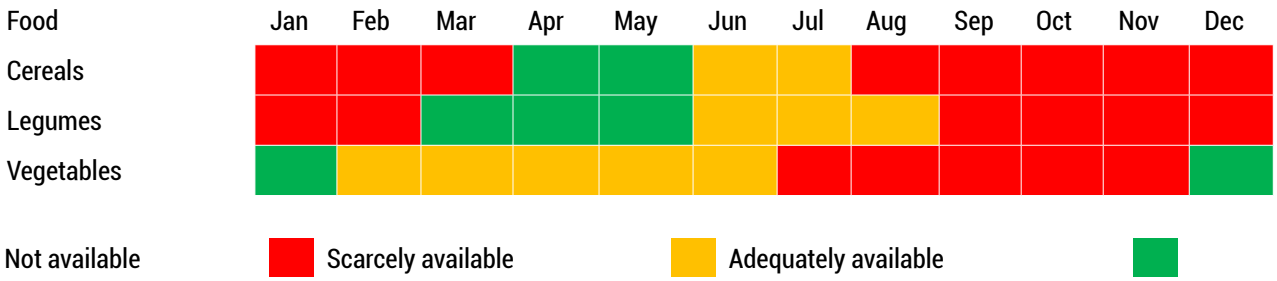
In wards bordering Hwange national park, human wildlife conflict is a major threat to crop and livestock production due to influx of wild animals from the parks. Elephants destroy crops such that farmers fail to harvest enough food even if the rainfall season is favourable. The encroachment of wildlife into farming communities increases the chances of interaction with livestock. This enhances the opportunities for pathogens transfer and hence risk of emerging diseases. A significant proportion of livestock especially cattle, goats and donkeys are also lost due to lions and hyenas attacks. Although the farmers have better access to agricultural extension services on climate smart agriculture, the adaptive capacity remains depressed. This is caused by the very limited access to irrigation, crop or animal insurance and loans or other income besides agriculture. The poor socio-economic status of farmers in the district makes it very difficult for them to cope with the impacts of climate change.

The main impediment to agricultural productivity in Zimbabwe is water scarcity. Agriculture in the country at large is also very vulnerable to recurrent droughts and long mid-season dry spells. The frequency and severity of drought has generally increased in the country. Heat stress that is induced by heat waves is responsible for the rapid drying up of waterholes for livestock watering and the elevated crop water use. There are significant losses to crops, agricultural land and livestock because of floods just like in Tsholotsho.

There are perennial food shortages in the district because of the erratic rainfalls and low adaptive capacity. Crop production is severely affected such that even small grain production is not spared. In some wards, farmers harvest less than a bucket of grain. The average maize, sorghum and millet production levels in the district for the 2023/24 season are 0.01 to 0.03 t/ha while the national average maize yield was 0.36 t/ha. The depressed yield was driven by the El Nino induced drought that was experienced in Southern Africa. During the 2021/22 rainfall season (a favourable season), the average maize yield was 0.4 t/ha in Tsholotsho, and the national

average was 1.17 t/ha. These yield levels are very low and barely adequate for subsistence up to the next harvest as outlined in Table 3.8. During bad agricultural seasons, the farmers will have virtually no food throughout the year. Out of the 60 districts in the country, only two (Goromonzi and Makonde) had sufficient food to last 12 months (CLAFA, 2024). 8 districts had food supplies for 7 to 9 months and the other 8 districts had food supplies for 4 to 6 months. The remaining 42 districts managed to produce food that lasts up to 3 months only. It can be deduced that food availability is very low across the country during drought years.

Table 3.10: Food Availability Calendar for Tsholotsho District for a Good Season



The fall armyworm problem is now prevalent in the district, and it started in 2019, and this challenge is most likely climate change induced. The fall armyworm challenge is a national problem which is favoured by the drier conditions. Another climate related induced challenge in tomato production is the *Tuta absoluta* leaf miner caused by water stress and high temperatures. Smallholder farmers in the country are battling to control the leaf miner (FAO, 2021). The large grain borer is also a menace for stored grain and causes yield losses of up to 30%. Saline ground water in most parts of the district decreases irrigation potential which could have assisted the vulnerable community. Even though a season turns to be favourable, the community rarely harvests anything because their crops are destroyed by wild animals especially elephants.

Water shortages is the main barrier of sustainable livestock production in the district. There is very low feed availability for the greater part of the year and animals travel very long distances for water during the dry season. There are very high cattle lean season deaths due to shortages of pastures that is induced by the frequent droughts experienced in the district. This challenge is prevalent across the country especially during drought years. 16,543 cattle lean season deaths were recorded across the country from January to November but 69.8% (11,542) of these deaths were recorded from June to November (Daily Situational Report for Drought Mitigation, 2024). This translates to an average of 1,924 deaths per month. Assuming that the average price of a health animal is 400 USD, the country lost approximately 4 616 800 USD in potential revenue. In Tsholotsho the cattle lean season deaths for August to September 2024 was 500 cattle (~200,000 USD), which is approximately 250 deaths per month. It can be deduced therefore that almost 13% of the national cattle lean season deaths from August to September took place in Tsholotsho. Matabeleland provinces (South and North) are the most affected by the cattle lean season deaths (Daily Situational Report for Drought Mitigation, 2024). In some wards, most farmers now have less than 5 cattle per household because of the lean season deaths. Farmers also lose their livestock especially goats as they use them to purchase food during drought times. They barter trade an adult goat

for a 50kg bag of maize meal which lasts up to 3 weeks only. Despite droughts, floods are also responsible for livestock deaths especially for communities that are adjacent to rivers. Tick borne diseases are now on the increase because the changing climate lengthens the tick activity seasons. This challenge is prevalent across the country. Drought affects the physical condition of some cattle such that they will be too weak for plunge dipping making it difficult to control tick borne diseases. Controlling the diseases is also difficult in the district because the veterinary service department has vaccine storage challenges. This situation is severe in wards 16, 17 and 18. Very windy conditions are responsible for the eye problems experienced by most livestock. Dust and debris that is blown by wind cause redness of eyes, eye irritation and inflammation thereby increasing the risk of eye infections. The cattle producer price has drastically gone down in the district due to panic selling to as low as R3,000 (approximately $170 USD). This translates to a loss in revenue of about 230 USD due to the impact of drought. The poor physical condition of livestock also affects draught power that is required for land preparation.

All districts in the country have been affected by drought for the past 3 decades with the 2023/24 being the most severe in recent times. The President declared a state of disaster on 2 April 2024 due to the El Nino induced drought. Agriculture production and productivity for the 2023/24 season were severely negatively impacted by the El Nino induced drought. There was a reduction in area planted for maize by 7% of the target and 12% compared to the previous season (CLAFA, 2024). 53% of the area planted under maize (908,004 ha) was written off due to the drought. There was a general 77% decrease in food crops production compared to the previous season (CLAFA, 2024). Generally, rain fed grain productivity in Zimbabwe is on the decline and this is as a direct impact of climate change. The recurrent droughts in the country are responsible for the reduction in livestock herds due to inadequate dry season feed. For the current season, up to 47% of the wards faced grazing challenges by July and the problem intensified as the year progressed. Only 12% of the wards in the country had adequate grazing to the next season (CLAFA, 2024). In terms of water supply for livestock watering, 24% of the wards in the country had adequate water until the next season while 76% had water deficits by October. The prevalence of trans-boundary pests and diseases is also widespread in the country.

Adaptation strategies

Table 3.11: Local Adaptation Strategies Used by Farmers in Tsholotsho District

STRATEGY	DESCRIPTION
Climate smart agriculture solutions	These include the following: climate proofed Presidential Agricultural Input Scheme (pfumvudza/intwasa/ gachopo) Adoption of small / future grains at the expense of the popular maize Improved breeds of small stock Planting of cover runner crops in the fields Building of traditional seed banks Solar powered irrigation for nutrition gardens Use of shade nets
Ward Drought Mitigation Centres	The centres consist of the following: Boreholes equipped with solar power Holding pens for cattle Feeding and drinking troughs for cattle
Indigenous Knowledge Systems	Include the following methods: Use of wild fruits as livestock feed e.g. marula, acacia pods and buffalo thorn fruits Traditional grazing management systems – migrating to places called umlageni for better pastures Scarring away wild animals by beating metal objects and blowing whistles Traditional seasonal rainfall forecasting methods by observation of plant, animal, wind, sun and moon behaviour.

The community in Tsholotsho also rely heavily on diaspora remittances to cushion themselves from the chronic food shortages. The communities residing along the banks of Gwayi river engage in flood recession agriculture and are reluctant to permanently relocate to less flood prone areas where they were relocated. They exploit flood plains where there is a layer of fertile silt and moisture that is favourable for crop production. On a national scale, the NAP advocates for development, implementation and scaling up of climate smart agricultural solutions to adapt to the adverse effects of climate change. Climate smart agricultural solutions are being implemented in Tsholotsho just like in all districts in the country. Agroecological tailoring is one of the adaptation strategies that is being practised in the country. This is done by shifting towards the more climate resilient traditional grains. The 2023/24 season had a 16% increase in planting of traditional crops from 533,625ha to 621,048ha (CLAFA, 2024). Sorghum and Pearl millet production increased by 27% and 8% respectively compared to the previous season (CLAFA, 2024). There is nationwide surveillance of the fall armyworm that has been made possible by investment in equipment like drones and capacity building of manpower in all provinces. 7,120.21 MT of silage was delivered across the country, and this translates to 78,907 animals that were saved for 45 days (CLAFA, 2024). Amalima Loko distributed 655.15 MT of subsidized beef survival feed to Tsholotsho, Lupane, Nkayi, Hwange and Binga districts. There is strong focus towards hay baling, veld fire management and urea treatment of stover to augment diminishing pastures in the

country. Intensive livestock dipping regimes are being undertaken in known outbreak and spread areas of Theileriosis. As of the 23rd of November 2024, 86 drought mitigation centres were established in the country. These boreholes have been solarised and the feeding troughs and cattle holding pens are yet to be established. These drought mitigation centres are being established by the government in partnership with developmental agencies like IFAD, SACP, FAO-CERF-MIEND. In addition to the previously stated adaptation measures, indigenous knowledge systems are being used across the country.

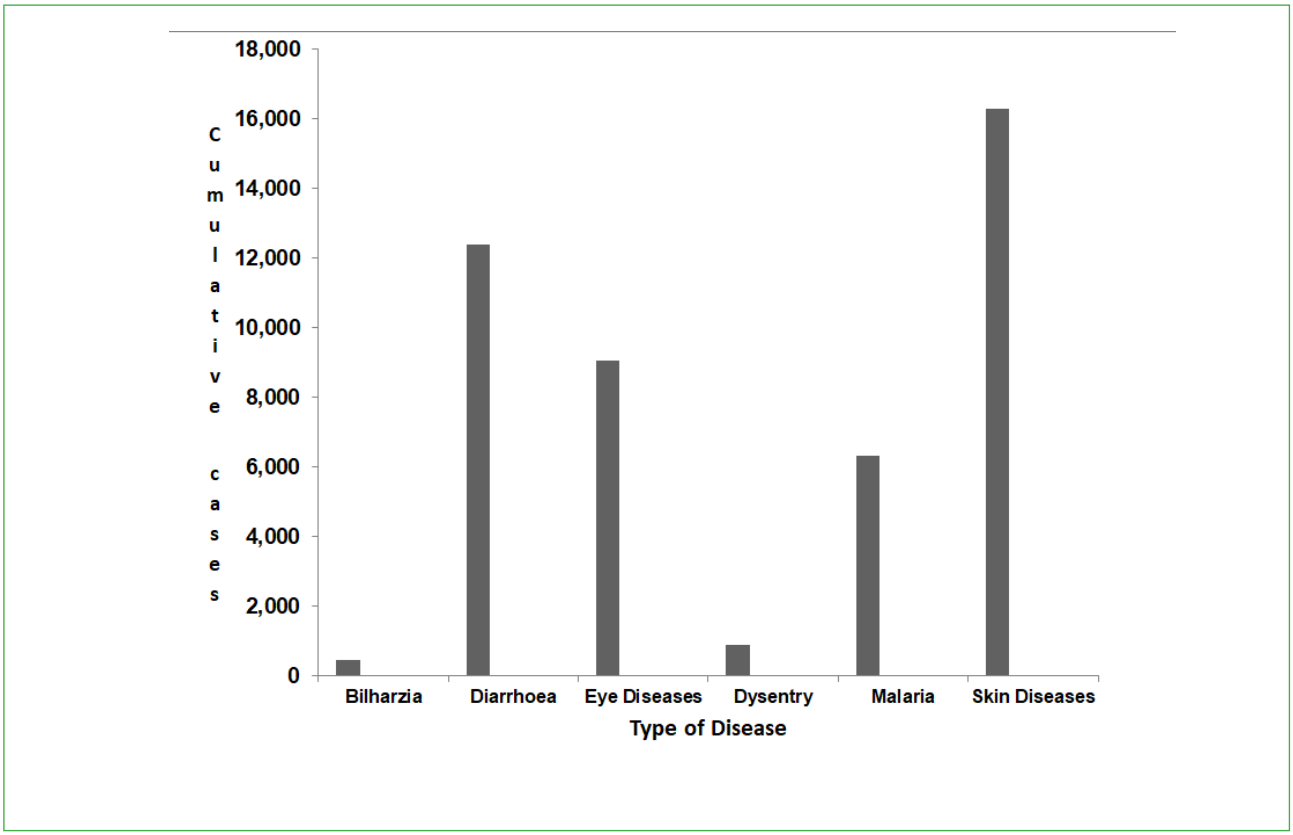
Adaptation Options

i) To maintain high adoption levels of conservation agriculture, mechanisation is imperative to reduce the labour requirements.
ii) There is also need for support of the whole value chain of the small (future) grains in terms of production, harvesting, processing and storage. Examples of the required equipment include no till or reduced till planters, small grain planters, pot holing machines, mulchers, subsoilers, cover crop seeders, threshers, cleaners, cutters, grain dryers and bush mills.
iii) There is need for irrigation development in the district and this must be preceded by construction of dams.
iv) Develop irrigation schemes by drawing water from the Gwayi-Shangani pipeline to improve the adaptive capacity of farmers.
v) To reduce human-wildlife conflict, there is need to develop more water sources and increase watering points in parks so that wild animals will not get into communities in search of water.
vi) Research and development of new community specific deterrents for wildlife is essential to ameliorate the impacts of human-wildlife conflict on agriculture.
vii) In times of drought, there is need for destocking so that farmers have manageable herd sizes. The reduction in herd sizes is crucial for achieving sustainable stocking rates. The money generated from destocking can be used to purchase supplementary feed to support the remaining animals.
viii) There is need to follow the Drought Mitigation Tracking and Programming Database to ensure that all wards without watering facilities in the form of solarized boreholes are covered for equitable distribution of the water resource
ix) Capacity tests should be done on all drilled boreholes to ascertain water adequacy for all operations of the Ward Drought Mitigation Centers
x) Drilled boreholes should be quickly equipped with solar power so that livestock and humans can access the water resources
xi) There is need for research on and implementation of drought resilient livestock breeds and pasture species.
xii) Overall, since water insecurity is the main driver of climate related impacts on agriculture, there is need for implementation of water conservation strategies in the district.
xiii) Flood monitoring and early warning systems is required for early preparedness that can reduce crop or livestock loss.

3.4.7.3 Human Health

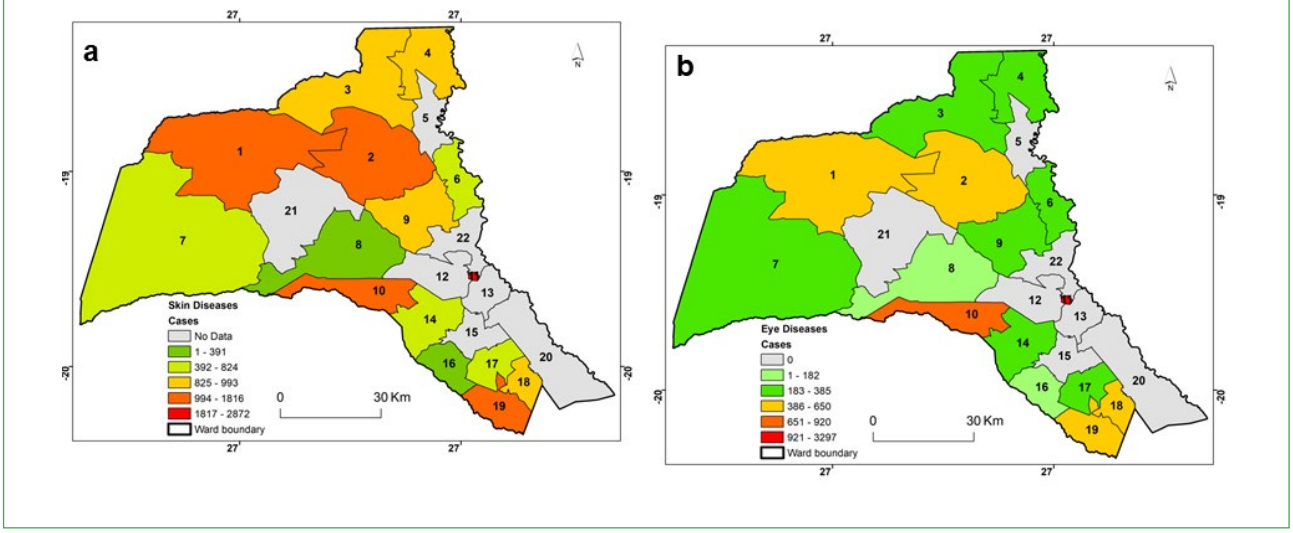
Tsholotsho district is characterised by occurrence of diseases related to water and sanitation. The figure shows the common climate related diseases in the district and the cumulative cases recorded from 2019 to 2023.

Figure 3.17: Common Diseases in Tsholotsho District



It can be observed that skin diseases, diarrhoea and eye diseases frequently occur in the district. Figure 3.19 shows the distribution of the most common diseases that occur in the district. Diseases such eye and skin diseases are most widespread across the wards, and these are associated with high temperatures and heat waves common in the district. Climate change will likely exacerbate the occurrence of these diseases since temperatures are projected to increase across Matabeleland North province.

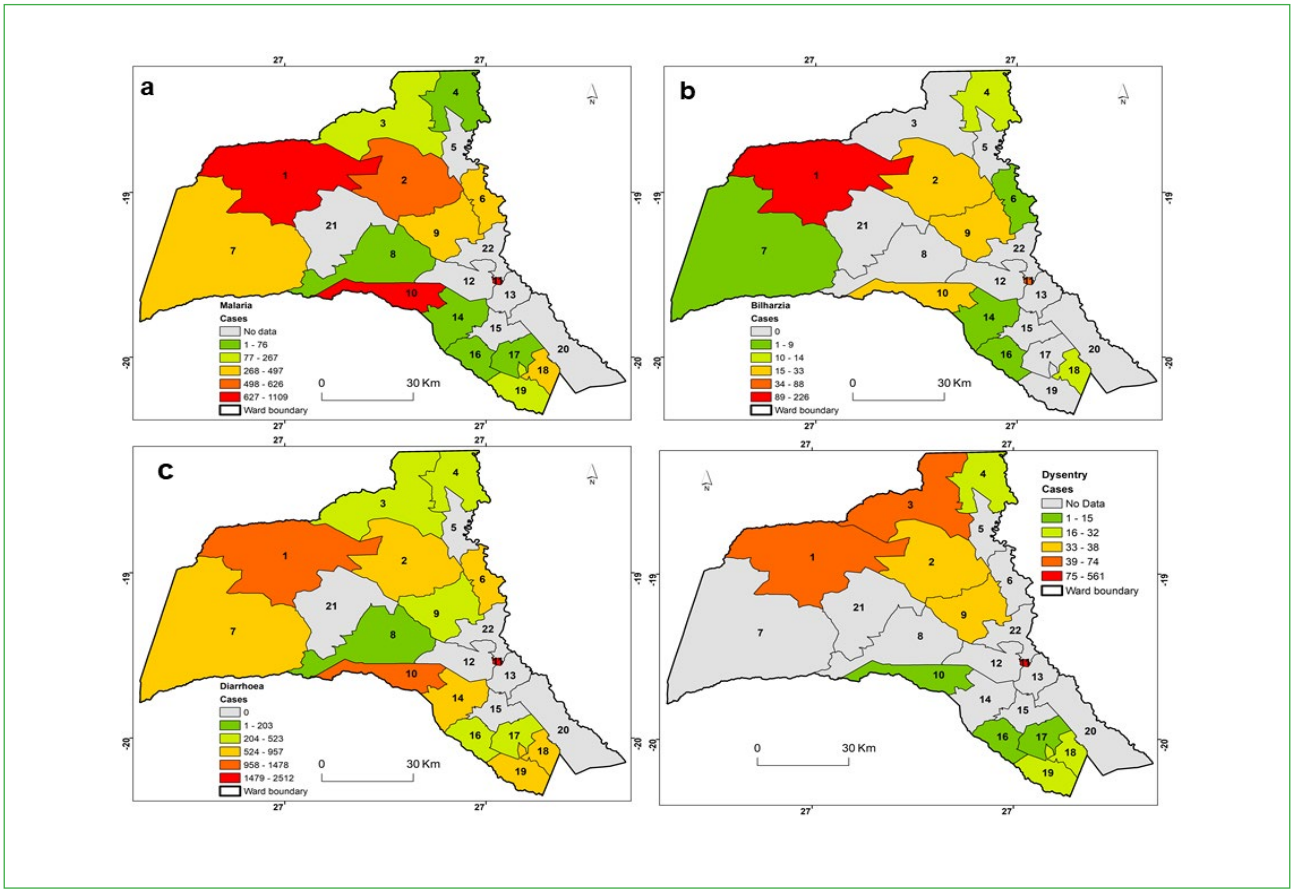
Figure 3.18: Spatial Distribution of Cumulative Cases a) eye infections and b) Skin diseases across different ward in Tsholotsho from 2019-2022



The health of the population across the district is threatened by water sanitation related illnesses where most households still use pit latrines, the cat system and open defecation system. Indirectly, families who reside in flood prone are at high chances of being affected by environmental enteric dysfunction (EED) in children particularly when the drink water from unprotected water sources (Case & Mwinyi 2008). The limited access to safe drinking water means hygiene practices such as hand washing under running water are not practised in most areas.

Across the district, most deaths of children under the age of 5 are associated with diarrhoea diseases related to poor water and sanitation practices and high temperatures (Bastaraud et al. 2020). This is associated with use of unsafe drinking water during food preparation. These diseases occur in different proportions across the different wards. Figure 3.20 shows the distribution of diseases associated with poor sanitation and lack of access to clean water. The common climate related diseases that occur in the district include dysentery, diarrhoea (associated with dehydration and some with no dehydration), bilharzia, diseases of the eye that includes cataracts, skin diseases which include scabies and heat rush.

Figure 3.19: Spatial Distribution of Cumulative Cases a) Malaria, b) Bilharzia, c) diarrhoea and d) Dysentery in Zimbabwe from 2019-2022



Some of the parasitic and bacterial diseases common in the area include malaria and bilharzia. Changes in temperature and rainfall affect the distribution of disease vectors such as mosquitoes which increases the incidence of malaria. Indirectly poor sanitation associated with scarcity of water due to low rainfall; associated with climate change increases the risk of soil transmitted helminth (STH) associated with anaemia and listeria which increase maternal fatality and pre-term birth. Another key observation is that approximately 25% of children below 2 years are affected by stunted growth associated with diarrhoeal cases. This is mainly an asymptomatic condition which can cause chronic swelling, low nutrient absorption of the intestine and debilitated barrier purpose of the small intestines

The health-related illnesses are associated with unsafe water from open water surfaces such as Gariya dam. Figure 4 shows samples of water from Gariya dam used by communities. The dam was constructed in 1953. Today the dam supplies water for wild animals and domestic animals and for domestic purposes to the over 20,000 households in surrounding villages of Butabubili, Mutshina, Phumula.

Figure 3.20: Water Collected from Gariya Dam Used by Communities in Tsholotsho

As a result of low rainfall and higher temperatures associated with climate change, most parts of the district are characterised by low water tables and combined with the loose deep Kalahari sands these areas have limited access to water. This result is some indirect impacts such spinal damage, hernias, genital prolapse and amplified risk of impulsive abortion and development of urogenital contagions among women and adolescent girls as a result of travelling long distances to fetch water.

In some wards such as ward 5, climate change induced flooding damages sanitation infrastructure, making latrines and toilets unusable. This leads to open defecation which contaminates water sources, increasing the spread of waterborne diseases such as cholera, typhoid, and dysentery.

Water shortages associated with drought significantly hinder menstrual hygiene management. This is an indirect impact as women and girls are faced with challenges in maintaining menstrual hygiene which increases the risk of reproductive tract infections. The problem is compounded by the increased workload women face during flooding, including

the need to fetch water from further distances, exposing them to physical exhaustion and health risks. poor water and sanitation practices associated with scarcity of water negatively affects pregnant women. The lack of clean water and hygienic conditions often lead to infections and complications during childbirth, such as sepsis, which can be life-threatening for both mothers and new-borns.

The changes in climate increases food insecurity and negatively affects nutrition and food availability resulting in malnutrition and stunting growth which may increase the probability of impaired cognitive development. The limited access to water and poor sanitation also results in chronic worm infections such as whipworm (*Trichuris trichiura*) infections and roundworm (*Ascaris lumbricoides*) infections particularly among poor communities. The utilisation of unsafe drinking water results in hookworm (*Necator americanus* and *Ancylostoma duodenale*) infection. Another disease associated with poor sanitation and limited access to safe water is Trachoma which causes blindness (Kearns et al. 2019) while bilharzia associated with dirty water results in irreparable damage to liver and kidney among children

In areas affected by flooding such as ward 5, communities suffer from sustained increases in common mental disorders due to anxiety and stress related to forced displacement. The increase in the frequency of such extreme events because of climate change can trigger anxiety in people as they worry about the future of their communities, the availability of food and water, and the safety of their families. The anxiety is intense for women and children living vulnerable as some are displaced and schools are destroyed which leaves them requiring humanitarian assistance. The displacement associated with loss of homes, schools, and community networks disrupts the sense of security and belonging among the population, resulting in stress, depression, and post-traumatic stress disorder.

Adaptation Strategies

The adaptation strategies to reduce the impacts of climate change on human health include building climate-resilient infrastructure to climate-proof the infrastructure for healthcare through using clean, renewable energy. In addition, there is need to improving surveillance and early warning systems to assist in tracking diseases assisting in disease management.

There is also a need to consider local contexts which involves considering traditional medicines to treat diseases such as malaria and diarrhoea. To reduce incidences of malnutrition associated with food insecurity, there is need to enhance nutrition adaptation. This may involve value addition of food crops produced locally such as millet, sorghum, ground nuts.

There is also need to scale-up nutrition through community care groups to enhance livelihoods. Already there is a local non-governmental organisation working in seven out of the 22 wards which is offering household production training to improve consumption patterns. This is being achieved through strengthening community care groups by training village health workers and lead mothers to deal with nutrition issues. In addition, there is need to strengthen disaster risk reduction in different sectors such as agriculture, water and health.

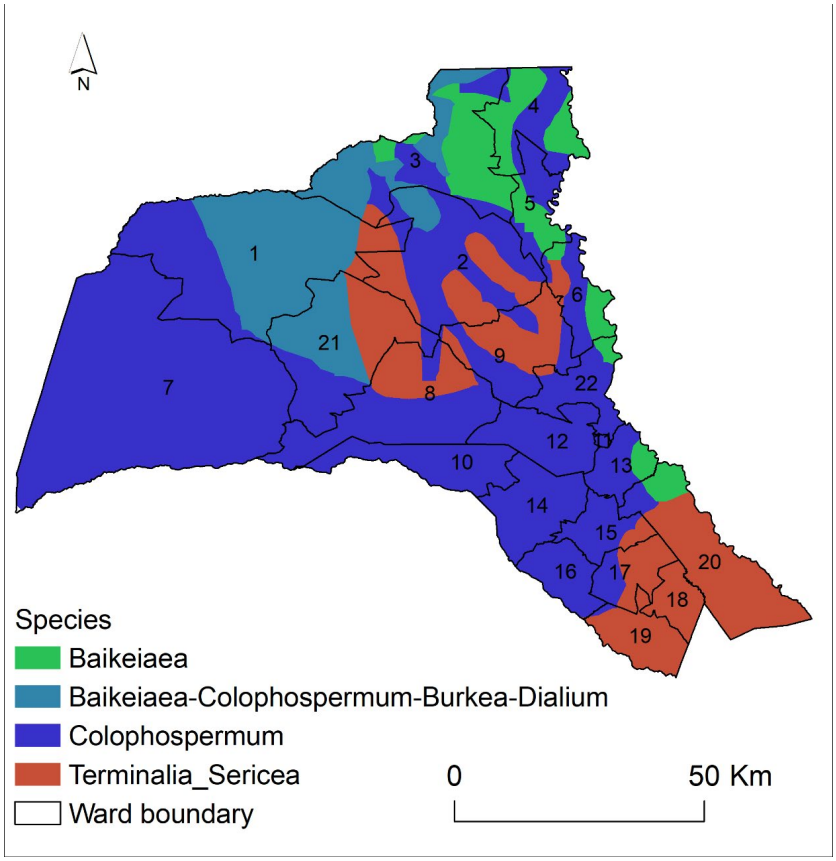
The Ministry of Health and childcare carries out Indoor residual spraying and provision of insecticide treated nets to control malaria, and this has greatly reduced the spread of the disease. There is also a need to expand the school feeding programme to more schools as it is critical in improving access to food and enhancing nutrition among school children. Water and sanitation practices can be made much more resilient by drilling more boreholes which is being done through the Presidential

Rural *Development* Programme. Accessing water from the Gwayi-Shangani project may also assist in improving access to water thereby reducing incidences of diseases associated with scarcity of water hence improving WASH.

3.4.7.4 Biodiversity and Ecosystems

The vegetation in Tsholotsho district is characterised by a variety of indigenous trees that include Mopane, Marula, Teak, *Combretum and Vachellia*, species that are scattered across diverse landscapes (Figure 3.21). These indigenous trees are a major source of livelihood through providing high value timber for furniture. In addition, species such as *Vachellia* spp., *Dichrostachys cinerea*, *Colophospermum mopane* and *Piliostigma thonningii* are key source of livestock fodder. Thatching, grass cutting, firewood sales, art and craft are some of the livelihood sources derived from these ecosystems.

Figure 3.21: The Spatial Distribution of Dominant Vegetation Types in Tsholotsho District



Source; Zimflora

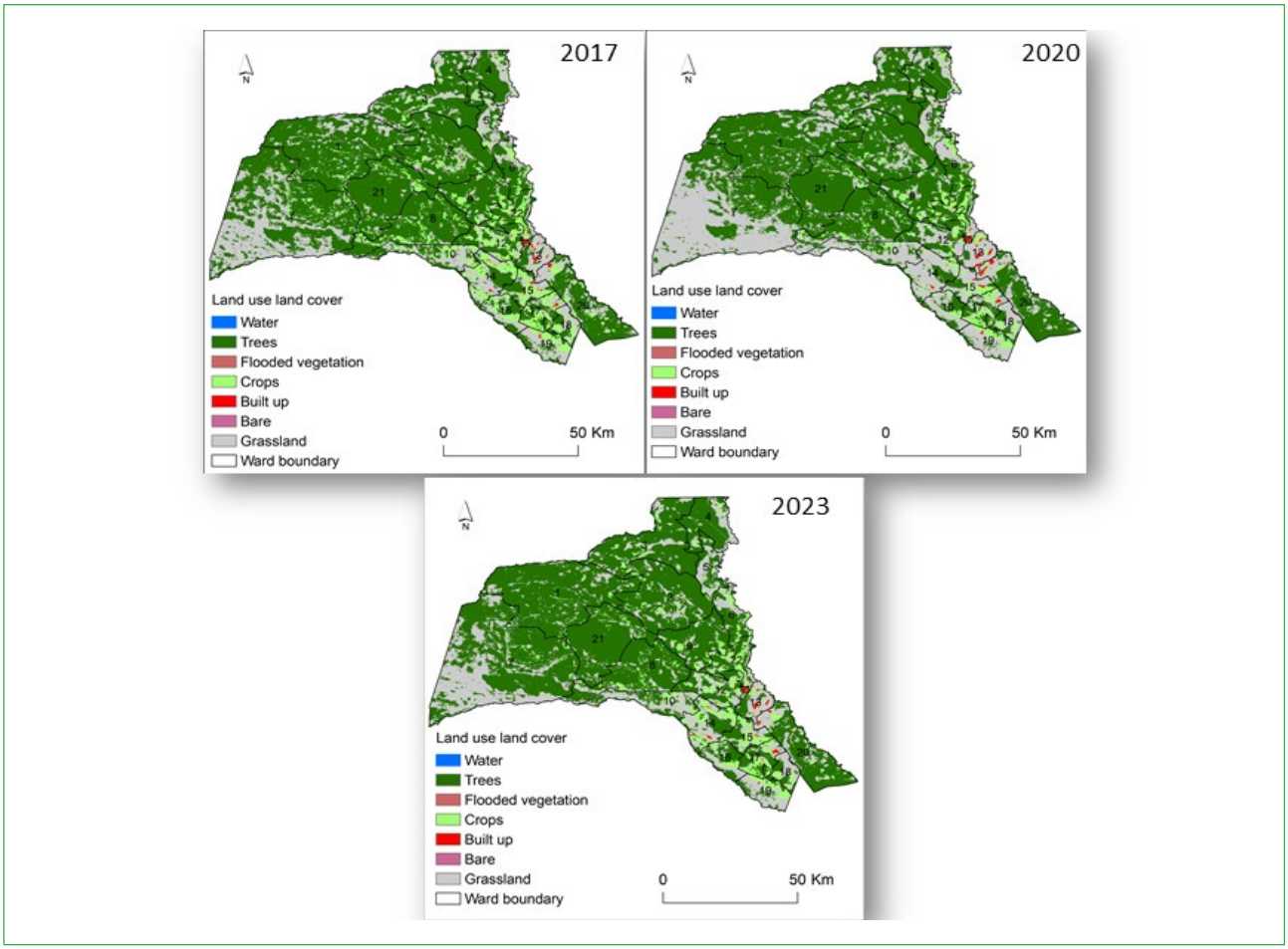
Aquatic ecosystems in Tsholotsho district primarily comprise rivers (Gwayi and Manzamnyama), wetlands, seasonal floodplains and dams (Gariya and Cigijima) that support diverse aquatic life. These ecosystems are critical for local biodiversity, providing habitats for fish, amphibians, and various invertebrates, while also playing a role in the livelihoods of communities relying on fishing and agriculture. The water resources in the district also attract wildlife from Hwange National Park especially during the dry season when greater parts of

the waterholes in the park dry out. This leads to intense human-wildlife conflict especially in wards adjacent to the park i.e., wards 1, 3,4 and 7. Land degradation is also reducing the capacity of the land to provide ecosystem goods and services thereby affecting livelihoods dependent on these ecosystems.

Figure 3.22 illustrates the land cover dynamics derived from Sentinel land cover maps for Tsholotsho district. There is a general decrease in tree cover from between in 2017 and in 2023.

The main drivers of reduction in tree cover include increased population pressure, the rising demand for agricultural land, leading to deforestation, mining activities, tree cutting for fencing, housing, woodcarvings, brick moulding as well as demand for firewood. There is need to enforce existing legislation such as Forest Act and Environmental Management Act or even enact by laws to arrest increased deforestation in the district.

Figure 3.22: Landcover Dynamics in Tsholotsho District between 2017 to 2023

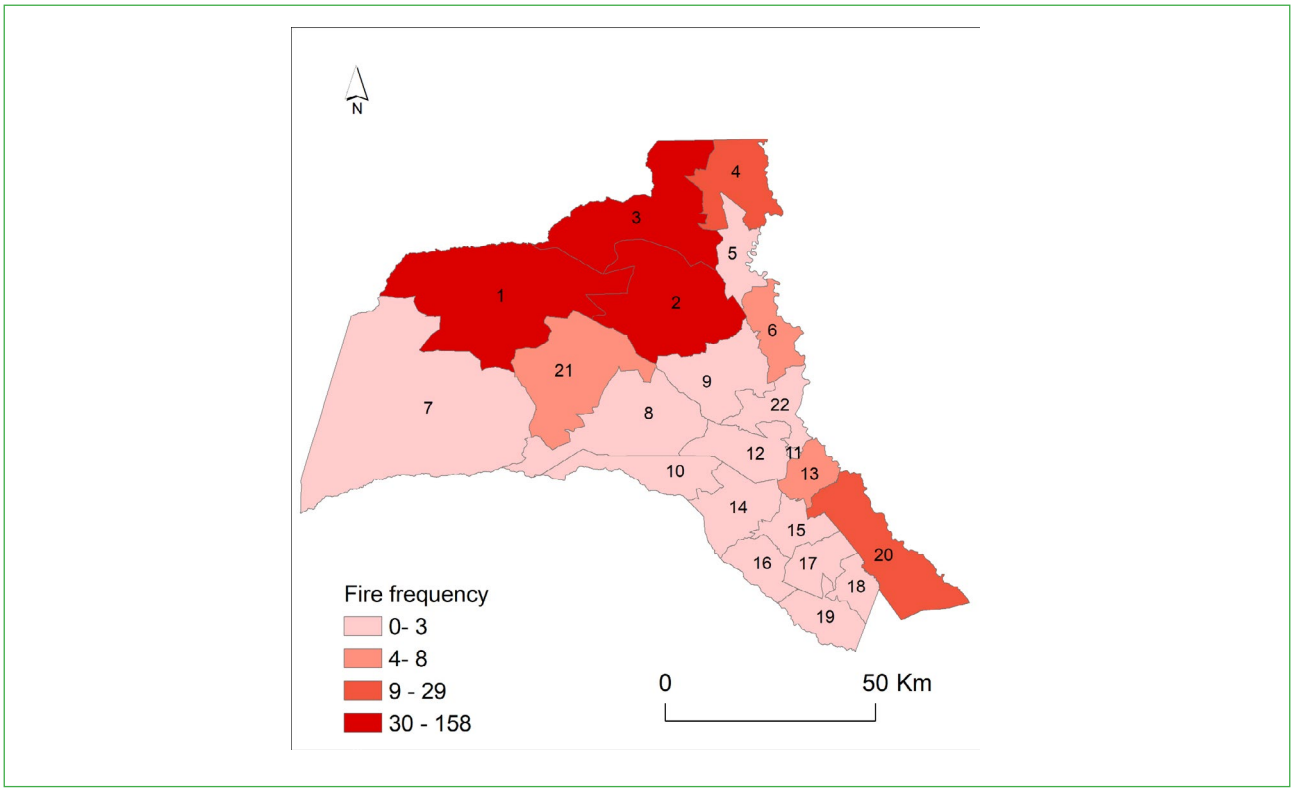


(Derived from Sentinel Global land use and land cover maps)

An analysis of fire occurrence across wards of Tsholotsho Districts illustrates a distinct spatial pattern with high fire frequency found in wards close to Hwange National Park. The rest of the wards in the central and southern parts of the country have no to low wildfire occurrence except for Ward 20 that exhibits unusually high fire occurrence. The susceptibility of the district to wildfires emanates from the dry conditions, agricultural practices, and human activities. For instance, agricultural activities such as burning of crop residues, rangeland management and

land clearing are the main causes of wildfires in the district. These fires pose a significant threat to local communities, ecosystems, wildlife, and agriculture. Wildfires are key in ecosystem functioning as they facilitate plant regeneration through optimal conditions germination and growth. However, frequent and severe fires tend to cause land degradation and reduce biodiversity through invasion by invasive alien species. In addition, uncontrolled wildfires negatively affect ecosystems through destabilisation of soil nutrients and soil structure as well as ecosystem functions. As climate projections point towards an increase in temperature and greater variance in rainfall, the fire season is anticipated to increase in duration, severity and intensity.

Figure 3.23: Spatial Variations in Fire Occurrence in Tsholotsho District between 2000 and 2023



(Source Environmental Management Agency and FIRMS)

Invasive alien species

Like other districts in Zimbabwe, Tsholotsho's ecosystems are under pressure from Invasive alien species (IAS). IAS are a major threat to ecosystems through affecting community composition (structure) and function. Changes in ecosystem structure and function is usually associated with reduced ability of such ecosystems to provide goods and services thereby threatening livelihoods of communities dependent thereon. Invasive alien species such as *Lantana camara* are common in the district with wards 11 and 13 being some of the most affected. However, organisation such as EMA and Amalimalico are engaged in projects focused on clearing the plant.

Wildlife

Tsholotsho district boasts of a large diversity of wildlife from the mega-herbivores to small game owing to its proximity to Hwange National

Park, the largest national park in the country. The district is host to a variety of animals (~100 mammal species) such as elephants, lions, buffaloes, leopards, and many bird species and nearly (~400 bird species). The landscape includes savannahs and woodlands, which provide a good habitat for these animals. Additionally, community-driven conservation efforts help protect wildlife and promote eco-tourism, benefiting both the ecosystem and local people. However, human-wildlife conflicts are also common in the district especially in wards adjacent to the national park due to the abundance of wildlife.

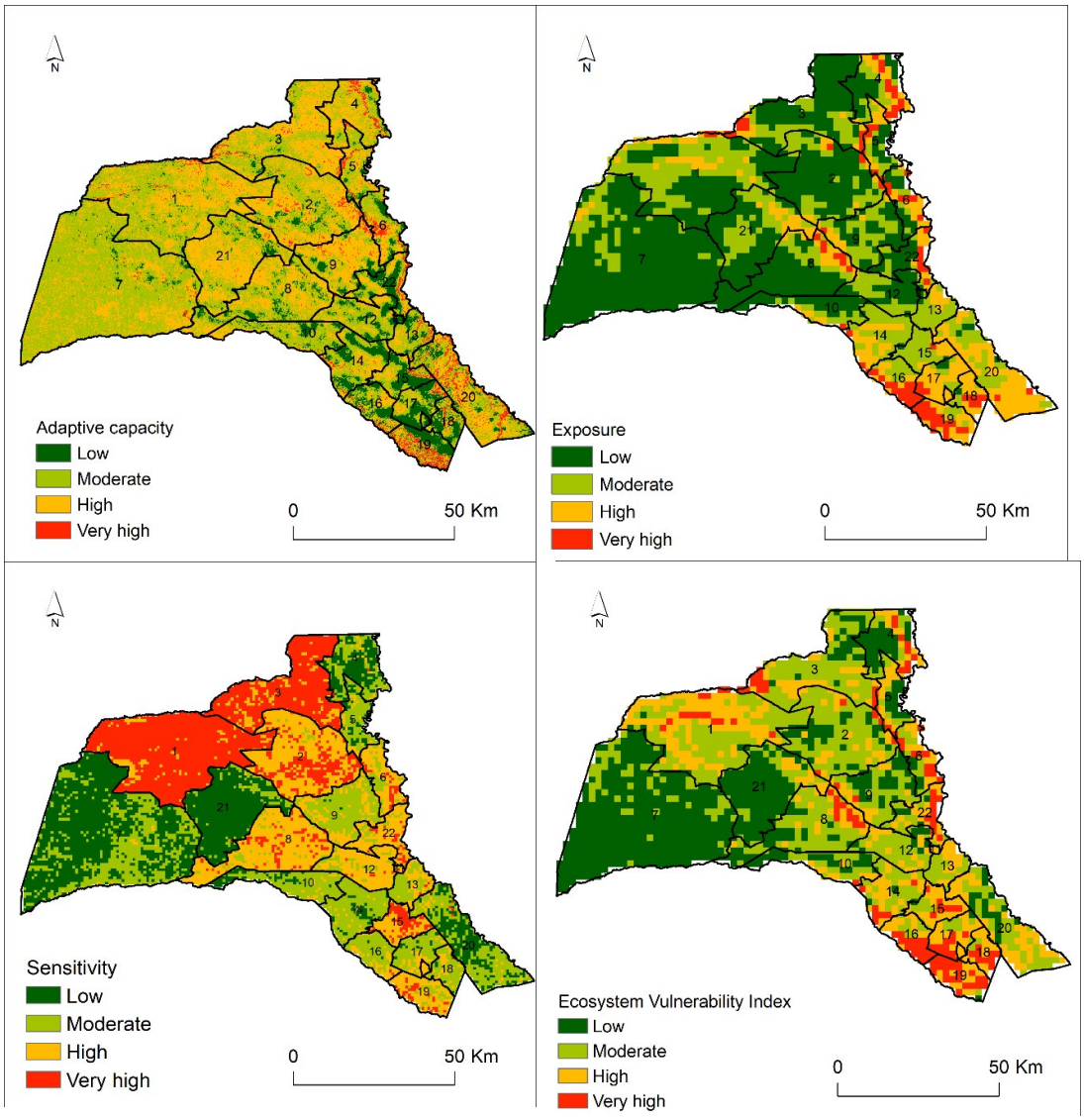
Human wildlife conflict

Due to its proximity to Hwange National Park, the district faces frequent crop damage from elephants, competition for water resources, and threats to livestock from lions, hyenas, and other carnivores. These human-wildlife conflicts adversely affect livelihoods and pose safety risks, disrupting daily activities like water collection and cattle herding. The dry environment and limited water supplies in Hwange National Park exacerbate these issues, prompting elephants, in particular to encroach on communal lands in search of food and water, resulting in dangerous encounters. Conflicts become especially severe during drought years, such as the 2024 rainfall season. As the pressures of human-wildlife interaction intensify, communities are left grappling with the consequences of losing precious crops to raiding elephants and the constant vigilance needed to protect livestock from predation. Climate change exacerbates the situation through altering rainfall patterns and further worsen the scarcity of water in already arid regions. In addition, elephants congregate at water points limiting access to water for domestic animals and human consumption. The CAMPFIRE program has been introduced in response to mitigate the effects of such conflict. Tsholotsho District was granted Appropriate Authority Status for the management of wildlife in 1991 and has 11 Wards that benefit from the CAMPFIRE Programme. The negative perception about community benefits from wildlife and bans on elephant and lion trophy imports have led to a decline in hunter arrivals in the district. However, the success of these initiatives hinges on collaboration between local communities, conservationists, and government entities to ensure long-term solutions are both practical and context specific.

Exposure

The southern, eastern central parts of the district are highly exposed to climate change with exposure index ranging from 0.48-0.96. These areas are dominated by Baiakea and Terminalia Sericea. The greater part of the Colophorspermum mopane dominated ecosystem are within the low to moderate exposure. The high exposure in the district is attributed to climate variability and change. The rising temperature and decrease in precipitation observed in the district significantly affect ecosystem productivity for both terrestrial and aquatic ecosystems. Further, increasing extreme events have increased soil erosion rates

Figure 3.24: Spatial Variations in Exposure, Sensitivity, Adaptative Capacity and Ecosystem Vulnerability



Ecosystems in the northern part of the district, particularly near Hwange National Park, display higher sensitivity compared to those in the eastern and north-western wards. The overall high sensitivity in the district is driven by population pressure and high poverty levels, with over 77% of households classified as poor. These factors lead to a heavy reliance on forest resources, coupled with frequent wildfires, human-wildlife conflicts, and deforestation. As a result, the ecosystem services that these regions offer are increasingly under threat. The degradation of natural habitats not only disrupts the delicate balance of biodiversity but also compromises the livelihoods of communities that depend on these resources for their survival. In areas where sensitivity is notably acute, indigenous species are at risk, with some facing extinction due to habitat loss and overexploitation. Furthermore, the interconnectedness of these ecosystems means that adverse changes in the northern regions can have ripple effects throughout the district. The eastern portions, while displaying lower sensitivity, are still vulnerable to the pressures exerted by population growth and agricultural expansion, which further strain available resources. Sustainable management practices are crucial to mitigate these impacts and safeguard both biodiversity and community

livelihoods.

Adaptive capacity

Ecosystems in the district have generally low adaptive capacity. The low adaptive capacity emanates from relative low biodiversity interconnectedness due to anthropogenic drivers such as deforestation. The main drivers of deforestation are clearance for poles for fencing, firewood, woodcarvings and agricultural expansion. Further, the district has is dominated by Kalahari Sands which are characterised by relatively low in nutrients especially nitrogen, phosphorus, and organic matter. This nutrient deficiency limits their fertility for agricultural uses. Because of loose texture, low vegetation cover (in some areas), the soils are highly susceptible to wind and water erosion resulting in loss of topsoil. Frequent meteorological and hydrological droughts further weaken the already fragile ecosystems.

Vulnerability of Forest Ecosystem

The ultimate integration of key components of forest vulnerability i.e., Exposure Index, Sensitivity Index and Adaptive Index yielded the overall vulnerability of forest ecosystem. Results show that forest ecosystems in Tsholotsho district are predominantly in the moderate to very high vulnerability category. In particular, the Terminalia and Mopane dominated landscapes in southern, central and northern parts of the districts are highly vulnerable to climate change. The high vulnerability of forest ecosystems in the district is a result of high exposure and sensitivity coupled with low adaptive capacity of the ecosystems. Thus, the vulnerability is a function of climatic and non-climatic stresses. The climate stresses include extreme weather events such as heat waves, droughts and floods, which are common in the district. These climate stresses may lead to forest dieback, habitat contraction and key ecological processes such as carbon sequestration, phenology. The anthropogenic drivers of ecosystem vulnerability are high human footprint index, forest fires, and poverty and forest fragmentation. However, the introduction of community-based resource management systems such as CAMPFIRE are likely to improve the management of forest and wildlife in the district. For these interventions to be effective there is need for tangible benefits to cascade to communities.

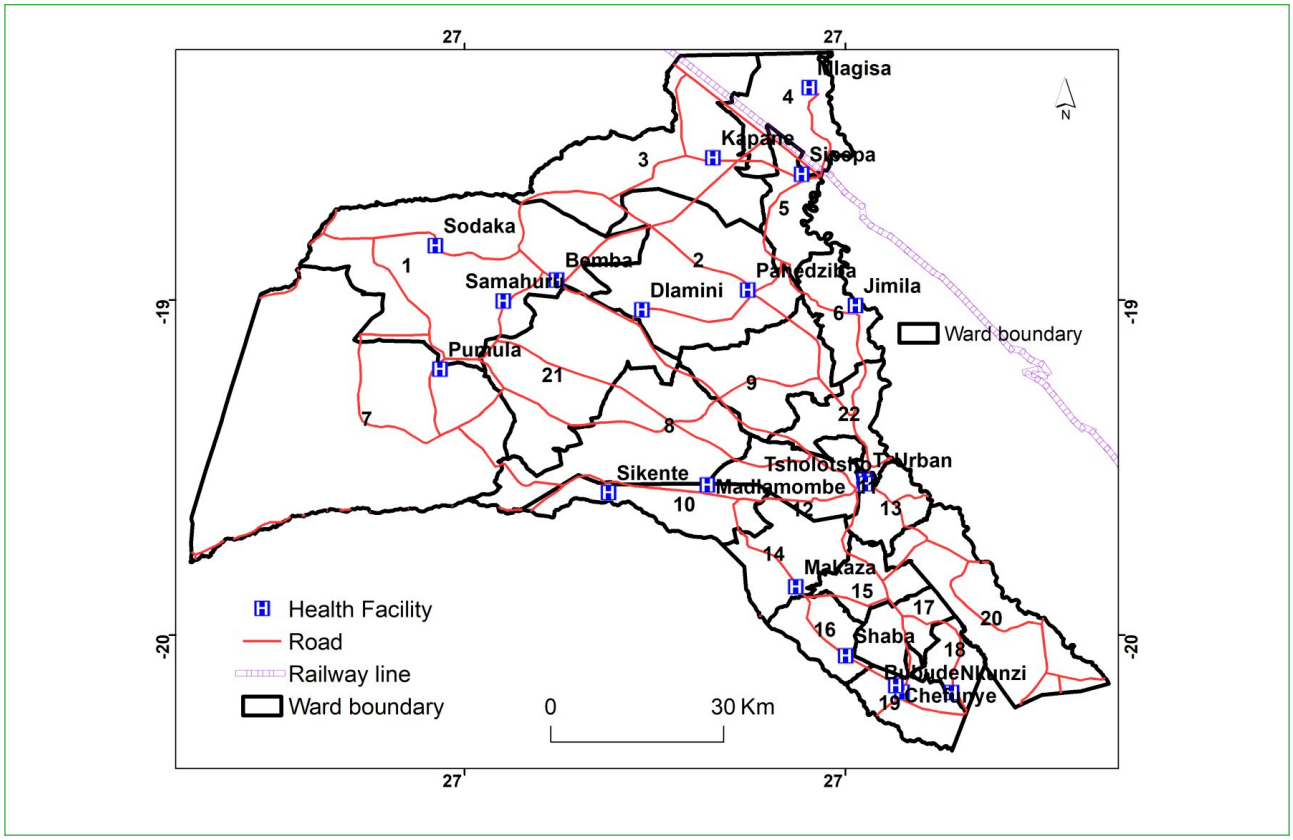
Adaptation options

- Capitalise on GEF 7 programme which seeks to "unlock a sustainable and an inclusive Wildlife Economy potential of Hwange National Park in Tsholotsho District of the Hwange-Kazuma Landscape in Zimbabwe";
- Support environmental education programmes to further enhance awareness about the importance of conservation;
- Promote alternative livelihoods option to reduce overdependence on forest resources;
- Adopt nature-based solutions to ensure sustainability of terrestrial and aquatic ecosystems;
- Enhance public private partnership to enhance conservation of timber and non-timber forest.

3.4.7.5 Infrastructure

The district of Tsholotsho is vulnerable to several hazards the include floods, droughts, heat waves, strong winds and cyclones. These hazards negatively affect infrastructure in the district. The infrastructure that is vulnerable to climate change includes roads, primary and secondary schools, health facilities and human settlements. The road network in the district is highly vulnerable to climate change since the roads are not tarred. The district is covered by approximately 547 km roads which are made up of gravel. Figure 3.25 shows the distribution of the gravel roads in the district that link different wards.

Figure 3.25: Spatial Distribution of Infrastructure



(Health facilities and road and rail Infrastructure in Tsholotsho district)

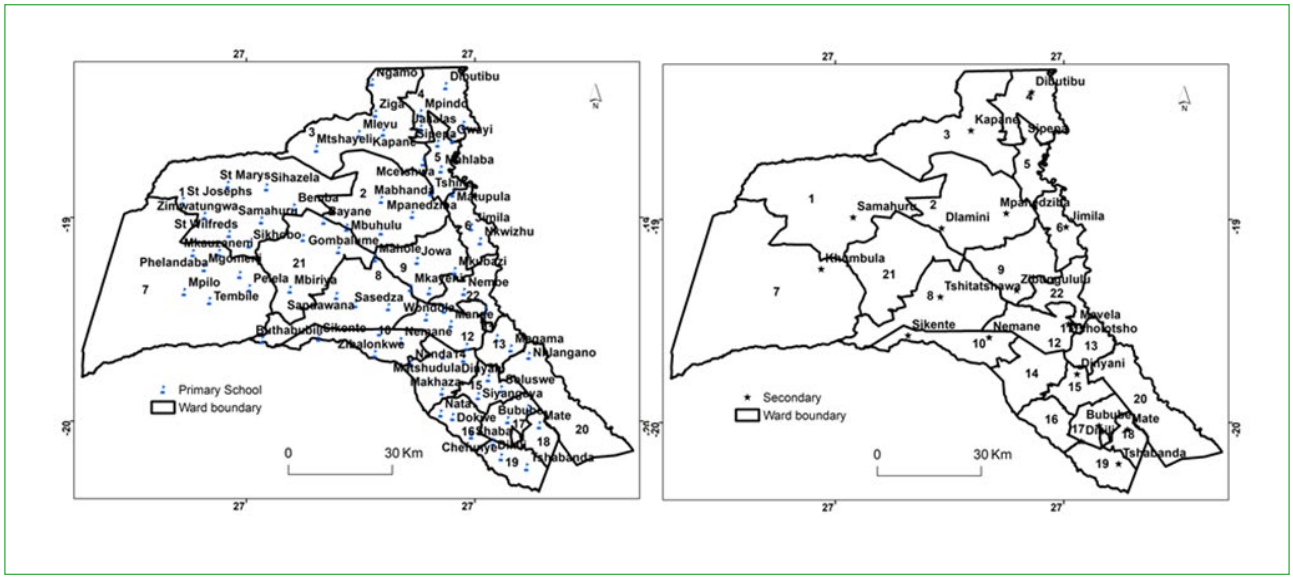
The major threat to the gravel roads is extreme rainfall events which result in damage to the infrastructure making some areas not reachable. Figure 3.27 shows the flooded Tsholotsho- Gariya road during the 2014 floods.

Figure 3.26: Flooding along the Tsholotsho-Gariya Road

(Picture courtesy of Dube 2014, DPhil thesis)

In terms of health facility infrastructure, the district has about 20 health facilities distributed as indicated in Figure 3.26. In addition to roads and health facilities, the district has a total of 114 schools, 29 of which are secondary schools while the remainder are primary schools. The health facilities and schools are threatened by climate change related hazard such as cyclones, floods and strong winds. Flooding in areas such as Ward 5 resulted in one of the primary schools being closed and the site changed for the abandoned school.

Figure 3.27: Distribution of Primary and Secondary Schools



(Source: Ministry of Primary and Secondary Education)

The negative impacts of climate related hazards also result in roofs of schools and health facilities being blown off which disrupts provision of normal services. Figure 3.28 shows schools with roofs blown off.

Figure 3.28: Roof of Nembe Primary School Destroyed by Strong Winds

In addition to the aforementioned infrastructure, settlements belonging to local communities are also destroyed during floods and heavy rains. This results in displacement and resettlement of affected communities Figure 3.29. shows the houses destroyed during cyclone Dineo in 2017

Figure 3.29: Homesteads Destroyed during Floods at in Butabubili Village

(Picture courtesy of Dube 2014, Dphil thesis)

The destruction of houses is attributed to poor building material which is mostly pole and dagga. The material is easily washed away during floods and excessive rains.

In general, the impact of climate related hazards on infrastructure in Tsholotsho has to do with the infrastructure characteristics for example grave roads, pole and dagga houses and old roofs on schools and health facilities. For schools and health facilities, the roofs are weakened by termites which destroy the timber used for roofing. The other challenge is to do with the physical location of the infrastructure where some communities built their homes in low lying areas or along the flood plain of Gwayi river which increases their vulnerability to flooding. One school that was destroyed by floods in 2017 had to be relocated because of its physical location with Gwayi flood plain. Most of the infrastructure is critically important across the district and their destruction has negative impacts on service delivery in the area. The destruction results in socioeconomic implications such as inaccessibility of areas due to damaged roads, disruption of learning activities due to destruction of schools, closure of health facilities due to destruction of health facilities and relocation of households due to destruction of homes.

Adaptation options

The government of Zimbabwe recognised that poorly planned, developed and governed settlements are more vulnerable hazards such as floods. Hence it developed the Zimbabwe National human Settlements Policy in 2020 to climate proof settlements and infrastructure through specifying building codes in each area. The policy also prohibits construction of settlements in flood prone areas such as wetlands. In this case there is need to enforce building codes and prohibition of housing development in high flood areas. are also lacking There is also a need to develop robust early warning systems and disaster response strategies in the infrastructure sector. The country has implemented several projects that includes the Climate Adaptation Water and Energy Infrastructure Programme (CAWEP)

that was aimed at developing climate-resilient infrastructure in vulnerable communities in Binga, Chipinge, Chivi and Insiza hence there is need to scale-up this project to other areas such as Tsholotsho. Using the National human Settlements Policy developed in 2020 the government is also encouraging development of **C**limate resilient hydro-energy infrastructure to withstand anticipated reductions in river runoff, higher evaporation, and increases in climatic variability. Investment in climate proofing building technology is critical in building resilience and sustainability. There also need to develop guidelines for planning and designing infrastructure that includes climate impact assessments.

Development partners such as UNDP and UNICEF also implemented the Partnership for Building Urban Resilience in Zimbabwe programme to build resilience in infrastructure.

To reduce the negative impacts of climate change on infrastructure in the district, there is need for any construction to take into consideration the type of soil. Most of the soils are sodic and sandy which negatively affects the ability to withstand climate hazards. This will reduce the destruction of latrines, schools and health facilities which are negatively affected by poor construction standards. In this case there is need for the government through the Ministry of Housing to develop and enforce building codes for infrastructure particularly schools and health facilities. Another action is to use land use zonation to guide the development of infrastructure in particular areas. Communities also raised the issue of understanding wind belts when siting schools and health facilities as most of the destruction occurs along belts of strong winds that blow between August and

September.

INFORMATION ON FINANCIAL, TECHNOLOGY DEVELOPMENT AND TRANSFER AND CAPACITY BUILDING SUPPORT NEEDED AND RECEIVED

4.1 OVERVIEW

This chapter provides information on financial resources, technology development and transfer, and capacity-building support needed and received in Zimbabwe under the Paris Agreement in up to 2022. This includes relevant information on the financial support provided to Zimbabwe for climate action, the technology transfer initiatives, and the capacity-building efforts aimed at enhancing Zimbabwe's ability to implement its commitments under the Climate Change Convention.

In addition to the specific focus on the Paris Agreement, the chapter includes relevant information related to climate change and sustainability efforts in Zimbabwe. This include information on other international agreements, initiatives, or partnerships that Zimbabwe is involved in, as well as any national policies or programs related to climate change mitigation and adaptation.

By compiling this information, Zimbabwe aims to provide a comprehensive overview of the support received by Zimbabwe and the needs and gaps that exist in terms of financial resources, technology transfer, and capacity-building. This information will contribute to the fulfilment of reporting requirements and inform future decision-making processes related to climate action in the country.

4.2 NATIONAL CIRCUMSTANCES, INSTITUTIONAL ARRANGEMENTS AND COUNTRY-DRIVEN STRATEGIES

4.2.1 National Circumstances

Zimbabwe is Party to the UNFCCC and the Paris Agreement and is in the process of implementing its Nationally Determined Contribution, National Climate Change Adaptation Plan consistent with the NDS1 and the 2030 Agenda for Sustainable Development.

Zimbabwe has a multi-currency system and it includes the Zimbabwe Gold (ZWG), US dollar, Rand, Pula, among others. The country has been experiencing fluctuating inflation rates since 2000. Zimbabwe's financial sector is diverse. It consists of a central bank, commercial banks, microfinance houses, building societies, Development Finance Institutions (DFIs), asset management companies, insurance companies, pension funds and two stock exchanges.

Zimbabwe's economic growth is sensitive to various shocks such as pandemics and extreme climate events such as droughts and floods. The economy experienced GDP growth rates of around 5% in 2017 and 2018. This was followed by a decline from 2019 – 2020 of -7.8% because of the Covid-19 pandemic. However, by 2022, the GDP growth rate had recovered to 6.1%.

Recognising the threat of climate change to national development and the commitments through the NDC and NAP, the Government of Zimbabwe mandates its ministries, departments and agencies to mainstream climate change in development planning and budgeting processes.

This is a deliberate attempt to ensure mainstreaming of climate change across all government institutions. This has resulted in a steady increase in climate-related investments, mitigation and adaptation, in the country's annual budget. However, the country's financial needs for adaptation and mitigation still fall far short of the actual requirements as estimated in the national climate policy frameworks hence the need to tap into external sources of support. In its attempt to access international finance from the multilateral institutions, Zimbabwe has made efforts to have some of local institutions accredited to receive such finance. The Infrastructure Development Bank of Zimbabwe (IDBZ) and the Environmental Management Agency (EMA) are accredited to the Green Climate Fund (CF) and Adaptation Fund (AF) respectively.

4.2.2 Institutional Arrangements

Zimbabwe's Institutional Arrangements for Transparency (Figure 0.2) identifies a Technical Working Group on Finance, Technology and Capacity Building with clear roles and responsibilities. Regarding the tracking of climate finance, various tools are being considered for use in this regard and these include Development Projects Management Information System (DEVPROMIS), Online Partnership Planning Tool (OPPT), Greenhouse Gas Information Management System (GHGIMS), among others. However, these are still in their development and refinement phase. Key institutions integral to the technical working group include Ministries responsible for Finance and Environment, with inputs from other key MDAs and other stakeholders. Whilst these tools are in place, there is need for capacity development on their use.

Zimbabwe has designated focal points within the Ministry of Environment, Climate and Wildlife for key finance and technology support facilities such as the Green Climate Fund, Global Environment Facility, Adaptation Fund, Climate Technology Centre and Network (CTCN), among others.

4.2.3 Country-Driven Strategies

To enhance mobilisation of finance and technological support for implementation of Zimbabwe's climate change commitments and priorities, a number of policies, strategies and plans have been adopted to guide the process. These include:

4.2.3.1 Development Cooperation Policy

In 2020 Zimbabwe launched the Development Cooperation Policy which aims to:

i. Promote sustainable and inclusive development,
ii. Reduce poverty,
iii. Coordinate external support from development partners, and
iv. Improve the quality and effectiveness of development cooperation.

The policy aligns external support with national priorities, institutions, and systems. The government expects development assistance

to be provided in line with the national priorities identified in the National Development Agenda. The Development Cooperation Policy provided for the establishment of the Development Projects Management Information System (DEVPROMIS), a web-based system for reporting, tracking and monitoring development projects funded by both the Government and Development Partners. The system is meant to improve the coordination and management of development assistance through information sharing and enhanced monitoring and evaluation of all development projects. The DEVPROMIS is expected to provide a database of all public investment projects and online project appraisal. The System was launched in May 2024 and some end users (both government and development partners) were trained on the use of the system. NDC and LT-LEDS Investment Framework

4.2.3.2 NDC LT-LEDS Investment Framework

To enhance implementation of NDC and LT-LEDS (2020 – 2050), the Government of Zimbabwe (GoZ), developed the NDC and LT-LEDS Investment Framework that provides a comprehensive and strategic approach to mobilizing the resources needed for climate action targeting a range of sources including domestic public and private, bilateral, multilateral and donors.

4.2.3.3 Green Resilient Recovery Strategy and Investment Plan

Following the Covid-19 pandemic's disruptions to global efforts to combat climate change, Zimbabwe with support from the Green Climate Fund developed a Green Resilient Recovery Strategy and Investment Plan to guide accelerated climate action post Covid-19.

4.2.3.4 Zimbabwe's National Climate Change Adaptation Plan

Zimbabwe's National Climate Change Adaptation Plan comes with its adaptation finance strategy to guide mobilisation of the US $10.3 Billion adaptation finance gap identified in the NAP. The finance strategy identifies various potential sources of finance for adaptation action such as multilateral, bilateral, public and private, domestic and external, philanthropy, donors and other innovative sources of financing - carbon trading, bonds, among others. The Strategy further identifies enabling activities that the country can undertake to tap into such sources of financing.

4.4 UNDERLYING ASSUMPTIONS, DEFINITIONS AND METHODOLOGIES

4.4.1 Underlying Assumptions

The assumptions listed in Table 4.1 were made in the compilation of this chapter:

Table 4.1: Assumptions

ITEM NO.	TOPIC / AREA	ASSUMPTION (S) MADE
1	Currency	Zimbabwe is using a multi-currency system (ZWG, Rands, US dollar, Pula, etc) and most transactions are done in United States Dollar
2	Estimation of the amount of support needed	The amount of support needed is being estimated using national documents such as the 4th National Communications, Biennial Update Report, Nationally Determined Contribution, National Adaptation Plan, NDC and LT-LEDS Investment Framework, and NDC Implementation Plan
3	Determination of the reporting year or time frame	Reporting year for the BTR1 is 2022 however for this chapter available information up to 2024 was captured.
4	Identification of support as coming from specific sources	Information on support received will have parameters that will reduce the chances of double-counting, such as name of donor, and whether the support is bilateral or multilateral
5	Determination of support as committed, received or needed	Support is said to be committed if an award letter given and signed or a grant agreement is in place. It is said to be received if the amount has been moved by the donor to the recipient or technology development and transfer, or capacity-building have been paid for by the donor, even if disbursement is not done in full.
6	Identification and reporting of the status of the supported activity (planned, ongoing or completed	The activity is said to be planned if both the start and end date of the activity are in the future and the disbursements will not have started. For Ongoing activities Implementation will have started and financial resources may or may not have been disbursed. Status is said to be completed if implementation is complete and the support disbursed fully.
7	Identification and reporting of the channel (bilateral, regional or multilateral)	The channel through which the support is provided is bilateral if the donor or development partner is a country or private company, and is multilateral if development partner is a UN Agency (e.g. UNDP) or multilateral bank (e.g. WB). The channel is regional if the support is coming from a regional body such as SADC, COMESA or Africa Union.
8	Identification and reporting of the type of support (mitigation, adaptation or cross-cutting)	Projects or activities that will result in reduced GHG emissions will be considered mitigation measures while those that will be taken to minimise the negative impacts of climate change will be taken as adaption measures. Those measures that will have both mitigation and adaptation attributes will be dubbed cross-cutting
10	Identification and reporting of sectors and subsectors	Identification and reporting of sectors and sub-sectors will be guided by IPCC Guidelines and classification
11	Reporting on the use, impact and estimated results of the support needed and received	The use, impact and estimated results of the support needed can be obtained from the objectives of the project, while those for the support received will be provided by the implementing and monitoring entities.
12	Identification and reporting of the support as contributing to technology development and transfer and capacity-building	The primary objective of the activity will be assessed to see if it relates to technology development and transfer or capacity building or both

4.4.2 Methodologies

In delivering this chapter the following steps were taken:

i. Reviewed relevant documents, including national climate action plans, reports, funding proposals and project documents.
ii. Engaged key stakeholders, including government ministries, department and agencies, international organizations, civil society groups, and private sector entities, to gather information on support needed and received.
iii. Collected and analysed data on financial resources, technology development and transfer, and capacity-building support, including their sources, allocation, utilization, and impact.
iv. Carried out Quality Control (QC) on the data using data from other sources such as OECD datasets and OPPT.
v. Identified gaps, challenges, and lessons learned in accessing and utilizing the support, and recommend strategies for improvement.

4.5 INFORMATION ON FINANCIAL SUPPORT RECEIVED (CTF III.7)

Zimbabwe has managed to mobilise resources from various funding mechanisms ranging from domestic, bilateral, regional and multilateral platforms. The Green Climate Fund (GCF), Global Environmental Facility (GEF) and Adaptation Fund have been the main sources of climate finance for Zimbabwe as highlighted in *Table 4.2*

Table 4.2: Climate-related Financial Support Received

NO	TITLE OF ACTIVITY, PROGRAMME, PROJECT	RECIPIENT ENTITY	IMPLEMENTING ENTITY	USD	TIME FRAME	FINANCIAL INSTRUMENT	TYPE OF SUPPORT	USE, IMPACTS AND RESULTS
1	Kariba Dam Rehabilitation Project (KDRP) -	Ministry of Energy and Power Development	African Development Bank (AfDB)	25,500,000	2015 - 2026	Grant	Mitigation	Sustained hydro power generation. Safeguarded lives and livelihoods through the long-term safety and reliability of the dam complex
2	Emergency Power Infrastructure Rehabilitation Project - Phase II Stage II – Zim Trust Fund	Ministry of Energy and Power Development	African Development Bank (AfDB)	7,028,124	2017 - 2025	Grant	Mitigation	The initiative improves electricity transmission and distribution efficiency and reduce losses across the country thereby improving access to energy
3	Alaska – Karoi Power Transmission Reinforcement Project	Ministry of Energy and Power Development	African Development Bank (AfDB)	18,874,489	2017 - 2024	Grant	Mitigation	Contribute to reduced grid transmission and distribution losses
4	Energy Sector Reform Project	Ministry of Energy and Power Development	African Development Bank (AfDB)	4,116,318	2022 - 2025	Grant	Mitigation	To facilitate the creation of an enabling environment for promoting Independent Power Producers
5	Harare Sustainable City Initiative	Government of Zimbabwe	UN Habitat	6,500,000.00	2022 - 2027	Grant	Mitigation	Sustainable waste to wealth practices in the greater Harare. Increased access to clean energy by the urban and peri-urban poor in Harare. Achieved energy and resource efficiencies in Zimbabwe's built environment.

NO	TITLE OF ACTIVITY, PROGRAMME, PROJECT	RECIPIENT ENTITY	IMPLEMENTING ENTITY	USD	TIME FRAME	FINANCIAL INSTRUMENT	TYPE OF SUPPORT	USE, IMPACTS AND RESULTS
6	Zimbabwe Energy Offer	Ministry of Energy and Power Development	United Nations Development Programme (UNDP)	1,581,637	2022 - 2024	Grant	Mitigation	Enhanced contribution of renewables to the energy mix.
7	Smallholder Irrigation Revitalisation Programme	Ministry of Lands, Agriculture, Fisheries, Water and Rural Development	International Fund for Agricultural Development (IFAD)	25,500,000	2016 - 2023	Grant	Adaptation	Sustainable increase in increase rural households' income in schemes and adjacent rainfed areas supported by the programme in Chipinge, Chiredzi, Gwanda, Chirumhanzu, Chimanimani, Makoni districts.
8	Building Climate Resilience of Vulnerable Agricultural Livelihoods in Southern Zimbabwe - Green Climate Fund	Ministry of Lands, Agriculture, Fisheries, Water and Rural Development	UNDP	26,574,567	2020 - 2027	Grant	Adaptation	The project benefits an estimated 2,302,120 people across Manicaland, Masvingo and Matabeleland South provinces and contributes towards GoZ's achievement of priorities outlined in its NDC and climate change plans and strategies.
9	Climate Adaptation Water and Energy Programme (CAWEP)	Ministry of Environment, Climate and Wildlife	UNDP	16,000,000.00	2022 - 2025	Grant	Cross-cutting	Continued access to water for productive and household use during droughts and floods and Improved access to clean and affordable energy to support economic activities, while strengthening early warning systems
10	Strengthening Biodiversity and Ecosystems Management and Climate-Smart Landscapes in the Mid to Lower Zambezi Region of Zimbabwe:	Ministry of Environment, Climate and Wildlife	UNDP	1,569,715.22	2020-2025	Grant	Adaptation	Prevention of the extinction of known threatened species

NO	TITLE OF ACTIVITY, PROGRAMME, PROJECT	RECIPIENT ENTITY	IMPLEMENTING ENTITY	USD	TIME FRAME	FINANCIAL INSTRUMENT	TYPE OF SUPPORT	USE, IMPACTS AND RESULTS
11	HFC 134: eliminate the use of the Ozone Depleting Substance HFC-134a in the domestic manufacturing of refrigerators and freezers	Ministry of Environment, Climate and Wildlife	UNDP, UNEP and Ministry of Environment, Climate and Wildlife	406,227.00	2019 - 2024	Grant	Mitigation	Reduced use of Ozone Depleting Substances HFC-134a in the domestic manufacturing of refrigerators and freezers in Zimbabwe by the adoption of isobutane (HC-600a) as a refrigerant.
12	Amplifying the roles of Youths, Women and Persons with Disabilities in implementing Zimbabwe's Nationally Determined Contribution, National Adaptation Plan and other climate-related policies and strategies	Ministry of Environment, Climate and Wildlife	UNOPS & SNV Zimbabwe	181,498.90	Aug 2023 - Jan 2025	Grant	Cross-cutting	Capacitated women, youths and people with disabilities (PWDs) on NDC, NAP and other climate-related policies and strategies implementation : Knowledge-sharing platform for women, youth and PWDs established and/or strengthened to enable the exchange of information to inform NDC, NAP and other climate-related policies and strategies implementation

NO	TITLE OF ACTIVITY, PROGRAMME, PROJECT	RECIPIENT ENTITY	IMPLEMENTING ENTITY	USD	TIME FRAME	FINANCIAL INSTRUMENT	TYPE OF SUPPORT	USE, IMPACTS AND RESULTS
13	Mainstreaming Migration into Environment and Climate Change Policies (MECC)	Ministry of Environment, Climate and Wildlife	International Organisation for Migration	210,000.00	2022-2024	Grant	Adaptation	A comprehensive stocktake report was developed under the project which clearly shows how migration has been mainstreamed into climate change and environment policies and strategies A MECC toolkit was developed which provides a set of recommendations on the mainstreaming of migration into climate change.
14	Support towards hosting the Climate Diplomacy training programme for Zimbabwe Negotiators	Ministry of Environment, Climate and Wildlife	UNITAR	55,841.85	2023	Grant	Cross-cutting	New climate negotiators for the Conference of Parties sessions to the United Nations Framework Convention on Climate Change capacitated.
15	Integrated Climate Risk Management for Food Security and Livelihoods in Zimbabwe focusing on Masvingo and Rushinga districts	Ministry of Environment, Climate and Wildlife	World Food Programme	10,000,000	2021-2025	Grant	Adaptation	The project will enhance early warning systems for agriculture in the project area and will also enhance livelihoods of the communities, building resilience to climate change and improving food security
16	Climate Promise 2	Ministry of Environment Climate and Wildlife	Ministry of Environment, Climate and Wildlife	500,000	2023-2024	UNEP	Grant	The project assisted in the enhancing the implementation of Zimbabwe's revised Nationally Determined Contribution

NO	TITLE OF ACTIVITY, PROGRAMME, PROJECT	RECIPIENT ENTITY	IMPLEMENTING ENTITY	USD	TIME FRAME	FINANCIAL INSTRUMENT	TYPE OF SUPPORT	USE, IMPACTS AND RESULTS
17	Development of Green Building Standards for Zimbabwe (2023-2024)	Ministry of Environment, Climate and Wildlife	Ministry of National Housing	295,000	2023-2024	Climate Technology Centre and Network (CTCN	Grant	Enhanced climate change mitigation in the built environment for Zimbabwe.
18	Capacity Building Initiative for Transparency (CBIT) (2022-2024)	Ministry of Environment, Climate and Wildlife	UNEP	1,200,000	2022-2024	Global Environment Facility	Grant	Strengthened capacity of institutions to conform to enhanced transparency framework requirements of the Paris Agreement
19	Integrate Short Lived Climate Pollutants (SLCPs) within climate commitment plans and inventories" in Zimbabwe	Ministry of Environment, Climate and Wildlife	Ministry of Environment, Climate and Wildlife	170,000	2024-2025	Grant	Mitigation	Enhance the capacity of the Climate Change Management Department and other national institutions in Zimbabwe to increase planning and action on the mitigation of SLCPs
20	Capacity Building Related to Multilateral Environmental Agreements in ACP Countries Phase III (ACP MEAs 3) - GCP/ GLO/006/EC	Ministries of Environment, Climate and Wildlife; Lands, Agriculture, Fisheries, Water and Rural Development; & Farmer Organisations	FAO	556,700,00	Aug 2019 - July 2024	Grant	Adaptation	The programme developed and implemented integrated approaches to address national biodiversity-related priorities and commitments in agriculture. It promoted ecosystem-based practices and approaches for agriculture and the sustainable use and conservation of biodiversity that ensure environmental sustainability while increasing productivity.

NO	TITLE OF ACTIVITY, PROGRAMME, PROJECT	RECIPIENT ENTITY	IMPLEMENTING ENTITY	USD	TIME FRAME	FINANCIAL INSTRUMENT	TYPE OF SUPPORT	USE, IMPACTS AND RESULTS
21	Institutional Strengthening Project for the Implementation of the Montreal Protocol in Zimbabwe	Ministry of Environment, Climate and Wildlife	UNDP	392,782	2018-2023	Grant	Mitigation	The programme assisted in the reduction of Hydrofluorocarbons
22	Project for the upscaling of the rolling out of energy, water, and hydrofluorocarbon (HFC) audits in private companies and public sector institutions	Ministry of Environment, Climate and Wildlife	Common Market for Eastern and Southern Africa	139,217	2024 - 2025	Grant	Mitigation and Adaptation	Energy efficiency, Shift to HCs with lower GWP and improved water-use efficiency
23	1st Biennial Transparency Report (BTR1)/ 2nd Biennial Transparency Report & Fifth National Communication (NC5) to the United Nations Framework Convention on Climate Change Project	Ministry of Environment, Climate and Wildlife	UNEP	1,233,000	2023-2027	Grant	Adaptation and Mitigation	The project assists in improving transparency and timely reporting to the UNFCCC

NO	TITLE OF ACTIVITY, PROGRAMME, PROJECT	RECIPIENT ENTITY	IMPLEMENTING ENTITY	USD	TIME FRAME	FINANCIAL INSTRUMENT	TYPE OF SUPPORT	USE, IMPACTS AND RESULTS
24	Building Capacity to Advance National Adaptation Planning in Zimbabwe	Ministry of Environment, Climate and Wildlife	UNEP	3,000,000	2019-2023	Grant	Adaptation	The project resulted in the development of Zimbabwe's National Climate Change Adaptation Plan to guide the mainstreaming of climate change into development planning.
25	Grid connected solar systems		Independent Power Producers	6,100,000	2020-2030	Loan	mitigation	clean energy production, emission reduction and improved energy access
26	Strengthening Local Communities' Adaptive Capacity and Resilience to Climate Change through Sustainable Groundwater Utilisation in Zimbabwe	Ministry of Lands, Agriculture, Fisheries, Water and Rural Development	UNESCO	5,000,000	2024-2028	Grant	Adaptation	Enhanced Sustainable Groundwater Utilization and Climate resilience
27	Enhancing Resilience of Communities and Ecosystems in the Face of a Changing Climate in Arid and Semi-arid Areas of Zimbabwe	Environmental Management Authority	Environmental Management Agency	5,000,000	2024-2028	Grant	Adaptation	Enhanced Ecosystem resilience to climate change

NO	TITLE OF ACTIVITY, PROGRAMME, PROJECT	RECIPIENT ENTITY	IMPLEMENTING ENTITY	USD	TIME FRAME	FINANCIAL INSTRUMENT	TYPE OF SUPPORT	USE, IMPACTS AND RESULTS
28	Strengthening the Capacity of Institutions in Zimbabwe to Comply to the Transparency Requirements of the Paris Agreement	Ministry of Environment, Climate and Wildlife	UNEP	1,210,000	2022 - 2024	Grant	Mitigation	Improved Monitoring, Reporting and Verification (MRV) system and institutional capacity to comply with the ETF
29	Initiative for Climate Action Transparency Project in Zimbabwe Phase 1	Ministry of Environment, Climate and Wildlife	UNOPS	126,000	2020 - 2022	Grant	Mitigation	NDC Implementation tracking information report was used to enhance the CBIT project proposal; training on GHG MRV, cost modelling and GHG data verification capacitate 14 experts and 20 technical government officials.
30	Initiative for Climate Action Transparency Project in Zimbabwe Phase 2	Ministry of Environment, Climate and Wildlife	UNOPS	170,000	2024-2025	Grant	Adaptation	Adaptation transparency arrangements based on the NAP Monitoring and Evaluation Frameworks established and contributing reporting and policy formulation
31	Support to Zimbabwe to develop a Climate Change Management Bill	Ministry of Environment, Climate and Wildlife	UNEP	50,000	2024-2025	Grant	Cross Cutting	Enactment of Zimbabwe's climate change law to support enhanced climate action and reporting
	Total			168,684,417				

NB: *This table is not exhaustive due to limited capacity to track all the climate finance mobilised by various stakeholders through various channels.*

4.5 INFORMATION ON FINANCIAL SUPPORT NEEDED BY ZIMBABWE (CTF III.6)

Zimbabwe is a developing country and requires substantial financial resources to pursue climate action. Resources mobilised so far have been helpful in complementing allocations from the national Treasury. Following the adoption of the NAP and as the country upscales efforts towards implementation of its Revised NDC, substantial financial and technological support will be required from external sources to leverage the available domestic resources towards attainment of the NDC and NAP targets. The Country requires an estimated USD 15,8 Billion to implement its climate change priorities by 2030. *Table 4.3* details financial support needed by Zimbabwe.

Table 4.3: Financial Support Needed

SECTOR	TITLE OF ACTIVITY, PROGRAMME, PROJECT OR OTHER	USD	EXPECTED TIME FRAME	TYPE OF SUPPORT
Energy	Reduced Transmission and Distribution losses from 18% in 2020 to 11% in 2025	1,239,031,042	2021-2030	Mitigation
Energy	Expansion of Solar: 300 MW in 2025	346,829,477	2021-2030	Mitigation
Energy	Expansion of microgrids: Additional of 2.098 MW of capacity added through microgrids by 2028	3,367,829	2021-2030	Mitigation
Energy	4.1 MW biogas capacity added in 2024	15,132,474	2021-2030	Mitigation
Energy	Energy Efficiency Improvements: Agriculture: 12% savings (2030 compared to baseline scenario); Commercial: 16% savings; Domestic: 22.08% savings; Manufacturing: 18.63% savings; Mining: 8% savings	721,250,120	2021-2030	Mitigation
Energy	2% biodiesel in fuel by 2030	84,195,720	2021-2030	Mitigation
Energy	Transport fuel economy policy / Fuel efficiency improvement 2025-2030: Motorcycles: 2.2% per year; LDVs: 2.9%/year; Buses: 2.6%/year; HDVs: 2.5%/year	92,603,914	2021-2030	Mitigation
Energy	Public transport. 5% shift from private car to public transport in 2030	999,949,331	2021-2030	Mitigation
Industry	Increased clinker substitution with fly ash (up to 16% by 2030, 20% by 2050).	1,035,380	2021-2030	Mitigation

SECTOR	TITLE OF ACTIVITY, PROGRAMME, PROJECT OR OTHER	USD	EXPECTED TIME FRAME	TYPE OF SUPPORT
Industry	Increased clinker substitution with blast furnace slag (BFS) (up to 16% by 2030, 20% by 2050).	11,593,978	2021-2030	Mitigation
Industry	Decomposition of N2 O emissions through use of a secondary catalyst. Selective De-N2 O catalyst results in abatement of approximately 75% of all N2 O emissions produced during nitric acid production. Implementation by 2023	3,970,852	2021-2030	Mitigation
Industry	HFC Phasedown schedule Kigali Amendment (Freeze 2024, 2029, 10% reduction)	5,575,122	2021-2030	Mitigation
Forestry	Increase area of forest land from 9.9 million hectares to 10.4 million hectares by 2025: Add 100,000 hectares of natural forest land per year between 2021 and 2025 (Priority 1)	921,602	2021-2030	Mitigation
Forestry	Increase area of forest plantation from 68848 hectares to 118848 hectares by 2025: Add 10,000 hectares of plantation forest land per year between 2021 and 2025 (Priority 3)	1,170,752,864	2021-2030	Mitigation
Forestry	Reduce area burned by 500,000 hectares between 2020 and 2025 inclusive of agricultural production landscapes (Priority 2)	55,751,220	2021-2030	Mitigation
Waste	Waste to Energy: It was assumed that 42% of the methane generated would be collected in 2030 and used for energy production through waste to energy projects in the Bulawayo, Harare, Gweru and Mutare metropolitan areas	580,950,468	2021-2030	Mitigation
Waste	20% of organic matter composted in the long term	167,617,750	2021-2030	Mitigation

SECTOR	TITLE OF ACTIVITY, PROGRAMME, PROJECT OR OTHER	USD	EXPECTED TIME FRAME	TYPE OF SUPPORT
Agriculture, Water, Health, Infrastructure, Human Settlement, Tourism, Forestry and Biodiversity	Zimbabwe's National Climate Change Adaptation Plan (NAP) implementation	10,300,000,000	2023-2030	
Adaptation Climate Change Mainstreaming	Capacity Building for Ministries, Departments and Agencies (MDAs), and non-state actors on climate change mainstreaming.	1,000,000	2025-28	
Loss and Damage	Development of a National Framework for responding to Loss and Damage Associated with the Adverse Impacts of Climate Change	250,000	2025-26	
Climate Transparency	Strengthen country's MRV capacity	1,000,000	2025-2027	Cross-cutting
Action for Climate Empowerment and Capacity Building	Upscale Action for Climate Empowerment Initiatives and climate-focused capacity building in Zimbabwe	1,750,000	2025 - 2028	Cross-cutting
Total		15,804,529,143		

4.6 INFORMATION ON TECHNOLOGY DEVELOPMENT AND TRANSFER SUPPORT RECEIVED BY ZIMBABWE UNDER ARTICLE 10 OF THE PARIS AGREEMENT (CTF III.9)

The country received support focusing on technology development and transfer from both bilateral and multi-lateral finance mechanisms as outlined in CTF III.9. These include:

- Nitrous Oxide abatement technology and monitoring equipment by the Nitric Acid Climate Action Group (NACAG) to Sable Chemicals Industries through GiZ.
- Climate Technology Centre and Network supported initiatives on; development of green building standards among others.
- Hydrochlorofluorocarbon phase out and hydrofluorocarbon phase down support for the refrigeration and air conditioning sectors, and,
- Support the shift towards electric mobility in Zimbabwe.

4.7 INFORMATION ON CAPACITY-BUILDING SUPPORT RECEIVED BY ZIMBABWE UNDER ARTICLE 11 OF THE PARIS AGREEMENT (CTF III.11)

Zimbabwe received some support towards capacity building and this include:

- Strengthening the capacity of institutions in Zimbabwe to conform to the transparency requirements of the Paris Agreement. This is the Capacity Building Initiative for Transparency Project that the country has been implementing from 2022 – 2024.
- Amplifying the roles of youths, women and persons with disabilities in implementing Zimbabwe's NDC, NAP and other climate related policies and strategies being implemented by the Ministry of Environment, Climate and

Wildlife in partnership with SNV Zimbabwe. Resources for the project were mobilized from NDC Partnership Action Fund

- UNICEF Zimbabwe is into a partnership with the Ministry of Environment, Climate and Wildlife to implement programmes on environment and climate change with a focus on making sure inclusion of the children and youth constituency in decision making.

4.8 INFORMATION ON CAPACITY-BUILDING SUPPORT NEEDED BY ZIMBABWE UNDER ARTICLE 11 OF THE PARIS AGREEMENT (CTF III.10)

As Zimbabwe intensifies implementation of its NDC and NAP and intends to strengthen institutions towards effectively addressing loss and damage associated with the adverse impacts of climate change some capacity gaps still exist and support is required as outlined in CTF III.10. The support needed include:

- Development of a national framework for responding to loss and damage associated with adverse impacts of climate change
- Capacity building for ministries, departments, agencies and non-state actors on climate change mainstreaming
- Numerical Weather prediction and hydrological monitoring, Artificial Intelligence and Radar Technology, and
- Capacitation of research and academic institutions.

4.9 AREAS OF IMPROVEMENTS

Table 4.4 shows the climate finance tracking and reporting gaps and proposed interventions.

Table 4.4: Reporting Gaps

AREA	IDENTIFIED GAP	PROPOSED INTERVENTIONS
Usage of climate finance tracking tools	Level of usage of tracking tools is low. This may be due to limited capacity of potential data providers to use the recently developed data collection tools.	Identification of focal points, training and provision of the necessary tools for timely data provision
Technology needs	Outdated technology needs assessment	Conduct a technology needs assessment consistent with the NDC and NAP.
Monitoring climate related public expenditure	Limited monitoring and review of climate related public expenditure and institutional performances.	Conduct annual Climate Public Expenditure and Institutional Review (CPEIR)
Climate Change Legislation	Absence of a climate change legislation to compel reporting of climate finance, technology and capacity building received. Further the legislation should establish a National Climate Change fund to support local climate action and leverage incoming climate finance	Expedite the process of formulating the Climate Change Management Bill.

4.10 CONCLUSION

Zimbabwe is committed to report transparently its climate action and support (needed and received). The country has started strengthening its institutional arrangements and governance structures and acquiring appropriate systems and tools for use in tracking climate finance.

During the reporting period, Zimbabwe revised its NDC and adopted its NAP among many other climate related policies and strategies requiring an estimated USD 15,8 Billion for implementation by 2030. Over the reporting period , the country received an estimated USD 168,7 Million in climate financial support. Zimbabwe therefore requires substantial external financial and technological support to achieve its NDC and NAP by 2030

CLIMATE CHANGE EDUCATION, TRAINING AND PUBLIC AWARENESS

5.1 INTRODUCTION

Climate change poses a significant threat to Zimbabwe, exacerbating existing vulnerabilities and undermining the country's sustainable development efforts. Addressing this global challenge necessitates a comprehensive and coordinated response that engages all segments of society. At the heart of this response lies the critical importance of climate change education, training, and public awareness.

Well-informed and empowered citizens are essential for driving climate action and building resilience. By equipping the population with a deep understanding of the science, impacts, and solutions related to climate change, Zimbabwe can foster a culture of climate-conscious decision-making and spur meaningful participation in both mitigation and adaptation efforts.

Zimbabwe has made significant strides in enhancing climate change education, training, and public awareness, as highlighted in the country's earlier National Communications to the United Nations Framework Convention on Climate Change (UNFCCC). Building on this foundation, the present chapter outlines ongoing and planned initiatives aimed at further strengthening these crucial pillars of the national climate change response strategy.

This chapter explores the integration of climate change topics into the national education curriculum, capacity-building programs targeting key stakeholder groups, and public awareness campaigns aimed at fostering widespread understanding and engagement. It will also discuss mechanisms for monitoring and evaluating the progress and impacts of these initiatives, alongside recommendations for future enhancements.
By investing in climate change education, training, and public awareness, Zimbabwe aims to empower its citizens to become active participants in the fight against climate change, ultimately contributing to the country's overall climate resilience and sustainable development goals.

5.2 CLIMATE CHANGE EDUCATION

The Government of Zimbabwe recognizes that education is a vital tool in addressing climate change and fostering sustainable development. Significant efforts have been

made to integrate climate change topics across all educational levels, ensuring that students are equipped with the knowledge necessary to understand and tackle the challenges posed by a changing climate. To support this integration, targeted teacher training programs have been implemented in partnership with the Ministries of Education and the United Nations Institute for Training and Research (UNITAR), utilizing platforms like UN CC: e-Learn to enhance educators' capacity to deliver climate-focused content effectively.

In addition to curriculum development, Zimbabwe has prioritized the establishment of innovation hubs within universities to promote collaborative learning and research on climate issues. These hubs serve as platforms for students, researchers, and industry stakeholders to develop innovative solutions to pressing environmental challenges. Moreover, partnerships with organizations such as Zimbabwe Postal Services (ZIMPOST) have facilitated the distribution of climate change educational materials in schools and Community Information Centres, thereby enhancing public awareness and engagement. By collaborating with academic institutions on research and curriculum development, Zimbabwe aims to cultivate a well-informed populace capable of contributing to climate resilience efforts. Through these comprehensive initiatives, the country is committed to empowering its citizens with the tools and knowledge necessary for effective climate action.

5.2.1 Primary and Secondary Education

At the primary and secondary school levels, climate change has been incorporated into subjects such as Geography, Agriculture, Environmental Science, Integrated Science and Biology. Students are introduced to the basic science of climate change, its causes, impacts, and strategies for mitigation and adaptation. The Ministry of Primary and Secondary Education collaborates closely with the Ministry of Environment, Climate and Wildlife to develop age-appropriate teaching and learning materials, which are distributed nationwide. During the curriculum review exercise conducted by the Ministry of Primary and Secondary Education, climate change issues have been integrated strongly across all learning areas at primary and secondary educational levels. In addition, working with the Ministry of Higher and Tertiary Education, Innovation, Science and Technology Development, the Ministry of Environment, Climate and Wildlife has worked on reviewing the teacher training modules to incorporate climate change issues so that the teacher who is going to deliver the climate-inclusive curriculum is well equipped.

To further support climate change education, climate-related information has been incorporated into existing Community Information Centres across the country. These centres serve as hubs for sharing information and resources on a range of environmental and sustainable development topics. Students and teachers have access to educational materials, including climate-related books/ issues, brochures, factsheets, posters, and interactive displays, to enhance their understanding of climate issues.

5.2.2 Tertiary Education

At the tertiary level, climate change has emerged as a focal study area in academic institutions such as Bindura University of Science Education, Lupane State University and the University of Zimbabwe. Universities and colleges offer climate change-related courses that cover topics such as climate science, policy, and project management. Collaborations with government and research organizations facilitate climate change research and the development of innovative teaching methods.

The Ministry of Higher and Tertiary Education, Innovation, Science and Technology Development has initiated faculty development programs to strengthen the capacity of university and college lecturers to effectively teach climate change subjects. This ensures that the next generation of professionals is well-equipped with the knowledge and skills necessary to contribute to Zimbabwe's climate response.

Through these comprehensive efforts to mainstream climate change education across all levels, Zimbabwe aims to cultivate a well-informed and environmentally conscious population capable of actively participating in climate change adaptation and mitigation, building a sustainable future.

5.3 CLIMATE CHANGE TRAINING

Recognizing the necessity of building capacity among various stakeholder groups, Zimbabwe has implemented a comprehensive suite of training programs aimed at diverse actors as follows:

5.3.1 Government and Local Authorities Capacity Building

A key focus area has been the integration of climate change considerations into the budgeting and planning processes of all government Ministries, Departments, Agencies and Local Authorities. Training sessions are conducted to equip policymakers, public sector officials and local authorities' workers with the knowledge and tools necessary to embed climate change adaptation and mitigation strategies into sectoral plans, strategies and budgets. This systematic approach ensures that climate change is addressed across the entire government framework.

5.3.2 Media Training

Zimbabwe has placed significant emphasis on training media practitioners to enhance their understanding of climate change science, its impacts, and potential solutions. This initiative not only equips journalists with the necessary tools for more accurate and impactful climate reporting but also plays a crucial role in raising public awareness and catalysing action. In collaboration with civil society organizations, the government has developed specialized training modules and facilitated knowledge-sharing workshops tailored for journalists, editors, and media professionals. These training sessions have seen media personnel actively participating and covering a wide range of climate change programs, ensuring that critical information reaches diverse audiences.

The initiative addresses the pressing challenges posed by climate change in Zimbabwe, including recurrent droughts, floods, and extreme weather events that severely affect agriculture, health, and water resource management. By focusing on empowering media practitioners, the program aims to highlight the roles of women, youth, and persons with disabilities in implementing the country's climate policies. Through workshops and awareness campaigns, media personnel have become instrumental in promoting climate-smart practices and enhancing community preparedness. Their coverage not only informs the public about ongoing climate initiatives but also amplifies the voices of marginalized groups, ensuring that the message of climate empowerment resonates throughout the nation.

5.3.2 Targeted Training for Key Groups

Recognizing the essential contributions of youth, women, and persons with disabilities in driving climate action, the government has collaborated with civil society organizations to develop targeted training programs. These

initiatives empower these key demographic groups with the skills and knowledge necessary to actively engage in the implementation of the Nationally Determined Contribution (NDC), the National Adaptation Plan (NAP), and other climate-related policies and strategies. By fostering inclusivity and enhancing capacities, these programs aim to ensure that all voices are heard in the climate conversation and that diverse perspectives inform the solutions being pursued.

In addition to empowering community members, the government has prioritized the training of parliamentarians on climate change matters. Dedicated capacity-building sessions have been organized to enhance legislators' understanding of climate issues and their implications for national development. These engagements focus on equipping members of parliament with the necessary information to effectively oversee climate policies and advocate for increased resources during budgetary discussions. By strengthening their grasp of climate change dynamics, legislators are better positioned to champion sustainable development and ensure that climate considerations are integrated into national planning and resource allocation.

5.3.3 Capacity Building

Under the Capacity Building Initiative for Transparency (CBIT), Zimbabwe has undertaken significant training efforts to strengthen its monitoring, reporting, and verification (MRV) capabilities. This initiative aims to enhance the country's compliance with the Enhanced Transparency Framework set forth by the Paris Agreement. By building the technical capacity of greenhouse gas (GHG) data providers, the program is focused on creating robust systems that convert climate data into actionable insights for policymakers. Key components of this initiative include the development of specialized tools for tracking Nationally Determined Contributions (NDCs) and the establishment of country-specific emission factors, which are essential for improving the accuracy and reliability of reporting to the United Nations Framework Convention on Climate Change (UNFCCC).

As part of this three-year project initiated in February 2022, significant milestones have been achieved, particularly in 2024. The project has facilitated the finalization of institutional arrangements for climate change transparency in Zimbabwe, clearly defining the roles and responsibilities of key stakeholders involved in the reporting process. Additionally, a comprehensive Greenhouse Gas Information Management System (GHGIMS) has been developed, featuring a database for efficient data management and an Online Transparency Portal (OPT) for public access to various MRV products. The project has also made strides in the Agriculture, Forestry, and Other Land Use (AFOLU) sector, finalizing 23 validated emission factors specifically focused on livestock enteric fermentation and land conversion. Furthermore, NDC tracking indicators have been created to monitor the country's 17 projects aligned with its revised NDC, covering all sectors identified by the Intergovernmental Panel on Climate Change (IPCC). Throughout the project, extensive training sessions have been conducted, focusing on NDC tracking, GHGIMS utilization, climate finance identification, and mitigation scenario development, effectively equipping stakeholders with the necessary skills to enhance transparency and accountability in climate action.

5.3.3.1 Sector-Specific Training

Recognizing the importance of the refrigeration and air conditioning sector, Zimbabwe has implemented training programs for technicians to promote the adoption of ozone-friendly

and climate-friendly refrigerants. This initiative contributes to efforts to phase down hydrofluorocarbons (HFCs) and aligns with international climate commitments.

As part of its commitment to climate change mitigation and sustainable development, the Government of Zimbabwe has prioritized climate change training for stakeholders from key Ministries, Departments, and Agencies (MDAs). Recently, these stakeholders were capacitated on the Low Emissions Analysis Platform (LEAP), a widely-used software tool developed by the Stockholm Environment Institute for energy policy analysis and climate change mitigation assessment. LEAP is rapidly becoming the de facto standard for countries engaged in integrated resource planning, greenhouse gas (GHG) mitigation assessments, and the development of Low Emission Development Strategies (LEDS), particularly in the developing world.

By equipping stakeholders with expertise in LEAP, Zimbabwe aims to enhance its capacity for effective climate policy formulation and implementation. Many countries have adopted LEAP as part of their commitment to reporting to the U.N. Framework Convention on Climate Change (UNFCCC), and Zimbabwe's engagement with this tool underscores its dedication to transparent and informed climate action. This training not only strengthens the technical skills of key personnel but also fosters a collaborative environment for developing comprehensive strategies to address climate change challenges in the nation. Through these initiatives, Zimbabwe is actively working to build a resilient and sustainable future in the face of climate change.

5.3.3.2 Investment Framework

Additionally, Zimbabwe has developed the NDC/Long-Term Low Emissions Development Strategy (LT-LEDS) Implementation Plan and Investment Framework to guide the mobilization and allocation of resources for climate action. This framework, informed by stakeholder consultations and capacity-building efforts, serves as a crucial tool for driving climate-resilient and low-emission development.

Through these multifaceted training programs, Zimbabwe aims to equip a diverse range of stakeholders with the knowledge, skills, and resources necessary to effectively contribute to the country's climate change response.

5.4 PUBLIC AWARENESS AND OUTREACH

Recognizing the critical role of public awareness in driving climate action, the government of Zimbabwe, through the Ministry of Environment, Climate and Wildlife, has launched national awareness campaigns to provide the public with accurate and up-to-date information on climate change.

5.4.1 Engaging Platforms

Key platforms for public engagement include the Zimbabwe International Trade Fair (ZITF), the Harare Agricultural Show and Sanganai World Tourism Expo which attract a diverse range of stakeholders. These events offer opportunities for the ministry to set up interactive exhibits, deliver presentations, and distribute materials on climate change science, impacts, and available adaptation and mitigation strategies. The Ministry also take advantage of the Conference of Parties' meetings to set up a Pavilion meant to disseminate and showcase climate change-related initiatives being implemented in Zimbabwe to other Parties.

5.4.2 Media Collaborations

The ministry has collaborated with the Zimbabwe Broadcasting Corporation (ZBC), Zimbabwe Television Network (ZTN), Zimbabwe Association of Community Radio

Stations (ZACRAS) and other private media organisations to develop targeted radio and television programs featuring expert interviews and community dialogues. These programs allow the public to engage directly with climate specialists, share experiences, and voice concerns.

5.4.2 Tailored Campaigns

To reach marginalized groups—such as youth, women, and persons with disabilities—the ministry has partnered with CSOs to design tailored awareness campaigns. These initiatives leverage the networks of CSOs to ensure that climate change information is accessible and that these groups are empowered to participate in climate action.

5.4.1 Traditional Leadership Engagement

Engagement with traditional leaders, such as chiefs and headmen, has also been instrumental in disseminating climate change information and promoting environmental stewardship in communities. This approach effectively reaches remote areas where traditional leadership shapes social norms.

5.4.2 Educational Materials Distribution

The ministry has distributed educational materials, including climate-related books/ issues, brochures, pamphlets, factsheets and digital resources, through community information centres, libraries, agriculture extension workers across the country and local government offices. The educational materials distributed are in different vernacular, including languages such as English, Shona, Ndebele, Tonga, Ndau and Namibia. These materials provide comprehensive, easily understandable information on climate change science, impacts, and response strategies.

5.4.3 Digital Engagement

The government has leveraged digital platforms, such as WhatsApp, to enhance public engagement. The "Action for Climate Empowerment - Zimbabwe Chapter" WhatsApp group serves as a vibrant hub for sharing climate change news, resources, and engagement opportunities. In addition, the 'X' platform formerly known as 'Twitter', has been instrumental in engaging stakeholders across the country and the global community as well as providing constant updates to the public.
Through these multifaceted public awareness and outreach initiatives, Zimbabwe aims to foster a climate-conscious society where citizens are empowered to make informed decisions and actively contribute to the climate change response.

5.5 MONITORING AND EVALUATION

To ensure the effective implementation and continuous improvement of its climate change education, training, and public awareness initiatives, the Government of Zimbabwe has established a comprehensive monitoring and evaluation (M&E) framework.

5.5.1 Surveys and Assessments

Regular surveys and assessments gauge climate change awareness, knowledge, and engagement among the public. Conducted in collaboration with the Ministries of Primary and Secondary Education, and Higher and Tertiary Education, including Universities and Colleges, these surveys help identify knowledge gaps, tailor educational programs, and track progress in curriculum integration.

5.5.2 Integration into National Strategies

The government has integrated climate change education, training, and awareness indicators into the monitoring and evaluation section of its National Development Strategy 1 (NDS1) and

other reporting mechanisms. This systematic tracking allows for evidence-based decision-making and identification of improvement areas.

5.5.3 Development Projects Management Information System (DEVPROMIS)

Utilizing the Development Project Management Information System (DEVPROMIS), managed by the Ministry of Finance, Economic Development and Investment Promotion, the government tracks finance mobilized from various financial mechanisms for climate-related initiatives. This system enables the government to monitor the implementation and outcomes of climate change projects effectively. By providing real-time data, DEVPROMIS facilitates data-driven adjustments that enhance the effectiveness of interventions. This centralized approach ensures that resources are allocated efficiently and that stakeholders can assess the impact of their efforts, ultimately supporting Zimbabwe's commitment to transparent and accountable climate action.

5.5.4 Stakeholder Feedback Mechanisms

Robust monitoring, reporting, and feedback mechanisms have been established to gather insights from various stakeholders, including government agencies, CSOs, and the public. Workshops, online platforms, and community engagement provide opportunities for stakeholders to share experiences and suggestions, informing future initiatives

By implementing this comprehensive M&E framework, the Government of Zimbabwe aims to ensure the continuous improvement and optimization of its climate change education, training, and public awareness programs, ultimately enhancing the country's overall climate change response and resilience-building efforts.

5.6 CONCLUSION AND RECOMMENDATIONS

Zimbabwe's Vision 2030 aims to elevate the country to an upper middle-income economy, while the Second Republic's mantra of "***leaving no one and no place behind***" underscores a commitment to inclusive and sustainable development. Central to achieving these goals is the recognition that climate change education, training, and public awareness are vital components of the nation's strategy to confront the pressing challenges posed by a changing climate. Through the initiatives outlined in this chapter, the government has demonstrated its commitment to equipping citizens—particularly youth, women, and persons with disabilities—with the knowledge, skills, and resources necessary to actively engage in climate action.

Nationwide awareness campaigns, the integration of climate change into the education curriculum, collaborations with media outlets and traditional leaders, and leveraging digital platforms have all contributed to amplifying the climate change discourse and empowering communities across Zimbabwe. These efforts not only foster a better understanding of climate issues but also encourage active participation in climate resilience initiatives. By investing in climate change education, training and public awareness, Zimbabwe is laying the groundwork for a sustainable future, ensuring that all citizens are informed and equipped to contribute to the nation's climate goals. This holistic approach reinforces the vision of an inclusive society where every individual plays a role in building resilience and addressing the challenges of climate change.

- As the country develops sustainably, it is vital to build on this momentum and further strengthen climate change education, training, and public awareness efforts. Based on insights from the monitoring

and evaluation process, the following recommendations are proposed:

- **Continuous Curriculum Review and Update**: Regularly review and update climate change content in the education curriculum at all levels to ensure relevance and alignment with evolving scientific understanding and policy developments on climate change.
- **Capacity Building for Educators**: Invest in training and professional development for teachers and lecturers, equipping them with the knowledge, pedagogical skills, and resources to effectively deliver climate change education.
- **Targeted Outreach to Marginalized Groups**: Enhance focus on engaging marginalized groups, such as rural communities, the elderly, and persons with disabilities, through tailored awareness campaigns and community-based initiatives.
- **Strengthening Partnerships and Collaborations**: Foster stronger partnerships with civil society organizations, private sector entities, and international agencies to leverage their expertise and resources in delivering climate change education and awareness programs.
- **Innovative Communication Strategies**: Continuously explore and adopt innovative communication strategies, including digital platforms, social media, and interactive multimedia, to engage the tech-savvy younger generation.
- **Sustainable Funding and Resource Allocation**: Ensure adequate and sustainable funding for climate change education, training, and public awareness initiatives, focusing on long-term planning and integration into the national budget.
- **Improved Monitoring, Evaluation, and Feedback Loops**: Refine the monitoring and evaluation framework with robust indicators and feedback mechanisms to assess the impact and effectiveness of interventions, using insights to improve future programs.

RESEARCH AND SYSTEMATIC OBSERVATIONS

6.1 INTRODUCTION

This chapter presents and overview of the Hydrometeorological observation systems in Zimbabwe, the policy frameworks governing the systems, the gaps and challenges as well as the opportunities for improvement.

Zimbabwe is a member of the World Meteorological Organisation which recognises the critical role that hydro meteorological observations play in combating the impacts of climate change. The standards around the hydrometeorological observation systems are guided by the Commission for Observation, Infrastructure and Information Systems. Based on the call by the United Nation Secretary General to have early warning information accessed by all by 2027 to reduce losses, both lives and livelihoods due to increased extreme weather events from the changing climate, robust Hydrometeorological systematic observation systems are now critical.

The Zimbabwe Meteorological Services Department (MSD) is responsible for the provision of accurate seismological, weather and climate products and services that are timely, accessible as well as area and sector specific. Weather and climate products are required by diverse range of stakeholders such as the farming community, energy, industry, disaster risk management, health, water, tourism and aviation sectors among others. The Zimbabwe Meteorological Services Department (MSD) is developing the Zimbabwe National Framework for Climate Services to facilitate effective provision of hydrometeorological services.

On the other hand, the Zimbabwe National Water Authority (ZINWA) is responsible for the provision of hydrological services. ZINWA is a state-owned enterprise under the Ministry of Lands, Agriculture, Fisheries, Water and Rural Development. ZINWA works in collaboration with catchment and sub- catchment councils which are the corporate bodies responsible for granting water permits, supervision of the exercise of the water permits. ZINWA plays a critical role in the hydrological observation network and providing technical and secretarial services to the catchment and sub catchment council as well as the hydrological observation network and water allocation. All these institutions were established through the Water Act and ZINWA Act in line with the United

Nations Water Course Commission Guidelines as read with Revised SADC Protocol guidelines on water courses.

6.1.1 Regional Initiatives on Systematic Observations

Zimbabwe is a party to the African Ministers Conference on Meteorology (AMCOMET) that aims to improve the observation networks of member states. It also emphasises the need for strengthened collaboration and partnerships in achieving user driven weather, water and climate services. At sub regional level, the Southern African Development Community (SADC) has several frameworks and platforms that support weather and climate such as the SADC Regional Climate Outlook Forum (SARCOF) which provides seasonal climate forecasts and enhances regional cooperation in climate prediction.

Zimbabwe is also part of the SADC Meteorological Services Unit (MSU) which strengthens the regional meteorological cooperation that enhances weather forecasting and early warning systems. Currently work is underway to establish a regional radar network to strengthen the Early Warning System (EWS) across the SADC region. The SADC Hydrological Cycle Observation System (HYCOS) coordinates hydrological observations and the development of standards for data management and exchange.

6.2 COLLABORATIONS BETWEEN THE METEOROLOGICAL SERVICES DEPARTMENT AND ZINWA

The Meteorological Services Department (MSD) works closely with the Zimbabwe National Water Authority (ZINWA) through the Multi-Hazard Early Warning System which is critical in the Early Warning for All Initiative which focuses on the provision of early warning information. The two institutions in line with the Africa Multi-Hazard Early Warning and Early Action System (AMHEWAS) are responsible for Pillar 2 Monitoring and Warning Services. This pillar focuses on improving the quality and access of data and enhancing forecasting capabilities. The two entities, MSD and ZINWA together with other relevant institutions such as Agriculture, Department of Civil Protection, Health, Climate Change Management Department among others, cogenerate information that feed into the Multi-Hazard Early Warning System to inform the end-users.

6.2.1 Linkages with Climate Change

Systematic observations play a vital role in understanding and addressing climate change through tracking and monitoring of changes, patterns and anomalies in the climate data. They also play a critical role in climate modelling for predicting future changes and uncertainties. The Zimbabwe Meteorological Observation works in collaboration with the Climate Change Management department through the provision of data for the modelling of climate and for the development of climate change related policies and strategies. Policy Landscape in Meteorological and Hydrological Monitoring

There are several policies and acts that guides the operations of the Hydro meteorological services in the country. The mandate of the Meteorological Services Department in Zimbabwe is enshrined in the Meteorological Services Act, Chapter 13:21 of 2003 which provides for the legal framework of the Department to collect meteorological, climatological and seismological observational data as well as the production of weather forecasts for the country.

The National Water Policy of Zimbabwe aims to ensure that all citizens have access to water for primary, and to sustainably manage water resources. The department of Water resources development and Utilisation is

currently amending the Water Act of 1998 and ZINWA Act of 2000, where it is removing the statutory functions from ZINWA, establishing a stand-alone regulatory body but housed in the Department. This body will be responsible for streamlining the functions and operations of catchment and sub catchments councils.

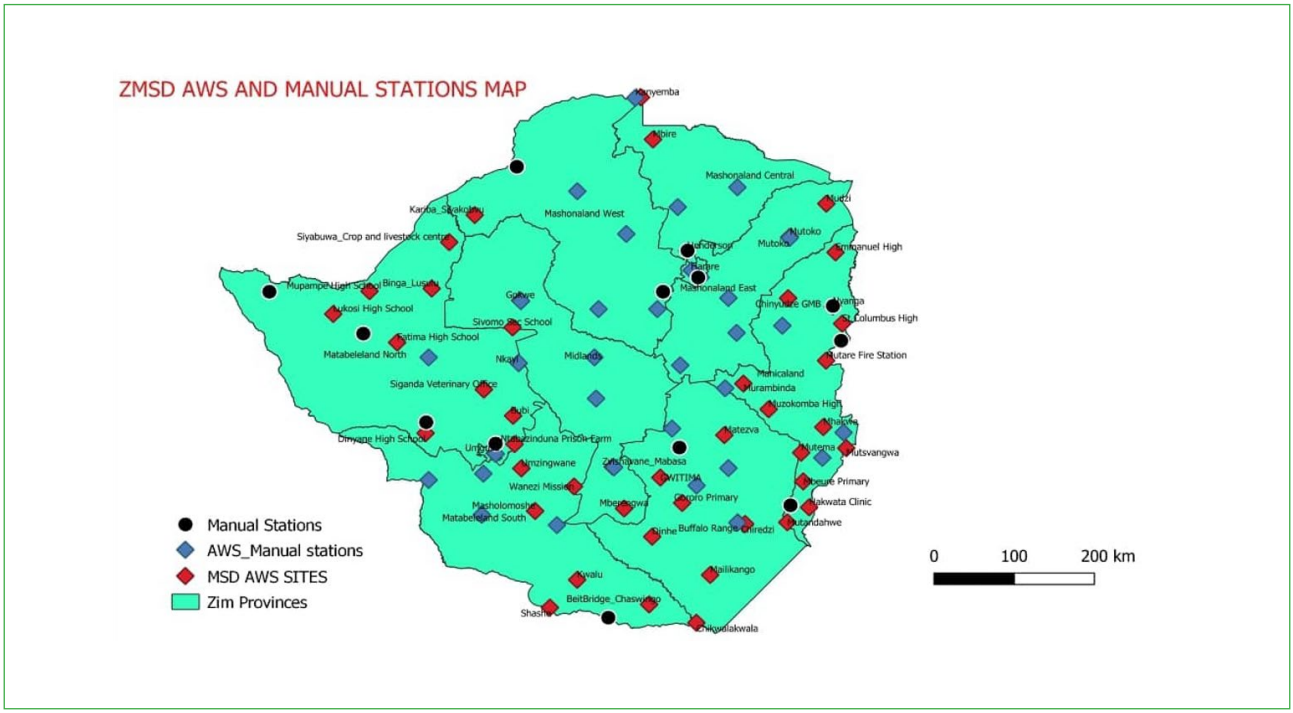
In addition, several acts are available SIs governing Catchment and Sub Catchments council operations, and these include the following, SI 209 of 2000, Water (Establishment of Catchment & Sub Catchment Councils), SI 33 of 2000: CCs Regulations. (S.I. 242 as Amendment), SI 47 of 2000: Sub-CCs Regulations.SI 206 of 2001: Water (Permits) Regulations ·SI 126 of 2009: Water (Permits, Amendment) Regulations among others.

6.3 CURRENTSTATUSOFTHEMETEOROLOGICAL SYSTEMATIC OBSERVATIONS

Zimbabwe observation network currently consists of forty-seven (47) manned stations, a five-radar network and over 600 voluntary rainfall stations. In addition, five radars were installed mainly at the main airports in the country to increase the accuracy of the weather information in the country. Despite having this network in place, the country falls short of meeting the World Meteorological Organisation (WMO) standards. This is of concern if area specific products are to be developed. To meet the WMO requirements, 350 stations are required which are now mostly Automatic Weather Stations in line with the Minamata Convention of replacing mercury-based instruments.

All the synoptic weather stations across the country are currently operational however, some have downscaled due manpower shortage. There is one operational upper air station in the country and the other upper air stations are no longer functional due to lack of hydrogen. The country has a network of four seismic stations and only two are working, Goetz Observatory and Matopos. The other two are down due to vandalism and lack of spares. The MSD intends to extend its station network to 10 stations which will enable seismic precise determination of the location and depth of earthquakes. Figure 6.1 below shows the country's station distribution for both manned and automatic weather stations.

Figure 6.1: Map Showing Meteorological Services Station Distribution



A total of nine, aviation stations are currently operational in the country namely Robert Gabriel Mugabe Meteorological Office (RGMO) in Harare, Victoria Falls Airport, Joshua Mqabuko Nkomo Airport (JMNA) in Bulawayo, Buffalo Range (BR), Masvingo, Kariba, Hwange, Charles Prince and Thornhill airbase. RGMO, JMNA and Thornhill have backup Automatic Weather Stations (AWS) installed.

Table 6.1: Meteorological Observation

TYPE OF STATION	NUMBER OF STATIONS	FUNCTIONAL	NON-FUNCTIONAL	COMMENTS
Aviation	9	9	0	All airports are functional and manned and only Charles Prince airport is not being physically manned, has an automatic weather station.
Rainfall	1300	600	700	Most of the dysfunctional stations were volunteer stations
Agromet/ Synoptic	38	38	0	All meteorological manned stations are also Agromet stations except of Aviation stations
Upper air	2	1	1	Harare Belvedere upper air station is non-functional. The hydrogen plant is down
Radar	5	5	0	All the Radars are working however, there is need for power supply backup, in case of load shedding. A reliable power supply will improve the uptime of the equipment and enable a mosaic from the 5 radars
AWS	105	70	35	Lack of spare parts, data transmitting to the cloud not local server (with reference to those 14 AWS procured under ZRBF), sim card replacement overdue and delayed maintenance.
Part time	19	8	11	Some of part time personnel are no longer participating in providing data.

Table 6.2 shows a summary of weather parameters not being measured/recorded in some stations, this is mainly attributed to vandalism of the instruments or breakage as well as the shortage of water for the evaporation instruments.

Table 6.2 Summary of weather parameters not being measured/recorded

PARAMETER	RADIATION	SUNSHINE (HOURS)	EVAPORATION (MM)	MAXIMUM	MINIMUM	GROUND MINIMUM
Number of Stations	44	21	18	1	2	24

Hydrological Observations

6.3.1 Hydrological Surface Observations

There has been a decline in the hydrological monitoring network in the country over time. Currently the network consists of only 275 stations which are operational of which 29 of the stations are near real time monitoring stations. Most of the stations were closed due to vandalism, being washed away by floods, getting submerged by dams, heavily silted dams or rivers, non-working recorders and channel / river diversion among a host of reasons.

The country is not moving along with the current methods for flow (drought and flood) monitoring with the bulk of the monitoring network still consists of the chart and drum system which in not suitable for flood and drought monitoring as information is relayed for processing well past the hydrological season. Near or real time monitoring stations are envisaged for the drought and flood early warning systems.

The existing stations are also not evenly distributed, and in most cases located in the upper reaches of the main river systems whilst flooding occurs in the low-lying areas making the monitoring of the floods in the low-lying areas difficult.

6.3.2 Groundwater Observations

Focus on water resources monitoring has been on surface water with limited monitoring of groundwater due to capacity limitations. However, the uptake of ground water has been increasing in both urban and rural areas. Enhanced monitoring of the groundwater resources is required to ensure the sustainable and conjunctive use of water for development.
Monitoring of groundwater levels is being carried out in the country's 3 major aquifers using manual dippers. These are Nyamandlovu Sandstone Aquifer where 94 boreholes are monitored, Lomagundi Dolomite Aquifer (Doma-Chinhoyi-Kadoma area) with 198 monitoring boreholes and the Save Alluvial Deposits (Mutema-Middle Sabi-Musikavanhu area) with 168 boreholes. The measurements are done once every month.

The monitoring exercise in these sites is hampered by several challenges such as inaccessibility to some of the boreholes, budgetary limitations and several boreholes require rehabilitation. In the Save Alluvial Deposits 48 boreholes were rehabilitated in 2013 through funding from the African Development Bank (AfDB) through SADC.

6.4 GAPS, CONSTRAINTS, CAPACITY NEEDS IN ZIMBABWE HYDROMETEOROLOGICAL STATIONS

- Current Meteorological Observation network does not meet the WMO requirements of stations at 20km radius and this sparse network is affecting data availability for production of area specific products and services
- Most of the hydrometeorological equipment are obsolete.

- Financial constraints to comply to the Minamata Convention which has banned mercury instruments globally.
- There are financial constraints to provide internet for data transmission of the automated weather stations.
- The department has a 11year climate data backlog (data not yet digitised) hence this has affected climate analysis looking at the extremes that have occurred in recent years.
- The Radar system is working well but is having downtime due to erratic power supply. There is need for a solar system to be set up to increase uptime and generate the mosaic from the 5 stations.

6.5 RECOMMENDATIONS FOR IMPROVEMENT IN THE HYDROMETEOROLOGICAL SERVICES

- Establishment of a dense systematic observation network for monitoring to address climate change.
- Piloting of innovations such as the 3D Printed Automatic Weather Stations
- Strengthening collaboration with research and academic institutions to enable relevant research in improvements around the weather, water and climate services value chains
- Setting up of the National Weather, Water and Climate Services Framework and its implementation to enable strengthened coordination and resource mobilisation including alignment with the National Adaptation Plan
- Strengthening forecasting skills and capacity development in Numerical Weather Prediction, Artificial Intelligence (AI), Radar Technology
- There is need for data integration through having a comprehensive database from the various observation networks (radar, AWS, manual, digital).
- There is need for data rescue to preserve the paper records still to be digitised and also assist the address the data backlog
- There is need to develop new and effective dissemination channels within reach of the vulnerable communities taking into consideration the age, socio-economic factors, gender dynamics.
- There is need to upgrade the existing monitoring stations

6.6 CONCLUSION

Zimbabwe's Observational Network has been operating with limited capacity in human, equipment and financial resources which compromise the quality of products and effectiveness of the services. There is the need for recapitalization of the Meteorological Services Department and ZINWA in terms of human expertise and infrastructure upgrading and its maintenance.

GENDER AND CLIMATE CHANGE IN ZIMBABWE

7.1 INTRODUCTION

This chapter provides an overview of gender and climate change in Zimbabwe. It focuses on the specific impacts of climate change on women, the policy frameworks and the guiding principles as well as the adaptation and mitigation initiatives currently being implemented in the country that focuses on women.

Climate change disproportionately affects vulnerable populations, particularly women globally. The climate crisis is not 'gender neutral' worldwide, women and girls experience the greatest impacts of climate change, and this amplifies the existing inequalities and poses unique threats to their livelihoods, health and safety. The Climate shocks retain a feminine face as women represent the majority of the world's poor with their identities being socially constructed around the roles that they are expected to provide daily on the domestic front.

Various international protocols on climate change recognize that women and men are differentially affected by climate impacts, hence the importance of ensuring that processes and systems that guide the formulation of plans, strategies and budgeting are gender sensitive and gender responsive to address the climate change related gender inequalities.

The UNFCCC recognizes the importance of involving women and men equally in UNFCCC processes and in the development and implementation of national climate policies that are gender responsive. This was done by establishing a dedicated agenda item under the convention which addresses issues of gender and climate change and by including an overarching text on climate change and gender in the Paris Agreement.

In 2014, the Conference of Parties established the first Lima Work Programme on gender, aimed at advancing gender balance and integrating gender considerations into the work of Parties. In 2015, the Paris Agreement emphasized gender integration to achieve gender responsive climate policy and action and recognizes the importance of gender equality and the empowerment of women in addressing climate change. Furthermore, the IPCC 2014 report on impacts, adaptation and vulnerability notes with high evidence that climate change reenforces multidimensional inequality and vulnerability.

7.1.1 Specific Vulnerability of Woman & Other Vulnerable Groups to Climate Change

In Zimbabwe women constitute 53%, which is the majority, and of these, 86% live in the rural areas as the mainstay of farming workers who are proportionally more dependent on threatened natural resources for firewood to cook for families thus exacerbating their workload and allocating them additional manual work. Women and girls, the youths and the elderly in Zimbabwe are disproportionately affected by climate change, facing social norms that restrict their freedom, choice and voice. Lack of property and land tenure rights force women to work on less productive land, limiting access to crucial information, inputs and extension services.

The effects of prolonged droughts and environmental degradation in Zimbabwe lead to water and power shortages thus incarcerating women's domestic workload. These gendered roles such as fetching firewood and water limit women's time for participating in public decision-making, income generation, education and community activities. Women with disabilities are often excluded from climate change processes, owing to societal beliefs which result in stigma.

Women and girls, the youths and the elderly in Zimbabwe are disproportionately affected by climate change, facing social norms that restrict their freedom, choice, and voice. Lack of property and land tenure rights forces them to work on less productive land, limiting access to crucial information, inputs, and extension services. Climate change exacerbates specifically woman's workload, allocating them additional manual work.

Furthermore, Zimbabwean women with disabilities are often excluded from climate change processes, owing to societal beliefs which result in stigma and discrimination yet they are the most affected group during climate change disasters. An example is during tropical cyclone Idai, were there are reports of elderly grandmothers who ran away from the scene of disasters leaving those with disabilities behind owing to the complications associated with transporting people with disabilities to safer locations during emergencies. In a similar manner, with dwindling physical strength and limited access to healthcare, the elderly struggle to cope with increased temperatures, changing rainfall patterns, and extreme weather events and lack of gender sensitive programmes that support childcare services for pregnant and lactating mothers hinders women's participation in the climate space.

Zimbabwean youths, particularly those in rural areas are forced to drop out of school to help with family livelihoods. Furthermore, climate disasters affect education infrastructure in the country leading to disturbances in learning, and limiting access to information, technology, and innovative adaptation resources. As a result, both youths and the elderly rely heavily on women, who are already overburdened, for care and support, perpetuating a cycle of vulnerability and reinforcing the need for inclusive climate change adaptation strategies that address the intersecting needs of all marginalized groups.

7.1.2 Women as Important Agents for Change

In Zimbabwe, women are not only disproportionately affected by climate change, but they are also effective actors or agents for change in relation to both mitigation and adaptation. They play a vital role in climate change adaptation and mitigation,

as key implementers in critical sectors such as agriculture, forestry, energy, livestock management, water management, disaster risk reduction and health. Zimbabwean women have a strong body of knowledge and expertise that can be used in climate change mitigation, disaster reduction and adaptation strategies.

In addition, the local women's responsibilities in households and communities, as stewards of natural and household resources, positions them well to contribute to livelihood strategies adapted to changing environmental realities. Their local and environmental knowledge, as well as survival strategies, significantly contribute to the fight against climate change. Therefore, empowering women and addressing the intersecting vulnerabilities of youths, the elderly, and other marginalized groups unlocks their full potential for climate resilience and sustainable development for Zimbabwe.

7.1.3 Perspectives on Gender Mainstreaming & Climate Change

Zimbabwe recognizes the importance of integrating gender perspectives into climate change policies and actions. It acknowledges that climate change impacts men and women differently, shaped by social conditioning and socioeconomic factors. The government sees women's empowerment as crucial to the success of climate change mitigation and adaptation efforts and climate finance in which the country recognizes the need to incorporate gender perspectives into climate finance mechanisms.

Successful gender mainstreaming initiatives to date include progress in governance and coordination on climate change and gender equality. In this respect Zimbabwe has developed national policies and strategies on climate change and gender equality as highlighted in the subsequent section.

7.2 NATIONAL POLICIES & STRATEGIES ADDRESSING GENDER IN THE CONTEXT OF CLIMATE CHANGE

The government of Zimbabwe has domesticated provisions of all the various international and regional protocols that speak to gender and climate change and has made significant strides towards the mainstreaming of gender in the climate change space. This is supported by a robust legal and policy framework on climate change and gender such as the National Climate policy, National Climate Change Gender Action Plan, the Climate Change Response Strategy among others, with specific provisions of the policies, strategies and plans highlighted in *Table* 7.1

Table 7.1: Zimbabwe Legal and Policy Framework on Climate Change

NAME OF POLICY	GENDER AND CLIMATE CHANGE CONSIDERATIONS
Zimbabwe Constitution (2013), Section 73(1).	Provides for environmental rights and protection for all, to ensure good health and well-being, and encourages ministries to take reasonable legislative and other measures to prevent pollution and ecological degradation.
Zimbabwe's National Development Strategy 1 (2021-2025)	The NDS1 Speaks to bringing gender equality through gender mainstreaming in all sectors until the year 2025.
National Climate Change Policy (2017)	Recognizes the disproportionate impacts of climate change on women and girls, particularly in rural areas where they rely heavily on natural resources for their livelihoods.
Zimbabwe National Change Climate Gender Action Plan (2023).	Addresses the critical interlinkages between gender equality and climate change, calling on women's equal, and meaningful participation in climate policy and action and for a more comprehensive, inclusive, and equitable approach to climate change It also seeks to mainstream gender in four NDC sectors for Zimbabwe namely Energy; Industrial Processes and Product Use (IPPU); Agriculture, Forestry and Other Land use (AFOLU) and Waste.
National Climate Change Response Strategy	Emphasizes gender mainstreaming in climate change policies to ensure active participation of vulnerable groups, and buttresses the importance of gender disaggregated data on climate change impacts and adaptation strategies, including provision of early warning systems on droughts, floods and disease outbreaks.
Zimbabwe National Adaptation Plan (2024-2030)	Emphasizes the importance of addressing climate change and promoting gender equality to achieve an upper-middle-income economy by 2030, to improve the care and protection of vulnerable groups, including women and children. It also highlights the need for gender-responsive climate action, recognizing the disproportionate impact of climate change on women and girls.
National Gender Policy (2024-2030)	Promotes increased responsiveness to environmental and natural resource management strategies, adaptation and mitigation initiatives for climate change.
Forestry Policy (2019)	Acknowledges importance of gender considerations in forest management, ensuring equal opportunities for women and men in forest management decision-making processes (Sec 4.20); Considers needs of vulnerable groups, including women, children, and indigenous communities, in forest management (Sec 4.5); Encourages community-led forest management, ensuring women's participation and benefit-sharing.
Climate Smart Agriculture Framework	Prioritizes gender mainstreaming to ensure equitable climate change mitigation and adaptation in agriculture. The main gender provisions include the recognition of women's critical role in agriculture and their disproportionate vulnerability to climate change, ensuring equal access to climate information, training, and resources and promoting women's participation in decision-making processes
National Gender Policy (2024-2030)	National Gender Policy which is a national guiding policy document for mainstreaming gender across sectors.

7.3 HIGHLIGHTS OF GENDER & CLIMATE CHANGE INITIATIVES

In response to the disproportionate impacts of climate change on women, the government is implementing various initiatives, some of which are highlighted below:

7.3.1 Solar for Health Programme

In response to climate related changes in temperature and rainfall patterns across the country, which have affected energy power generation, the government in collaboration with various partners initiated a programme called Solar for Health whereby solar systems were installed at various health centres in the rural communities to provide energy and lighting especially during the night. This initiative has transformed the lives of vulnerable groups such as pregnant women in rural and marginalised communities who could not get access to their health care needs including critical services like caesarean operations owing to the constant power outages. In addition, this is assisting in the refrigeration of their medical supplies.

7.3.2 Agric for She Programme

Agric4She initiative is a programme aimed at empowering women through agriculture, established by the Ministry of Lands, Agriculture, Fisheries, Water, and Rural Development with the First Lady of Zimbabwe being its patron. Under this programme, women receive inputs, chemicals and machinery to enhance agricultural activities, showing the critical role, that women play in ensuring food security and nutrition. The initiative has benefited thousands of women across the country through programmes that include Pfumvudza4She (Climate smart agriculture), Livestock4She, Fisheries4She, Horticulture4She, National Environmental and Agricultural Practices for Sustainability (NEAPS4She) and Mechanisation4She. The initiative is proving to be a game changer especially when agriculture is taken as a business and its also enhancing women's ability to provide for the families and ensure food security.

7.3.3 The Tsotso Cookstove Initiative

Women in the rural communities of Zimbabwe face challenges of clean energy access, and have to travel long distances to fetch firewood which is the only traditional mode of energy that is freely available to them. In view of this challenge, the government introduced the improved cookstoves, locally referred to as "tsotso" stoves. This was under the Sustainable Energy for Health Facilities and Surrounding Communities Programme steered by the Ministry of Health and Childcare. In the context of building resilience, the innovative initiative has become a source of income for women with skill and know-how to construct the stoves for sale.

7.4 YOUTH LED CLIMATE CHANGE INITIATIVES IN ZIMBABWE

7.4.1 Zimbabwe Sunshine Group

Zimbabwean youth are taking a centre stage in climate change programming through introducing innovative ways of building resilience in a low carbon trajectory. One outstanding youth led initiative is the Zimbabwe Sunshine Group which is transforming the lives of youths through sustainable waste management solutions, environmental conservation and climate action. The youths are addressing the repercussions of waste on both climate change and public health through innovating home-based waste management solutions at household level such composting, recycling and reuse as well as waste to energy initiatives.

7.4.2 Bulawayo Youth initiatives (YBU)

Another youth led initiative is the YBU youth business model which was pioneered by the Ministry of Lands, Agriculture, Fisheries, Water and Rural Development, and is established in Tsholotsho, Matabeleland North and at Nketa High School in Bulawayo Metropolitan. The initiative aims to empower youths to launch financially viable and environmentally sustainable agricultural projects. The YBU business unit is equipped with a cleared tilled and fenced piece of land, along with solar powered borehole and free-range chickens. As a result, the initiative has transformed the lives of women and youths in Matabeleland North and Bulawayo Metropolitan provinces

7.4.3 Solar Powered Boreholes

Zimbabwe is successfully turning climate change challenges into opportunities through the provision of solarized boreholes across the country through the devolution process. This was in response to address the effect of water challenges because of changes in temperature and rainfall pattens. Women and girls no longer must walk long distances in search of water for domestic use. This has also seen the reduction in sexual violation of women and girls at water points and enroute to water points both in urban and rural areas. Additionally, the solar powered boreholes are providing water for established nutrition gardens that focus on horticulture production and livestock production and dipping, leading to improved household nutrition and income, in marginalized rural areas. The solarized water powered conveyancing systems are successfully supporting agricultural enterprises leading to enhanced food security.

7.4.4 State Universities

Most of the state universities in Zimbabwe have introduced gender and climate change courses as cross cutting compulsory courses in their curricula, as well as full-fledged degrees in the same fields from undergraduate to Post graduate levels. Furthermore, these institutions conduct workshops, community engagement and sensitization programmes on gender sensitive climate change programming. Additionally, the Universities, are spearheading gender-based climate change research, innovations and green hubs as part of mainstreaming gender in climate change to achieve the aspirations of education 5.0.

7.4.5 Gender Transformative

Agriculture 8.0

In line with Zimbabwe's vision 2030 of becoming an empowered upper income society by 2030, the Ministry responsible for agriculture launched the Rural Development 8.0 model which has a gender dimension aimed at eradicating poverty in all its forms including water and food shortages caused by climate change. Some of the important flagship schemes under the facility include, Presidential Community Fisheries Scheme, Presidential Poultry Scheme, Presidential Goat Scheme among others. Women are benefitting through receiving various inputs such as the small livestock and maize seeds.

7.4.6 Provision of Loan Facilities

In 2024, the government extended loans through the Women's Development Fund (WDF), Zimbabwe Community Development Fund (ZCDF), the Zimbabwe Women Microfinance Bank (ZWMB) and the Small and Medium Enterprises Development Corporation (SMEDCO) to mitigate climate change. In the first half of 2024, WDF disbursed ZWG 1,470,000 to 35 women's projects across the country, ZCDF disbursed ZiG 1,008,000 to 24 community projects across the country. SMEDCO disbursed USD 347,200 to 65 MSME projects

in sectors such as manufacturing, agriculture, construction and trade. The Zimbabwe Women Micro-Finance Bank disbursed loans to the tune of US$6,68 million to 3,440 beneficiaries of which 88% are women. These are being done at community level where communities are grappling with climate change.

7.4.7 Participation of Women in Climate Change Consultative Forums and International Forums

In recent years the women, youth, children and other vulnerable groups are increasingly participating in the climate change space where their voices have contributed in the formulation of National Adaptation planning process; Carbon trading framework and most recently the climate change bill and National Communication process. In all these engagements emphasis has been on fostering the principle of inclusivity in climate action leaving no one behind.

Although efforts are currently underway to increase woman's participation in the UNFCCC processes, as a country we have made little progress towards the equal representation and participation of man and woman at these international conferences.

7.5 GAPS, OPPORTUNITIES AND CONSTRAINTS FOR GENDER INCLUSIVITY

Despite the presence of an enabling legal and policy framework, the country still faces challenges in achieving transformative change for inclusive gender and climate change adaptation mainly hampered by behavioural change in a conservative society. Whereas Zimbabwe has made concerted efforts to mainstream gender issues in climate change action, there exist several gaps and constraints that negate the important strides achieved so far as follows:

7.5.1 Gaps and Recommendations

- There are capacity gaps in reporting gender disaggregated data on climate change, hindering effective climate change adaptation and gender equality efforts. For example, when Zimbabwe was hit by a devastating tropical cyclone (Idai) in 2019 and national reporting processes on consequences of the disaster lacked a gender analysis and neither did it include specific figures for affected vulnerable groups including people with disabilities, elderly, youth, children and women.
- Non-transformational Climate change initiatives- Initiatives that take place in most parts of the country are gender sensitive but not gender transformative. For example, Initiative tends to be needs- based, focusing on alleviating the immediate challenges emanating from the climate related disasters, such as food, clothing and temporary shelter without providing longer term and permanent climate resilient infrastructure as well as gender sensitive budgets for rehabilitating the affected people in to their original communities. Furthermore, climate initiatives are not accompanied by an effective education and sensitisation model for empowering beneficiaries with required knowledge and skills. For example, some beneficiaries do not know how to translate a community intervention into a business model for sustainability. There is need for increasing education and sensitisation strategies to empowering beneficiaries with the requisite knowledge and skills to transform their needs into actions for longer term sustainability.
- Some Climate change innovative solutions unfit for the Zimbabwean context. From a Zimbabwean traditional context, the tsotso cookstove has been criticized for disrupting the social and family fabric. The

traditional fireplace in Zimbabwe brings together the family to socialise, tell stories and plan. The tsotso stoves isolates the women from the rest of the family and at the same time it increases the labour burden in cooking. The tsotso stove can only accommodate a smaller pot a time which may not be enough for a bigger family, Whereas the traditional fireplace can accommodate many bigger pots at a time meaning that the woman will spend more hours on the cookstove to prepare a single basic meal for their family. There is need for thorough context analysis and inclusion of communities in project planning and design to ensure the benefit suit their needs and contextual reality on the ground.

- In some instances, lactating mothers in some communities in Zimbabwe may not attend climate change meetings because there are no childcare facilities in the platforms. Enhance awareness of the importance of gender mainstreaming in climate change action in communities. In addition, inclusion of men and women; boys and girls in project planning, designing and implementation helps to create gender sensitivity among all beneficiaries to avoid patriarchal resistance.
- Some climate change programmes in Zimbabwe tend to be gender blind to the needs of women, people with disability the elderly, children and other disadvantaged groups. Engaging gender experts in programming, designing and capacity building processes on climate change will be critical for enhancing a gender balance in climate processes. Example
- Limited mainstreaming of gender and climate change in early warning and disaster risk reduction at community level. Lack of community mechanisms to support people with disabilities and the elderly. For instance, during cyclone Idai there were reports of elderly women who were only able to run away with mobile children and left behind children with disabilities (visually impaired and the crippled) in the wake of floods as they lacked facilities for relocating them to safer locations. Review early warning policies and strategies towards the inclusion of gender and climate mainstreaming. The Government to increase resources channeled towards gender focused early warning and disaster risk recovery.
- Limited enabling environment for participation of persons with disabilities. In Zimbabwe, people with disabilities experience limited participation in climate change processes and are often represented by people who do not clearly understand their status. In addition, people with disabilities lack resources and assistive devices that can enable them to move and access spaces were climate action dialogue and empowerment take place. The Government to put in place effective monitoring and evaluation processes for enhancing gender and inclusivity in programming.
- Exclusionary Information dissemination on Climate Change and gender-Whereas the Government of Zimbabwe has done a lot in the production of climate change information for supporting climate action including in vernacular it is yet to make the information accessible to people with visual and hearing impairments. This can be enabled by providing assistive devices such as braille machines, braille computers, hearing aids, font magnifiers, and text to voice transcribing machines for persons with various disabilities.

7.5.2 Opportunities for Gender Mainstreaming in Climate Change Programming in Zimbabwe.

- There is evidence at the country level that improving gender equality contributes to policy choices that transform the lives of women and increase their representation and voice within their communities, in society and at the political level.
- An opportunity exists for Zimbabwe through the constituency of development partners and donors with a keen interest on funding gender inclusive and transformative climate action.
- Provision of an enabling legal and policy environment that fosters the continued mainstreaming of gender in climate change programming
- Universities, academies and research centres to produce innovative science-based evidence on climate change.

7.6 CONCLUSIONS

The Government of Zimbabwe has made concerted efforts towards the mainstreaming of gender and disability in the climate space through the various policies strategies and plans that foster inclusivity. Focusing more on enablers such as capacity building, finance for men and women on climate change gender and disability increases the level of participation towards gender equality in climate change. Furthermore, providing disability specific technologies and assistive devices is a good opportunity for the country's positive efforts in enhancing gender and disability inclusive climate change action. In addition, Zimbabwe's vision 2030 of becoming an upper middle-income society emphasizes on equality, fostering inclusivity thus leaving no one and no place behind.

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ANNEXES

Annex 1. Livestock Population disaggregated by climatic zones

Dairy Cows

Table A1 Disaggregated annual average population of mature dairy cows, 1990 – 2022

INVENTORY YEAR	HUMID REGION	SEMI-ARID REGION	TOTAL DAIRY COWS
1990	57,208	69,920	127,128
1991	56,718	69,321	126,039
1992	55,886	68,305	124,190
1993	51,686	63,172	114,858
1994	47,209	57,699	104,908
1995	47,414	57,951	105,365
1996	43,942	53,707	97,649
1997	46,741	57,128	103,869
1998	47,496	58,051	105,548
1999	43,122	52,705	95,827
2000	34,477	42,139	76,616
2001	50,348	61,536	111,883
2002	44,187	54,007	98,194
2003	37,317	45,609	82,926
2004	26,764	32,712	59,476
2005	26,764	32,712	59,476
2006	26,764	32,712	59,476
2007	26,764	32,712	59,476
2008	20,143	24,619	44,763
2009	19,405	23,717	43,122
2010	20,143	24,619	44,763
2011	14,177	17,328	31,505
2012	14,177	17,328	31,505
2013	13,762	16,820	30,583
2014	12,766	15,603	28,369
2015	17,734	21,675	39,409
2016	19,091	23,333	42,423
2017	20,399	24,932	45,331
2018	17,275	21,114	38,390

INVENTORY YEAR	HUMID REGION	SEMI-ARID REGION	TOTAL DAIRY COWS
2019	18,024	22,030	40,054
2020	21,491	26,267	47,758
2021	27,608	33,744	61,352
2022	21,991	26,878	48,870

Other Cattle

Table A2 Disaggregated annual average population of other cattle, 1990 – 2022

INVENTORY YEAR	HUMID REGION	SEMI-ARID REGION	TOTAL OTHER CATTLE
1990	2,261,007	3,911,902	6,172,909
1991	2,207,107	3,863,775	6,070,882
1992	2,178,376	3,735,690	5,914,066
1993	1,910,257	3,283,464	5,193,721
1994	1,837,527	3,128,832	4,966,359
1995	1,831,525	3,160,607	4,992,132
1996	1,838,137	3,203,932	5,042,069
1997	1,593,931	3,655,561	5,249,492
1998	1,591,880	3,860,764	5,452,644
1999	2,115,414	3,841,340	5,956,754
2000	1,615,265	4,317,121	5,932,386
2001	2,120,887	4,009,132	6,130,019
2002	1,896,422	3,683,822	5,580,244
2003	1,822,346	3,737,994	5,560,340
2004	1,748,270	3,792,167	5,540,436
2005	1,674,193	3,846,339	5,520,532
2006	1,600,117	3,900,512	5,500,629
2007	1,526,041	3,954,684	5,480,725
2008	1,451,965	4,008,856	5,460,821
2009	1,377,888	4,063,029	5,440,917
2010	1,303,812	4,117,201	5,421,013
2011	1,390,570	4,667,817	6,058,387
2012	1,356,146	4,769,145	6,125,291
2013	1,295,103	3,531,256	4,826,359
2014	1,222,573	3,737,111	4,959,684
2015	1,216,631	4,032,340	5,248,971
2016	1,210,689	4,327,570	5,538,259
2017	1,204,747	4,622,799	5,827,546

INVENTORY YEAR	HUMID REGION	SEMI-ARID REGION	TOTAL OTHER CATTLE
2018	1,139,983	4,160,976	5,300,959
2019	1,075,219	3,699,152	4,774,371
2020	1,295,342	3,942,600	5,237,942
2021	1,270,123	3,827,329	5,097,452
2022	1,254,215	4,230,642	5,484,857

Sheep

Table A3 Disaggregated annual average population of sheep, 1990 – 2022

INVENTORY YEAR	HUMID REGION	SEMI-ARID REGION	TOTAL SHEEP
1990	94,788	465,791	560,579
1991	87,493	462,356	549,849
1992	89,855	393,205	483,060
1993	84,048	331,912	415,960
1994	77,280	357,972	435,252
1995	71,872	363,588	435,460
1996	68,719	310,816	379,535
1997	68,128	348,378	416,506
1998	68,676	317,972	386,648
1999	55,706	294,625	350,331
2000	52,972	274,128	327,100
2001	65,211	521,292	586,503
2002	55,504	515,382	570,886
2003	50,144	459,544	509,688
2004	48,511	412,252	460,763
2005	43,349	377,814	421,163
2006	38,188	343,376	381,564
2007	33,026	308,939	341,965
2008	27,865	274,501	302,366
2009	44,127	271,066	315,193
2010	43,264	265,764	309,028
2011	43,320	266,109	309,429
2012	43,255	265,707	308,962
2013	35,007	215,041	250,048
2014	51,807	318,243	370,050
2015	47,799	293,621	341,420

INVENTORY YEAR	HUMID REGION	SEMI-ARID REGION	TOTAL SHEEP
2016	43,791	268,999	312,790
2017	39,782	244,378	284,160
2018	44,574	273,811	318,385
2019	49,365	303,245	352,610
2020	43,201	265,379	308,580
2021	47,959	294,606	342,565
2022	52,717	323,833	376,550

Goats

Table A4 Disaggregated annual average population of goats, 1990 – 2022

INVENTORY YEAR	HUMID REGION	SEMI-ARID REGION	TOTAL GOATS
1990	439,511	2,196,487	2,635,998
1991	430,367	2,136,417	2,566,784
1992	427,664	2,115,442	2,543,106
1993	397,107	1,961,226	2,358,333
1994	693,265	3,777,167	4,470,432
1995	758,890	4,241,699	5,000,589
1996	725,918	4,087,985	4,813,903
1997	762,196	4,291,925	5,054,121
1998	813,191	4,177,777	4,990,968
1999	707,458	3,894,197	4,601,655
2000	628,495	3,439,183	4,067,678
2001	560,848	3,063,643	3,624,491
2002	526,537	2,846,129	3,372,666
2003	524,455	2,729,769	3,254,224
2004	511,469	2,506,135	3,017,604
2005	524,691	2,615,670	3,140,361
2006	537,913	2,725,204	3,263,117
2007	551,136	2,834,738	3,385,873
2008	564,358	2,944,272	3,508,630
2009	673,138	3,533,973	4,207,111
2010	711,664	3,736,239	4,447,903
2011	755,084	3,964,194	4,719,278
2012	817,986	4,294,425	5,112,410
2013	652,394	3,425,071	4,077,465

INVENTORY YEAR	HUMID REGION	SEMI-ARID REGION	TOTAL GOATS
2014	732,964	3,848,060	4,581,024
2015	731,258	3,839,105	4,570,363
2016	729,552	3,830,150	4,559,702
2017	727,847	3,821,194	4,549,041
2018	821,629	4,313,552	5,135,182
2019	915,412	4,805,910	5,721,322
2020	733,244	3,849,529	4,582,773
2021	795,613	4,176,967	4,972,580
2022	857,982	4,504,405	5,362,387

Horses and Mules and Asses

Table A4 Disaggregated annual average population of horses, and mules and asses, 1990 – 2022

INVENTORY YEAR	HORSES			MULES AND ASSES		
	HUMID REGION	SEMI-ARID REGION	TOTAL HORSES	HUMID REGION	SEMI-ARID REGION	TOTAL MULES & ASSES
1990	11,867	11,633	23,500	11,467	327,609	339,076
1991	12,119	11,881	24,000	12,147	351,943	364,090
1992	12,119	11,881	24,000	12,673	374,880	387,553
1993	11,614	11,386	23,000	13,385	403,261	416,646
1994	12,119	11,881	24,000	14,282	433,130	447,412
1995	15,052	9,448	24,500	16,322	501,864	518,186
1996	12,611	12,389	25,000	15,696	468,766	484,462
1997	9,843	14,657	24,500	18,611	573,850	592,461
1998	16,722	8,278	25,000	18,966	606,887	625,853
1999	9,855	15,645	25,500	20,023	646,758	666,781
2000	15,145	10,855	26,000	20,261	654,890	675,151
2001	15,315	11,685	27,000	15,059	469,739	484,798
2002	13,349	13,651	27,000	15,056	469,716	484,772
2003	13,411	14,089	27,500	15,038	469,550	484,587
2004	6,993	20,507	27,500	15,019	469,384	484,403
2005	13,172	14,828	28,000	15,000	469,218	484,218
2006	11,052	16,948	28,000	14,982	469,052	484,033
2007	14,395	13,605	28,000	14,963	468,885	483,848
2008	10,231	17,769	28,000	14,945	468,719	483,664
2009	129	27,871	28,000	16,863	545,235	562,098
2010	15,704	12,296	28,000	16,883	545,885	562,768
2011	17,098	10,902	28,000	18,112	585,632	603,744
2012	17,098	10,902	28,000	16,985	549,194	566,179
2013	17,098	10,902	28,000	13,553	438,210	451,763
2014	17,098	10,902	28,000	15,670	506,659	522,329
2015	17,098	10,902	28,082	15,885	513,602	529,487
2016	17,098	10,902	28,146	16,099	520,545	536,644
2017	17,098	10,902	28,160	16,314	527,488	543,802
2018	17,098	10,902	28,151	15,950	515,713	531,663
2019	17,098	10,902	28,261	15,586	503,938	519,524
2020	16,939	11,292	28,231	13,236	427,972	441,208

INVENTORY YEAR	HORSES			MULES AND ASSES		
	HUMID REGION	SEMI-ARID REGION	TOTAL HORSES	HUMID REGION	SEMI-ARID REGION	TOTAL MULES & ASSES
2021	16,951	11,301	28,252	14,843	479,924	494,767
2022	16,964	11,310	28,274	16,450	531,875	548,325

1.1.1.1***Swine***

Table A5 Disaggregated annual average population of swine, 1990 – 2022

INVENTORY YEAR	BREEDING SWINE		MARKET SWINE		TOTAL SWINE
	HUMID REGION	SEMI-ARID REGION	HUMID REGION	SEMI-ARID REGION	
1990	13,384	15,540	75,906	88,134	192965
1991	13,118	15,166	74,396	86,010	188690
1992	12,963	14,824	73,513	84,069	185369
1993	11,529	12,436	65,386	70,526	159878
1994	11,614	11,468	65,866	65,038	153985
1995	13,615	12,836	77,212	72,793	176455
1996	14,438	12,415	81,883	70,409	179146
1997	15,073	15,844	85,485	89,857	206259
1998	14,840	17,606	84,163	99,845	216453
1999	12,647	13,010	71,725	73,784	171166
2000	12,710	14,844	72,084	84,182	183820
2001	14,890	14,135	84,445	80,164	193635
2002	14,063	13,861	79,757	78,606	186287
2003	9,723	11,842	55,144	67,158	143867
2004	9,193	14,171	52,138	80,365	155867
2005	9,430	15,039	53,481	85,288	163239
2006	9,606	16,443	54,476	93,252	173777
2007	9,668	17,540	54,827	99,475	181510
2008	9,729	18,638	55,178	105,699	189244
2009	13,687	21,972	77,622	217,054	330336
2010	19,534	19,534	108,322	113,245	260636
2011	19,814	19,814	109,871	114,865	264363
2012	16,590	16,590	91,994	96,176	221350
2013	16,457	16,457	91,259	95,407	219580

INVENTORY YEAR	BREEDING SWINE		MARKET SWINE		TOTAL SWINE
	HUMID REGION	SEMI-ARID REGION	HUMID REGION	SEMI-ARID REGION	
2014	33,596	33,596	186,299	194,767	448259
2015	26,269	26,269	145,665	152,286	350488
2016	18,941	18,941	105,031	109,805	252717
2017	11,613	11,613	64,397	67,324	154947
2018	10,379	10,379	57,553	60,169	138481
2019	9,145	9,145	50,710	53,015	122015
2020	10,569	10,569	58,605	61,269	141012
2021	13,111	13,111	72,703	76,008	174932
2022	15,653	15,653	86,800	90,746	208853

Poultry

Table A6 Disaggregated annual average population of poultry, 1990 – 2022

YEAR	BROILER CHICKENS		LAYER CHICKENS		INDIGENOUS CHICKENS		TURKEYS	
	HUMID REGION	SEMI-ARID REGION	HUMID REGION	SEMI-ARID REGION	HUMID REGION	SEMI-ARID REGION	HUMID REGION	SEMI-ARID REGION
1990	72,069	81,270	33,920	814,090	1,717,953	3,054,139	59,802	121,417
1991	72,058	81,257	33,915	813,960	1,717,678	3,053,650	59,793	121,397
1992	72,023	81,218	33,899	813,568	1,716,852	3,052,181	59,764	121,339
1993	71,919	81,100	33,850	812,394	1,714,374	3,047,776	59,678	121,164
1994	71,607	80,749	33,703	808,872	1,706,941	3,034,562	59,419	120,638
1995	60,727	68,480	28,582	685,973	1,447,590	2,573,494	50,391	102,309
1996	49,847	56,211	23,461	563,074	1,188,240	2,112,426	41,363	83,979
1997	66,753	75,275	31,418	754,040	1,591,230	2,828,853	55,391	112,460
1998	71,510	80,639	33,657	807,770	1,704,616	3,030,428	59,338	120,474
1999	72,892	82,197	34,308	823,380	1,737,558	3,088,992	60,485	122,802
2000	74,389	83,885	35,012	840,292	1,773,246	3,152,437	61,727	125,324
2001	75,886	85,574	35,717	857,203	1,808,933	3,215,881	62,969	127,847
2002	77,383	87,262	36,421	874,114	1,844,621	3,279,326	64,211	130,369
2003	78,880	88,950	37,126	891,026	1,880,309	3,342,771	65,454	132,891
2004	80,377	90,638	37,831	907,937	1,915,996	3,406,215	66,696	135,413
2005	81,874	92,326	38,535	924,849	1,951,684	3,469,660	67,938	137,935
2006	83,372	94,015	39,240	941,760	1,987,371	3,533,105	69,181	140,458
2007	84,869	95,703	39,945	958,671	2,023,059	3,596,549	70,423	142,980
2008	86,366	97,391	40,649	975,583	2,058,747	3,659,994	71,665	145,502
2009	87,863	99,079	41,354	992,494	2,094,434	3,723,439	72,908	148,024
2010	89,360	100,768	42,059	1,009,405	2,130,122	3,786,883	74,150	150,547
2011	43,326	48,857	67,142	1,611,403	2,204,954	3,919,918	45,615	92,612
2012	118,181	133,268	66,209	1,589,025	2,323,980	4,131,520	52,710	107,018
2013	129,108	145,590	64,327	1,543,845	2,125,178	3,778,095	69,584	141,277
2014	140,034	157,911	62,444	1,498,666	1,926,377	3,424,670	86,458	175,536
2015	108,064	121,859	44,248	1,061,959	2,080,646	3,698,925	96,372	195,664
2016	60,109	67,782	16,954	406,899	2,312,049	4,110,309	111,242	225,855
2017	44,124	49,756	7,856	188,546	2,389,183	4,247,437	116,199	235,919
2018	52,159	58,818	8,643	207,434	2,178,098	3,872,175	96,242	195,400
2019	60,195	67,880	9,430	226,321	1,967,013	3,496,912	76,285	154,882
2020	68,231	76,941	10,217	245,209	1,755,928	3,121,649	56,328	114,364
2021	71,532	80,664	32,783	786,784	2,579,100	4,585,067	142,007	288,318
2022	74,834	84,387	55,348	1,328,359	3,402,272	6,048,484	227,686	462,272

Functional & non-functional Hydro-Metorological instruments

TYPE	NUMBER OF STATIONS	FUNCTIONAL	NON FUNCTIONAL	COMMENTS
Aviation	9	9	0	All airports are functional with only Charles Prince airport not being physically manned.
Rainfall	1300	600	700	
Agromet/ Synoptic	38	38	0	All meteorological manned stations are also Agromet stations except of Aviation stations
Upper air	2	1	1	Harare Belvedere upper air station is nonfunctional. The hydrogen plant is down due to unavailability of spares to repair it and hydrogen plant not working.
Radar	5	5	0	All the Radars are working There is need for power supply backup,in case of load shedding. A reliable power supply will improve the uptime of the equipment and enable a mosaic from the 5 radars
AWS	105	70	35	Lack of spare parts, data transmitting to the cloud not local server (with reference to those 14 AWS procured under ZRBF), sim card replacement overdue and delayed maintenance.
Part time Stations	19	8	11	Some of them are no longer participating.

Summary of Weather Parameters Not Being Measured

PARAMETER	RADIATION	SUNSHINE (HOURS)	EVAPORATION (MM)	MAXIMUM	MINIMUM	GROUND MINIMUM
Number of Stations	44	21	18	1	2	24

TYPE OF STATION	NUMBER OF STATIONS	DATA PERIOD	PARAMETERS	FUNCTIONAL/ NON-FUNCTIONAL	COMMENTS
Stream flow Gauging Station (Chart on Drum)	275	From 1920	Water Level Discharge Sediment load	Non Func 450 Functional 275	Spare parts are no longer available on the market hence the continuous decrease in non-function.
NEAR REAL	TIME				
Ott-NetDl 500	10	Nov 2022	Water Level Discharge	Functional 5 Non Func 5	3 are yet to be installed after completion of civil works and the other 2 were vandalised.
Ott – Ecolog 500/1000	9	From 2000	Water Level Discharge	Functional 5 Non Func 4	4 Yet to be installed
X-Link 100	1	2023	Water Level Temperature	Functional 1	installed for a flood early warning system at Tongogara Refugee Camp
Cello 4S	16	2019	Water Level	Functional 9 Non Functional 7	Six pending installations plus 1 vandalized, low cost on maintenance cost.
Smartsights	9	2023	Water level	non functional	4 yet to be installed 5 installed but has network and transmission issues

solinst	18	2024	groundwater temperature and water levels	procured from Canada	data loggers are in transit from canada. Nyamandlovu still using deepers monitoring levels 9 loggers will be monitoring the Lomagundi aquifer. 9 loggers will be installed in Save aquifer.

Appendix: Description of a Party's nationally determined contribution under Article 4 of the Paris Agreement, including updates

Structured summary: Description of selected indicators

Structured summary: Definitions needed to understand the NDC

3. Structured summary: Methodologies and accounting approaches – consistency with Article 4, paragraphs 13 and 14, of the Paris Agreement and with decision 4/CMA.1

4. Structured summary: Tracking progress made in implementing and achieving the NDC under Article 4 of the Paris Agreement [a]

5. **Mitigation policies and measures, actions and plans, including those with mitigation co-benefits resulting from adaptation actions and economic diversification plans, related to implementing and achieving a nationally determined contribution under Article 4 of the Paris Agreement.**

Information on projections of greenhouse gas emissions and removals under a 'with measures' scenario [a, b]

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