

Zimbabwe Human Development Report **2017**

Climate Change and Human Development:
Towards Building a Climate Resilient Nation



*Empowered lives.
Resilient nations.*



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Towards Building a Climate Resilient Nation

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GOVERNMENT OF ZIMBABWE



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LIST OF ABBREVIATIONS

ABR	Adolescent Birth Rate	IES	Institute of Environmental Studies
AIDS	Acquired Immune Deficiency Syndrome	IFRC	International Federation of the Red Cross
AMTO	Assisted Medical Treatment Order	IHDI	Inequality-adjusted Human Development Index
ART	Antiretroviral Therapy	IIED	International Institute for Environment and Development
BEAM	Basic Education Assistance Module	ILO	International Labour Organisation
CAFOD	Catholic Agency for Overseas Development	IPCC	Intergovernmental Panel on Climate Change
CAMPFIRE	Communal Areas Management Programme for Indigenous Resources	IQ	Intelligence Quotient
CARE	Cooperative for Assistance and Relief Everywhere	LprF	Labour market participation rate for Females
CCVI	Climate Change Vulnerability Index	LprM	Labour market participation rate for Males
CNFA	Cultivating New Frontiers in Agriculture	LULUCF	Land Use, Land Use Change and Forestry
CO₂ eq	Carbon Dioxide equivalent	MICS	Multiple Indicator Cluster Survey
CoP	Conference of Parties	MIMS	Multiple Indicator Monitoring Survey
CREATE	Consortium for Research on Education Access, Transitions and Equity	MMR	Maternal Mortality Rate
DfID	Department for International Development	MPI	Multidimensional Poverty Index
DHIS	District Health Information Software	MYS	Mean Years of Schooling
DPSIR	Drivers, Pressures, State, Impact, Responses	NER	Net Enrolment Rate
ENSURE	Enhancing Nutrition, Stepping up Resilience and Enterprise	NGO	Non Governmental Organisation
EPI	Environmental Performance Index	°C	Degree Celcius
ESAP	Economic Structural Adjustment Programme	OECD	Organisation for Economic Cooperation and Development
ESP	Empowerment by share of seats in Parliament held by women	OHCHR	Office of the United Nations High Commissioner for Human Rights
EU	European Union	OPC	Office of the President and Cabinet
EYS	Expected Years of Schooling	OPHI	Oxford Poverty and Human Development Initiative
FAO	Food and Agriculture Organisation	ORAP	Organisation of Rural Associations for Progress
FDG	Focus Group Discussion	OXFAM	Oxford Committee for Famine Relief
FRESH	Focus Resources on Effective School Health	PEPFAR	President's Emergency Plan for AIDS Relief
GDI	Gender Development Index	PPP	Purchasing Power Parity
GDP	Gross Domestic Product	SADC	Southern African Development Community
GHI	Global Hunger Index	SAFIRE	Southern Alliance for Indigenous Resources
GII	Gender Inequality Index	SARUA	Southern African Regional Universities Association
GIEWS	Global Information and Early Warning System of the FAO	SDG	Sustainable Development Goal
GNI	Gross National Income	SecF	Attainment of at least secondary education by Females
GPI	Gender Parity Index	SecM	Attainment of at least secondary education by Males
HDI	Human Development Index		
HDR	Human Development Report		
HEWS	Humanitarian Early Warning Service		
HIV	Human Immunodeficiency Virus		
ICT	Information and Communications Technology		

SIDA	Swedish International Development Cooperation Agency	UNFCCC	United Nations Framework Convention on Climate Change
SMS	Short Message Service	UNICEF	United Nations Children's Fund
SNV	Stichting Nederlandse Vrijwilligers (Netherlands Development Organisation)	US	United States
STEM	Science, Technology, Engineering and Mathematics	USAID	United States Agency for International Development
UK	United Kingdom	USD	United States Dollar
UN	United Nations	WASH	Water, Sanitation and Hygiene
UNDP	United Nations Development Programme	WFP	World Food Programme
UNEP	United Nations Environment Programme	WHO	World Health Organisation
UNESCO	United Nations Educational Scientific and Cultural Organisation	ZHDR	Zimbabwe Human Development Report
		ZIMASSET	Zimbabwe Agenda for Sustainable Socio-Economic Transformation
		ZIMSTAT	Zimbabwe National Statistics Agency
		ZIMVAC	Zimbabwe Vulnerability Committee
		ZRBF	Zimbabwe Resilience Building Fund

FOREWORD

Climate change is one of the most significant development challenges facing humanity today. In addition to destruction of our only planet, it affects people directly, their livelihoods and their wellbeing directly, thus having adverse effects on human development. Climate change is a significant threat to Zimbabweans and the Government of Zimbabwe regards climate as a top priority in its development efforts. A better understanding of the effects of climate change on human development is imperative to combatting climate change and it is with this objective that the Government of Zimbabwe and the United Nations Development Programme (UNDP) launched the production of the Zimbabwe Human Development Report on Climate Change and Human Development: Towards Building a Climate Resilient Nation.

The report was prepared by an independent team of experts in consultation with a broad constituency, including provincial and district planners, and communities, in a true spirit of human development. It uses the 'Drivers, Pressures, State, Impact, Responses' (DPSIR) framework, formulated by the United Nations Environment Programme (UNEP) to analyse the interactions between climate change and human development. Considering the key climate related development challenges, the report focusses on four human development themes, namely, livelihoods, food security, health and education.

A wealth of information is presented in terms of the status of climate effects and human development, and their interactions. As the report asserts, Zimbabwe is a high climate risk country because of high vulnerability of climate changes on its population and exposure to climate-related events such as frequent droughts, and reliance on agricultural land that is both flood and drought prone. In addressing these adverse effects, the Government of Zimbabwe has committed itself to implementing or domesticating international policy agreements that strengthen the country's adaptive capacity and resilience in the face of climate change, including launching a National Climate Change Response Strategy. However, a lot more needs to be done to minimise the effects of climate change on broader human development and the solutions that this report articulates could be of immense help. Among them are: strengthening the capacity of relevant institutions to forecast disasters and disseminate early warning to the people; mainstreaming disaster risk management; building resilience to climate-related shocks and stresses; improving disaster response measures and actions; adopting appropriate agro-ecological and climate resilient agricultural practices; mapping land and crop suitability; and enhancing social safety nets, to list a few. More importantly, the report suggests how the responses in terms of policies, strategies, legislation, institutional arrangements and actions can be tailored to make all sectors and the Zimbabwean population more resilient to climate change.

We hope that this report will reach and appeal to a wide audience to spur constructive public debate, change perceptions and priorities at the national level and garner support for action.



Bishow Parajuli
UN Resident Coordinator and UNDP Resident
Representative



Misheck. J. M. Sibanda
Chief Secretary to Cabinet and President

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CONTENTS

LIST OF ABBREVIATIONS	i		
FOREWORD	iii		
ACKNOWLEDGEMENTS	iv		
EXECUTIVE SUMMARY	viii		
ZIMBABWE COUNTRY PROFILE	xv		
Chapter 1			
INTRODUCTION	3		
Background and Objectives of the Zimbabwe Human Development Report	3		
The Human Development Report Process	4		
Analytic Conceptual Framework	5		
Structure of the Zimbabwe Human Development Report	8		
Conclusion	9		
Chapter 2			
THE CLIMATE CHANGE AND HUMAN DEVELOPMENT CONTEXT	10		
Rationale for the Climate Change and Human Development Theme	10		
The State of Human Development in Zimbabwe	11		
The Zimbabwe Climate Change Context	21		
Interaction of Climate Change and Human Development	31		
Chapter 3			
CLIMATE CHANGE AND LIVELIHOODS	37		
Introduction	37		
The State and Status of Livelihoods in Zimbabwe	37		
Climate Change, Livelihood Systems and Human Development	42		
Impacts of Climate Change on Urban Livelihoods	57		
Impacts of Climate Change on Vulnerable Groups	58		
Effects of Climate Change on Social Safety Nets	61		
Future Impacts of Climate Change on Livelihoods and Human Development	61		
Responses to Livelihood Challenges caused by Climate Change	63		
Effectiveness of Institutions in Responding to Climate Change Induced Livelihood Insecurity	65		
Livelihoods, Climate Change and the Sustainable Development Goals	67		
Conclusions	68		
Chapter 4			
CLIMATE CHANGE AND FOOD SECURITY	86		
4.1 Introduction	86		
Climate Change-Food Security Linkages	93		
Responses to Food Security Challenges of Climate Change	100		
Effectiveness of Institutions in Responding to Climate Change Induced Food Insecurity	104		
		Food Security, Sustainable Development Goals and National Policies	105
		Conclusions	107
Chapter 5			
CLIMATE CHANGE AND HEALTH	114		
Introduction	114		
The State of Health in Zimbabwe and its Vulnerability to Climate Change	115		
Climate Change-Health Linkages	121		
Responses to Health Related Challenges of Climate Change	127		
Effectiveness of the Health Service Delivery System in Addressing Climate Change Induced Health Problems	132		
Health, Climate Change and the Sustainable Development Goals in Zimbabwe	133		
Conclusion	134		
Chapter 6			
CLIMATE CHANGE AND EDUCATION	136		
Introduction	136		
The State of Education and Sectoral Performance in Zimbabwe	137		
Impacts of Climate Change on Education	141		
Responses to Climate Change Related Challenges to Education	147		
Education and the Sustainable Development Goals	151		
Conclusion	153		
Chapter 7			
CONCLUSIONS AND RECOMMENDATIONS	154		
Introduction	154		
Disaster Preparedness, Early Warning Systems and Disaster Risk Management	154		
Strengthening National Capacity to Adapt to the Effects of Climate Change on Livelihoods, Food Security, Health and Education	155		
Conclusions	166		
ANNEXES			
Zimbabwe Human Development Index (HDI) Computation	179		
Average Annual Income by Province, 2012 (US\$)	180		
Zimbabwe Gender Development Index (GDI) Computation	181		
Zimbabwe's GDI for 2015 relative to Selected Countries and Groups	182		
Zimbabwe's GII for 2015 relative to Selected Countries and Groups	183		
Multidimensional Poverty across Sub-National Regions	184		
Environmental Performance Index (EPI) For Selected SADC Countries, 2016	185		

FIGURES

Chapter 1		
Figure 1.1 DPSIR framework	7	
Chapter 2		
Figure 2.1 The world through a human development lens	12	
Figure 2.2 Zimbabwe HDI trends, 2000 to 2015	13	
Figure 2.3 Comparison of SADC member states' HDIs with that of Zimbabwe for the period 2010 to 2014	15	
Table 2.7 GDI for selected SADC countries, 2013 and 2014	16	
Figure 2.4 GDI, GII and MPI for selected SADC countries, 2014	17	
Figure 2.5 Women in Zimbabwe's National Parliament and Senate, 2010 to 2015	18	
Figure 2.6 Proportion of women in ministerial positions, 2010 to 2015	18	
Figure 2.7 Proportion of currently married women aged 15-49 years participating in select decisions	19	
Figure 2.8 Multidimensional poverty across Zimbabwe's regions, 2015	22	
Figure 2.9 Environmental Performance Index (EPI) for ten SADC countries	23	
Figure 2.10 Zimbabwe's national mean annual maximum temperature (OC), 1980 to 2016	24	
Figure 2.11 Maximum temperatures for locations in Zimbabwe for the decades 1956/1965 to 2001/2010	25	
Figure 2.12 Zimbabwe national mean annual minimum temperature (OC), 1980 to 2016	25	
Figure 2.13 Zimbabwe average seasonal rainfall (mm), 1981 to 2015	26	
Figure 2.14 Zimbabwe temporal rainfall (mm) variation for the period 1999/2000 to 2015/16	26	
Figure 2.15 Map of Zimbabwe showing rainfall deficits	27	
Figure 2.16 Spatial rainfall variations for season 2015/16 relative to WMO climate mean (1981 to 2010)	27	
Figure 2.17 Onset of the 2012/13 rainy season in Zimbabwe	28	
Figure 2.18 Map showing drought proneness in Zimbabwe	29	
Figure 2.19 Map showing mid-season dry spells in Zimbabwe in 2015	29	
Figure 2.20 Flood prone areas in Zimbabwe	30	
Figure 2.21 Interlinkages amongst selected human development components and climate change	32	
Chapter 3		
Figure 3.1 Trends in main income sources for rural households, 2009 to 2016	38	
Figure 3.2 Trends in main source of income for urban households	38	
Figure 3.3 Zimbabwe's national livelihood zone map	39	
Figure 3.4 Conceptual Framework for understanding the impact of climate change on livelihoods	43	
Figure 3.5 Agriculture's contribution to Zimbabwe's economy	46	
Figure 3.6 Wet and dry years for the seasons 1999/2000 to 2015/16	46	
Figure 3.7 National trends for maize production, 1993 to 2015	47	
Figure 3.8 Drought related cattle deaths in the ten most affected districts of Zimbabwe	50	
Chapter 4		
Figure 4.1 Prevalence of poverty in provinces and districts of Zimbabwe	71	
Figure 4.2 Food poverty by provinces and districts in Zimbabwe	72	
Figure 4.3 Zimbabwe's national livelihood zone map	73	
Figure 4.4 Maize production and consumption trends, 2010 to 2015	74	
Figure 4.5 National small grains production, 1995 to 2015	74	
Figure 4.6 National production level of non-dairy cattle 2008 to 2015	75	
Figure 4.7 Trends in cereal production and food insecurity, 2002 to 2016	76	
Figure 4.8 Percentage of children under age 5 classified as malnourished	77	
Figure 4.9 Linkages between climate change and food security	78	
Figure 4.10 Zimbabwe's seasonal calendar	79	
Figure 4.11 Crop yield and rainfall trends in Chiredzi district, 1979 to 2006	82	
Figure 4.12 Comparison of standardised indices of maize and sorghum yields and annual rainfall for Chiredzi district, 1980 to 2007	83	
Chapter 5		
Figure 5.1 Percentage of households using improved water sources and improved sanitation facilities in Zimbabwe in 2014	100	
Figure 5.2 Causal pathways of public health impacts from climate change	103	
Figure 5.3 Composition of healthcare allocation (USD 330.79) for Zimbabwe for the year 2016	112	
Chapter 6		
Figure 6.1 Primary school net enrolment ratio (percent) in Zimbabwe, 2000 to 2015	121	
Figure 6.2 Pathways of climate change impact on education	124	
Chapter 7		
Figure 7.1 Safety nets that exist in communities to combat food insecurity	149	
ANNEXES		

TABLES

Chapter 1

Table 1.1 Components of modified DP SIR framework	6
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Chapter 2

Table 2.1 Zimbabwe HDI trends, 2000 to 2015	13
Table 2.2 Zimbabwe's estimated HDI by province, 2015	14
Table 2.3 Zimbabwe's HDI by urban and rural areas, 2012 to 2015	14
Table 2.4 Zimbabwe's HDI relative to other SADC countries, 2015	14
Table 2.5 Zimbabwe's HDI and IHDI relative to other SADC countries, 2014	16
Table 2.6 Zimbabwe's GDI relative to Lesotho, Kenya and Sub-Saharan Africa	16
Table 2.8 Zimbabwe's GII profile, 2014	17
Table 2.9 GII for selected SADC countries, 2011 to 2014	19
Table 2.10 Zimbabwe's MPI by province and region, 2015	20
Table 2.11 MPI deprivation of selected SADC countries, 2015	21

Chapter 3

Table 3.1 National livelihood zones profiles	40
Table 3.2 Livelihoods in Zimbabwe and related climate change effects	44
Table 3.3 Ecotourism projects in Zimbabwe	54
Table 3.4 Potential effects of climate change on community based natural resource management activities	55
Table 3.5 Key policy and legislative frameworks that support livelihoods in Zimbabwe	62
Table 3.6 Sustainable Development Goal targets closely linked to climate change and livelihoods	66
Table 3.7 Examples of targets in other goals linked to livelihoods	67

Chapter 4

Table 4.1 Zimbabwe's position on the Global Hunger Index severity scale, 2016	73
Table 4.2 Seasonal mean rainfall per season, 1999/2000 to 2015/16	82
Table 4.3 Key policy and legislative frameworks on food security in Zimbabwe relevant to addressing climate change impacts	86
Table 4.4 Budget allocations to government departments central to agriculture and food security	90
Table 4.5 Food Security targets for Sustainable Development Goal 2	91
Table 4.6 Examples of targets in other goals linked to food security	91

Chapter 5

Table 5.1 Estimated life expectancy at birth by province, 2015	97
Table 5.2 Life expectancy values - projected population, 2012 to 2032	98
Table 5.3 Mortality rates (per 1 000) for various periods between 2000 and 2014	98
Table 5.4 Zimbabwe GDP at current prices (USD billion), 2000 to 2014	99
Table 5.5 Distribution of health facilities by level and province, 2014	101
Table 5.6 Key policy and legislative frameworks on health in Zimbabwe	110
Table 5.7 Budgetary allocations to Ministry of Health and Child Care, 2013 to 2016	112
Table 5.8 Health targets in Sustainable Development Goal 3	114

Chapter 6

Table 6.1 Secondary school net enrolment rate, 2000 to 2015	122
Table 6.2 Zimbabwe educational attainment indices, 1980 to 2015	122
Table 6.3 Secondary school dropouts by reason, 2015	123
Table 6.4 Key policy frameworks on education in Zimbabwe	132
Table 6.5 Sustainable Development Goal 4 and its targets	135

Chapter 7

ANNEXES

EXECUTIVE SUMMARY

Zimbabwe adopted the publishing of a National Human Development Report in 1998 and had so far published four reports addressing the most pressing issues at the time of publication. The 1998 Zimbabwe Human Development Report (ZHDR) focused on Poverty, 1999 on Globalisation; 2000 on Governance and 2003 on HIV.

The ZHDR 2017 has a special focus on issues of climate change, hence its theme is *Climate Change and Human Development: Towards Building a Climate Resilient Nation*. This is because the Government of Zimbabwe regards climate change as a challenge which has the potential to undermine many of the positive achievements made in meeting the country's development goals. The ZHDR 2017 seeks to provide an in-depth analysis of challenges relating to climate change and human development in order to mainstream climate change into national planning and build the resilience of vulnerable people in the country to climate change using a human development lens.

The production process of ZHDR 2017 was inclusive and participatory and was led by a Task Force chaired by the Office of the President and Cabinet, which was broad based and encompassed a wide range of experts in the areas of climate change/environment and human development and related matters. This was to ensure participation and collective ownership as well as the quality of the report. In addition, the compilation of the ZHDR 2017 involved convening consultative workshops that had representation from all ten provinces of Zimbabwe, with participants representing most interest groups to ensure that the views of as many constituencies as possible were taken into consideration so that the ZHDR is national in character. The views of young people (15 to 35 years) were also solicited through a UNICEF Zimbabwe U-Report Poll.

The ZHDR 2017 uses the 'Drivers, Pressures, State, Impacts, Responses' framework to analyse the interactions between climate change and human development. The framework is modified to provide for analyses of the state and trends of the livelihoods, food security, health and education aspects of human development, the impacts of climate change on them, and the responses by society, policy makers, the private sector and development partners to these impacts. It also assesses progress towards meeting internationally agreed goals and identifies gaps in their attainment. The concepts of sustainable development, human wellbeing and climate change are core to the analysis.

The production of the ZHDR 2017 is an important development as the previous ZHDR was produced in 2003. The Report is designed to advocate for a widened national response to climate change that includes multisectoral development interventions. These interventions should complement and strengthen the current, largely environmental, responses to climate change, as it is not just an environmental issue, but a threat to Zimbabwe's broader development effort.

Climate change can have adverse impacts on the lives and wellbeing of Zimbabweans and can constrain or even reverse the progress in social and human development that Zimbabwe has previously accomplished. The impacts of climate change and variability are becoming more evident with increased incidence of droughts, floods and hailstorms, as well as more hot days and heatwaves. These elements pose serious problems with far reaching social, economic, political and environmental consequences. In Zimbabwe, climate change is likely to stall the country's development, and pose a serious risk to food security and the adaptive capacity of the Zimbabwean population, especially those in vulnerable communities. There is a need to integrate climate change issues into the development planning process at all levels, including national, district and local levels, to ensure coordinated programming and activities.

Human development is an approach that is focussed on people's opportunities and wellbeing;

it is about expanding the richness of human life, rather than just the wealth of the economy in which human beings live. Apart from the purposes of comparability, the Human Development indices assist nation states in policy formulation, development planning and mitigation, which often require national as well as regional or international collaboration. The selected indices are generally non-parametric or distribution free, and hence amenable to intra-country and inter-country comparisons.

The Human Development Index (HDI) is a 'pooled' index from the dimensions relating to health, education and general incomes. Theoretically a higher HDI points to a higher level of socioeconomic development. Zimbabwe's HDI of 0.522 improved by 18 percent during the period 2000 to 2015. This is explained by increased life expectancy (to 60.7 years), an increase in the expected years of schooling (to 10.3 years) and mean years of schooling (to 7.7 years), decreases in human immunodeficiency virus (HIV) and acquired immune deficiency syndrome (AIDS) related mortality. Nevertheless, it was accompanied by fiscal economic downturn, with incomes falling by 33 percent. As expected, urban centres registered higher HDIs than rural areas.

The Inequality-adjusted Human Development Index (IHDI), which takes account of inequality in the three dimensions of health, education and incomes, falls below the HDI as inequality increases. In Zimbabwe, a general reduction of income disparities and provision of equal opportunities in the education sector and workplace would be required to improve the country's IHDI. For Zimbabwe, the difference between the IHDI and the HDI is relatively smaller than that of seven other Southern African Development Community (SADC) Member States. Thus, the disparities in the development dimensions are manageable, but could be improved.

The Gender Development Index (GDI) accounts for human development impacts of gender gaps in the computation of HDI. The GDI is not an independent measure as it merely adjusts for gender related inequalities in the HDI dimensions. Zimbabwe's GDI of 0.925 is close to unity, which implies that the HDIs for females and males are nearly equal. Zimbabwe should be complemented for accelerating both male and female educational streams, and expanding health facilities countrywide. It is expected that the Science, Technology, Engineering and Mathematics (STEM) initiative, coupled with other 'equal opportunity' educational reforms, will spur the country into even higher GDIs.

The Gender Inequality Index (GII) is a refinement of the GDI which considers gender related factors such as maternal mortality, adolescent birth rates, education, political empowerment and labour market participation. A low GII points to a high progression of females across the developmental levels. Although Zimbabwe's GII (0.540) is comparable with that of other countries in the SADC region, there is room for improvement. Maternal mortality is persistently high, as are adolescent birth rates. Government is urged to improve the conditions of maternal care and to discourage early marriage. In addition, policy makers are urged to upscale women's self-determination and career opportunities, as Zimbabwe was ranked 126/189 on the empowerment scale.

The Multidimensional Poverty Index (MPI) is a measure of acute poverty which captures severe deprivations of individuals in health, education and incomes. Poverty renders populations less capable of coping and adapting to the stresses of climate change. In Zimbabwe, urban MPIs are relatively lower than those in rural areas. Several provinces in Zimbabwe have been classified as being in 'severe poverty', with some in the 'destitute' category. Living standards contribute 55 percent to the level of deprivation, hence the need for policy makers to target resources accordingly that is to raise living standards by improving the availability of clean household fuel, decent sanitation, clean drinking water, household electrification and opportunities for asset acquisition.

The Environmental Performance Index (EPI) ranks countries, according to their environmental performance, relating to the protection of both humans and the environment. With a score of 49.55 percent, Zimbabwe is mid-way and ranks second to South Africa within the SADC region. Ar-

measures for improvement include policies that encourage renewable energy adoption, abolition of squatter settlements, reduction of wild forest fires and river/dam pollution, and introduction of air quality monitoring at mining/industrial sites.

Zimbabwe is experiencing hotter and fewer cold days as a result of climate change and variability.

The period since 1980 has been the warmest since Zimbabwe started recording its temperature in 1901. However, the maximum temperatures vary between locations, with temperatures being higher in the lowveldt and lower in the highveldt areas but generally showing an increase at all altitudes since 1980. Mean annual minimum temperatures have hovered around 14°C between 1980 and 2016 with a drop to 8°C between 2004 and 2008.

There has been an overall decline of nearly 5 percent in rainfall across Zimbabwe during the past century, with temporal and spatial rainfall variation in mean rainfall received. The largest recent rainfall deficit was for the 2015/16 season, which almost matched the 1991/92 drought at an average seasonal rainfall around 400mm. This had impacts on food security and nutrition, and provision of water, sanitation and hygiene. About 2.8 million people were deemed food insecure, during this drought, with negative impacts upon human development.

Rainfall distribution information is important as it can be used to determine, for example, the crops to grow and livelihoods to undertake in different regions of the country. In Zimbabwe rainfall distribution is erratic both in space and time across all the provinces. It is against such a climatic background that the ZHDR 2017 human development aspects – livelihood, food security, health and education – were assessed.

The timing and volume of rainfall received in Zimbabwe are becoming increasingly uncertain and affect the farming calendar. Stakeholders at the ZHDR consultative workshops indicated that rains were coming late (in some places towards the end of December), markedly reducing the length of the cropping season.

Drought is one of the most frequently occurring natural disasters in Zimbabwe, and given Zimbabwe's heavy reliance on rain-fed agriculture and livestock, this has serious implications for rural livelihoods and the country's food security. Results of hazard mapping show that drought is a recurrent feature of climate change that occurs in virtually all climate zones of Zimbabwe, from wet to dry, but is more severe in the western and southern parts of the country. The same areas also experience more frequent mid-season dry spells that affect crops, especially maize, the main staple cereal in Zimbabwe, making the country's communities food insecure.

Drought also has impacts upon water availability for domestic and industrial use and power generation, affecting cities and non-agricultural sectors. Hence adaptation to drought is crucial for coping with the wide ranging impacts of climate change. Actions need to be taken to improve access to water, and efficient management of its use as these are the foundations for building climate resilient livelihoods. Efforts are also needed to rehabilitate and improve water related infrastructure, including through promotion, resuscitation and rehabilitation of irrigation schemes

Recent meteorological data indicate an increase in the frequency of violent storms sometimes with hail and strong winds that damage infrastructure, property, crops and cause loss of human and livestock lives. Floods tend to occur in the low lying northern and southern areas of Zimbabwe, often as a result of the fact that cyclones tend to pass through these parts of the country.

Climate models predict that Zimbabwe's climate will become warmer than the 1961 to 1990 baseline, with warming rates of 0.5 to 2°C by 2030. These projections indicate a drying trend that will increase in intensity with time. As such Zimbabwe will become both a hotter and drier country under climate change. The foregoing demonstrates that climate is changing and it is necessary for the coun-

try to build resilience in all its sectors.

The Climate Change Vulnerability Index (CCVI) is a recent index that enables countries to calculate their vulnerability to the impacts of climate change over the next 30 years, with the classes of risk ranging from low to extreme risk. The countries with the highest risk are characterised by high levels of poverty, dense populations, exposure to climate related events, and their reliance on flood and drought prone agricultural land. Zimbabwe was ranked 9 among 16 countries with the 'extreme risk' rating in a global ranking of 170 countries.

The impacts of climate change on Zimbabwe's economy, which is primarily agro-based, with over 70 percent of the population living in rural areas and dependant on climate sensitive livelihoods such as arable farming and livestock, is large. These challenges create barriers to people, and inhibit them from engaging fully in decent work, resulting in huge untapped human potential. The impacts are much more pronounced among young people, women, people with disabilities and others who may be marginalised.

Climate change effects are expected to intensify in the years ahead. The increased incidence of drought and the resulting heightened water stress are already having adverse effects on crop and livestock productivity, causing deepening land degradation and threatening the very existence of wildlife and biodiversity. Over a million people in Zimbabwe are vulnerable to adverse climatic shocks and are food insecure as climate change is affecting the agricultural sector, ground water systems and surface water, environment, tourism and other economic sectors.

Climate change affects human development through changes in temperature and precipitation, resulting in extreme events. These bring about disasters through destruction of crops and damage to infrastructure, disruption of livelihoods, food security, health and education, and threats human and livestock lives. The Meteorological Services Department is mandated to provide up-to-date information on climate issues and information to determine the interventions required to react to the adverse impacts of climate change, while the Department of Civil Protection is responsible for disaster preparedness and response. However, both institutions have limited capacity (material, financial and human) to effectively carry out their mandates and it is necessary to capacitate both so that Zimbabwe has adequate disaster preparedness, early warning systems, and disaster risk management to deal with the increasing frequency of extreme events and disasters caused by climate change. Responses to floods and other weather related hazards require the creation of multiple hazard warning and response systems, embedded at community, ward and district levels and in Civil Protection Unit structures, which can translate early warning meteorological and hydrological information into integrated mitigation and adaptation actions.

Improvement of water use efficiency is one form of adaptation that has minimal costs. Water, Sanitation and Hygiene (WASH) interventions need to be strengthened through a focus on water recharge, retention and efficient use, including investment in rehabilitation of dams and weirs, water harvesting, drip irrigation and solar powered water schemes for irrigation, as well as demand management of institutional and domestic consumption. There is also a need to drill more boreholes as these normally provide safe water. Dam rehabilitation and training of communities, especially youth, on catchment management are key to reducing siltation of dams and improving irrigation facilities. Furthermore, it is important to look at water resources infrastructure and to design dams, bridges and levees that accommodate droughts, flooding and extreme events. Investment in piped water schemes for domestic use lessen women's burden in fetching water and enable them to use their time in more productive activities. Public-private partnerships are required for the design of cost effective and context specific rain harvesting techniques and infrastructure, and for scaling up borehole drilling programmes in rural and urban areas. It is also recommended that Government equip the District Development Fund with appropriate and adequate machinery and equipment to undertake borehole drilling and dam scoping exercises.

Appropriate agro-ecology and climate resilient agricultural practices, such as conservation agriculture, ensure improved production which does not undermine the environmental base and have the potential to improve in-situ water conservation. Agricultural productivity could be enhanced via knowledge and skills transfer through extension services and investment in agricultural infrastructure across the country. Land crop suitability mapping needs to be carried out for the country to ascertain whether there have been changes in land suitability across the country arising from climate change. Therefore, it is necessary to continue building and investing in climate smart technologies as well as in rain-fed and irrigation agriculture. Additional efforts should be made to address the bottlenecks faced by communities in adopting climate smart agriculture.

Marginalisation of locally adapted crop varieties leads to reduced social and ecological resilience. Efforts have been made to promote small grains that are more drought resistant in response to frequent droughts. However, uptake has been low because of the processing requirements of small grains. Women at the national ZHDR consultations complained that small grains require a lot of labour, especially in dehusking and processing, hence they did not favour small grains as an alternative diet to maize. Promotion of small grains should be continued, but supplemented by the promotion of technologies that reduce the labour requirements in their processing. Extensive research has been done on harnessing biofortified drought tolerant crops such as beans and sweet potatoes. Efforts to convince farmers to adopt local varieties of crops should be continued and strengthened with public awareness being pursued through all forms of media.

Planning destocking and encouraging rearing of indigenous breeds are some of the adaptive interventions for livestock production systems. Livestock, particularly indigenous cattle that are heat tolerant, are an important asset in the farming system and can do well in a dry climate. In this case, promoting livestock as a substitute or in addition to crop production in dry areas is an important safety net in the face of the changing climate in the country. It is important to improve livestock survival by encouraging and increasing the use of feedlots to carry livestock through the drought periods. The production and processing of fodder crops to increase livestock feed availability should be supported to improve the survival of livestock. Promotion of rapid destocking in anticipation of drought, is an appropriate adaptive measure but this entails there being functional markets that cater for this destocking process. Livestock improvement programmes instituted by government departments and private companies are vital for sustaining farming households through changing conditions.

Poor harvests caused by drought lead to malnutrition, hunger, sickness and inability to concentrate, which reduce performance and diminish learning achievement among children. Lack of food and increased incidence of weather related diseases tend to increase absenteeism and, in the worst case, cause children to drop out of school altogether. School based health and nutrition programmes improve the nutritional intake of children which improves their health, reduces morbidity, increases school attendance and improves concentration and learning performance and outcomes among school children. Therefore, it is recommended that such programmes be introduced in all schools.

Heavy rainfall, hailstorms and floods are becoming more frequent because of climate change. Flash floods occurring particularly in urban areas are caused mainly by blocked or poor drainage systems. Wetlands have an important role in providing a buffer against flood water. In addition, 'climate proofing' of infrastructure is desirable in order to minimise the risks and associated costs of weather related damage. It is recommended that local authorities ensure drains are thoroughly cleaned before the rainy season begins. With regard to wetlands, local authorities should enforce existing regulations and not allow development of infrastructure on these areas. Furthermore, there is a need for strict adherence to building standards, particularly in urban areas, as part of structural measures for protection against floods. A strategy for 'climate proofing' of infrastructure should be developed together with implementation modalities. This should facilitate the gradual conversion of all infrastructure to become as 'climate resilient' as possible.

It is necessary to improve the disaster preparedness capacity of the education sector so that it responds to the situation of internally displaced children by minimising disruption to their learning. The concepts of 'portable schools' and schools in 'buffer zones' capable of accommodating expanded numbers of students at short notice are worth exploring. It is recommended that a task force be put in place or a study be conducted to explore possible models that could be adopted to minimise disruption of education among children living in areas prone to weather related disasters. Related to this, the education sector's capacity to deliver schooling services in temporary shelters/camps set up for climate induced displaced populations, needs to be strengthened.

There are a number of safety nets that should be in place to combat climate change. These include: diversifying livelihood systems in communities to reduce the risk of dependence on and failure of one enterprise; improving financial instruments in order to help households to adapt to climate change; building comprehensive social protection systems; building communal granaries as a possible solution for dealing with erratic food supply; providing education assistance to orphans, the poor and other vulnerable children; and creating an insurance system that is based on a fair compensation system for farmers who are affected by climate related and environmental challenges. Empirical evidence shows that communities with a range of livelihood options and improved and diversified production are more resilient to climate related shocks than those that depend on one or two options. It is recommended that financial and non-financial channels for remittances be made simpler as remittances help people to manage shocks and escape from climate induced poverty. Social insurance and safety nets are efficient tools to support poor people when they are affected by natural disasters. This prevents communities from selling productive assets and enables them to bounce back from climate related shocks and stresses. There is a need for research on how the communal granary concept could work in a modern, individualistic world. More efforts should be made to mobilise resources for the expansion of the Basic Education Assistance Module to support the education of orphans and other vulnerable groups. Zimbabwe should introduce a Weather-based Index Insurance as a matter of urgency.

Improved governance structures that are gender sensitive, strengthened formal and informal institutions, strengthened disease surveillance systems, and development of a Public Health Adaptation to Climate Change Plan are some of the strategies that could be used to address climate change challenges. It is recommended that Government, development partners and the private sector build a centralised database and an open source repository of all initiatives and social, economic and climate data that is easily accessible, to allow for evidence based programming or interventions. It is necessary to identify constraints to female participation in value chain growth and to find opportunities for women's entrance into decision making platforms, as this will enhance women's livelihood options and incomes. Interventions that build the capacity of all institutions at all levels in disaster risk management, and the development of resilience plans that strengthen community level resilience to extreme climate related events should be implemented in Zimbabwe. Disease surveillance systems need to be strengthened in the face of the expectation of increased disease outbreaks resulting from climate change. It is recommended that Zimbabwe develop a National Health Adaptation to Climate Change Plan/Strategy.

Universities and agricultural institutions play an important role in meeting the demand for climate change research, education and training. Education is a powerful vehicle for imparting new ideas to young people and it can be used to carry climate messages. Adaptation responses should include scientific and indigenous technical systems to anticipate climate related patterns and design adaptive measures. Formal and informal dialogue platforms are needed to encourage young people and women to participate. It is recommended that financial support be provided for research in areas that inform adaptive strategies to produce knowledge products on which climate resilience and food security can be anchored. Areas for further study to understand and predict the impacts of climate change on health should be identified systematically and research commissioned. Further studies related to water management and climate change should be undertaken. In-service training for teachers

already in the system, public sector extension officers, agro-service providers and personnel of civil society organisations (CSOs) should be undertaken to strengthen their knowledge climate change. This would enhance their ability to implement action plans for climate change adaptation with communities. The communication strategy for raising awareness on climate change should be implemented. At least, a National Day should be set aside for climate change and indigenous knowledge appreciation and for sharing of ideas, and a programme could be established to encourage the co-production of modern and traditional scientific knowledge in building climate resilient measures to help individuals and communities to adapt to the impacts of climate change. The creation of Information and communications technology (ICT) platforms for spreading weather and climate forecasts, especially to rural farmers to advice their farming activities, should be a priority.

ZIMBABWE COUNTRY PROFILE

INDICATOR	VALUE	PERIOD
GEOGRAPHY		
Total area (land and water areas - km ²)	390 757	2012
Land area (km ²)	386 669	2011
Water mass (km ²)	3 910	2012
Arable land (percent)	42.5	2012
Land under forest cover (percent)	36.0	2015
SOCIO-DEMOGRAPHIC INDICATORS		
Population statistics		
Population (projection in millions)	14.24	2016
Annual population growth rate (percent)	2.2	2012
Sex ratio (male/female)	93	2012
Fertility rate (births per woman)	3.7	2015
Crude birth rate (number of live births per year per 1 000 mid-year total population)	31.3	2016
Economically active population (percent)	55	2015
Population under 15 (percent)	41	2012
Population 65+ (percent)	4	2012
Age dependency ratio (per 100)	80	2015
Population density (per km ²)	36.4	2016
Rural/urban population (percent of total population)	67/33	2015
ECONOMIC INDICATORS		
GDP at current market prices (USD million)	16 620	2016
Growth of GDP at constant prices (percent)	1.9	2016
GDP per capita (USD) constant	996	2016
GDP per capita (USD) current	1 167	2016
Unemployment rate (percent)	11.0	2016
Labour force participation rate (female/male)	90	2016
HEALTH		
Life expectancy at birth (total years)	60.7	2012
Infant mortality rate (per 1 000 live births)	50	2015
Under 5 child mortality rate (per 1 000 live births)	69	2015
Maternal mortality ratio (per 100 000)	651	2015
Physicians (per 100,000 people)	10	2014
Number of health institutions	2 000	2012
Total health expenditure (percent of GDP)	6.4	2014
EDUCATION		
Gross enrolment rate of primary (percent)	97.9	2006
Gross enrolment rate of secondary (percent)	53.0	2006
Ratio of girls to boys in primary education	97.8	2012
Adult literacy rate (percent)	97.0	2012
Adult literacy ratio (male to female)	94	2014
HOUSING CONDITIONS		
Number of private households (million)	3.06	2012

Average household size	4.2	2012
Percent male headed households	65.0	2012
Households with access to electricity (percent)	44.0	2012
Population with access to safe water (percent)	75.0	2012
Population with access to improved toilet facilities (percent)	76.0	2012
Households using fuel wood for energy (percent)	63.0	2012
INFRASTRUCTURE		
Bitumen road coverage (km)	88 328	2015
Railway lines coverage (km)	3 427	2015
Installed electricity (MW)	1 920	2016
Households with access to electricity (percent)	44.0	2015
Fixed internet per 1 000 people	45	2014
Internet users per 1 000 people	210	2016
CLIMATE CHANGE		
Climate Change Vulnerability Index (CCVI)	9 (extreme risk category)	2011
National total greenhouse gas emissions	22 019.566 Gg carbon dioxide equivalent	2006 base year
Removals from Land Use, Land Use Change and Forestry (LULUCF)	83 000.000 CO ₂	2006 base year
Net sink position	60 980.434 Gg CO ₂ eq	2006 base year
Environmental Performance Index (EPI)	49.55	2016



Section A

Overview Of The Zimbabwe Human Development Report 2017

INTRODUCTION

Saving our planet, lifting people out of poverty, advancing economic growth, these are one and the same fight. We must connect the dots between climate change, water scarcity, energy shortages, global health, food security and women's empowerment. Solutions to one problem must be solutions for all.

Ban Ki-moon

Background and Objectives of the Zimbabwe Human Development Report

Zimbabwe adopted the publishing of a national Human Development Report (HDR) in 1998, eight years after the United Nations Development Programme (UNDP) published its first Global Human Development Report in 1990. This was the same year that the Southern African Development Community (SADC) published its first Regional Human Development Report. National Human Development Reports aim to place human development at the forefront of the national political and economic agenda. They are tools for policy analysis reflecting people's priorities, strengthening national capacities, engaging national partners, identifying inequities and measuring progress (UNDP, 2009). As policy advocacy documents, they have introduced the human development concept into national policy dialogues, not only through human development indicators and policy recommendations, but also through the country led and country owned process of consultation, research and report writing.

As advocacy tools designed to appeal to a wide audience, the reports can spur public debate and mobilise support for action and change. They have helped to articulate people's perceptions and priorities, and have served as a source of alternative policy opinion for development planning across varied themes (UNDP, 2009).

While the global Human Development Reports are able to address development issues in individual countries broadly, the national Human Development Reports are much better placed to go into detail, analysing both human devel-

opment and deprivation, and identifying local patterns of inequality and exclusion. Ultimately, they are able to propose specific and concrete policy options. Although the focus of reports varies, those that are most successful in influencing policy tend to adhere to the recommended core principles of national ownership, consultative preparation, independent, objective data and analysis, and sustained advocacy.

Since 1998, Zimbabwe has published four national reports. The Zimbabwe Human Development Reports (ZHDRs) have always addressed the most pressing emerging issue at the time of publication – Poverty in 1998, Globalisation in 1999, Governance in 2000; and HIV in 2003.

The Zimbabwe Human Development Report 2017 has a special focus on issues pertaining to climate change; hence its theme is Climate Change and Human Development: Towards Building a Climate Resilient Nation. The Government of Zimbabwe regards climate change as one of the threats to the country and its people and is of the view that climate change has the potential to undermine many of the positive achievements made in meeting the country's development goals. The challenge for the country is to develop adaptation and mitigation strategies that will reduce the diverse, cross-cutting and adverse impacts of climate change and build a resilient nation (Government of Zimbabwe, 2015).

This ZHDR, therefore, seeks to provide an in-depth analysis of the challenges relating to climate change and human development in order to:

- Inform and influence national policies, programmes and measures for climate mitigation and adaptation, using a human development lens.
- Help integrate climate change and environmental policies into broader development and sectoral policy planning, with a focus on inclusive growth and sustainable development.
- Support local and national forums to debate adaptation and mitigation policy trade-offs, and win-win solutions, especially for the most vulnerable groups, based on data and other forms of empirical evidence.
- Produce a report to be used as a tool to mobilise resources for climate change mitigation and adaptation initiatives, as well as building the resilience of the vulnerable people in the country.
- Support advocacy initiatives that influence individual and societal behavioural change to cope with a changing climate.
- Develop capacities for longer term human development policy research, debate and advocacy.
- invigorate and strengthen the national communications processes for climate change and sustainable development (UNDP, 2009).

The ZHDR 2017 attempts to assess the state and trends of human development, defined as people's ability to lead long and healthy lives, be knowledgeable, have a decent standard of living and participate in community life with dignity and self respect (UNDP, 2009), and how climate change threatens progress in achieving Zimbabwe's targets for human and sustainable development. The Report also aims to inform Zimbabweans about significant conditions and trends in the country's human development, as well as to support sustainable human development planning and decision making through provision of credible information.

The Report focusses on three key elements of the Human Development Index (HDI), namely livelihoods, health and education, and adds

a fourth theme, food security. This is because, although the Government of Zimbabwe will implement all the seventeen Sustainable Development Goals, priority will be given to eleven focus goals that include food security. This is expected to trigger activity in the remaining seven goals, leading to the ultimate Goal of Eliminating poverty in all its forms everywhere (Ministry of Economic Planning and Investment Promotion, 2015).

Food security is part of the definition of poverty and human wellbeing, as the definitions of poverty are to a large extent determined by food deprivation, with food poverty defining extreme poverty (Manjengwa et al., 2012). Poverty is widespread in Zimbabwe with 43.1 percent of rural households and 6.3 percent of urban households living in extreme poverty (ZIM-STAT, 2013a). Climate change is likely to exacerbate these levels of food poverty. Furthermore, achieving food security underlies all the components of human development because one cannot live a long and healthy life, be educated and knowledgeable, and have a decent standard of living without having adequate food.

The ZHDR reviews the state and trends of livelihoods, food security, health and education, the impacts of climate change and variability upon these, and how the government, the private sector, development partners, civil society and communities respond to these challenges. The Report also suggests how the responses in terms of policy, strategy, legislation, institutional arrangements and actions can be tailored to make all sectors and the Zimbabwean population more resilient to climate change. Gender is mainstreamed in all chapters and themes. The assessments cover the period 2000 to 2016.

The Human Development Report Process

Process guidance

The ZHDR production process was guided by a ZHDR Task Force chaired by the Office of the President and Cabinet, with the Ministries of Macroeconomic Planning and Investment Promotion, and Environment, Water and Climate being the two lead ministries. The membership of the Task Force was broad and inclusive of experts in the areas of climate change/environment and human development related matters, in addition to the key line ministries.

Specific actions of the Task Force included awareness building on issues relating to the topic among Task Force members, and arranging consultations with wider stakeholder groups. The Task Force was also responsible for reviewing the draft background papers and chapters to ensure they met the HDR quality standards and the guiding principles for the production of HDRs. The launch of the report was also undertaken by the Task Force. Attention was paid to ensuring the technical soundness and comprehensiveness of the information, as well as producing a report that would be interesting and accessible even to non-technical readers, not because concepts were made simple or technical terms avoided, but because they were explained clearly.

Methodology

The compilation process of the ZHDR 2017 widened the degree of consultation by convening six consultative workshops that had representation from all ten provinces of Zimbabwe. These were clustered into three groups with the first group made up of Matabeleland North, Matabeleland South and Bulawayo, the second group of Masvingo, Manicaland, and Midlands while the third group comprised Harare, Mashonaland East, Mashonaland Central and Mashonaland West. Two workshops were held for each cluster of provinces, with attendees of the first workshop being administrators from government, civil society and the private sector, while the second workshop was attended by representatives of communities, including chiefs, councillors and community group members. The second group of workshops was conducted in the appropriate vernacular language (Shona or Ndebele).

A total of 279 people was consulted, made up of 101 women and 178 men. Thirty-three members of the traditional leadership (fifteen chiefs, three headmen, seven village heads and eight councillors) attended the workshops. Some of the attendees fell into the 'youth' category. Although the number of people consulted is low relative to Zimbabwe's population, they represented most interest groups to ensure that the views of as many constituencies as possible were taken into consideration in the Report and that it would have a truly national character.

Another method used to collect data was the U-Report Poll. The United Nations Children's

Fund (UNICEF) Zimbabwe Country office conducts U-Report polls as a means of ensuring that children and young people have an opportunity to understand and to voice what they believe are the most significant challenges in their communities. U-Report is a free SMS social monitoring tool for community participation designed to address issues of popular concern. In 2016 the U-Report platform in Zimbabwe had 55 604, members aged 15 to 35 years, with a gender makeup of 57 percent males and 43 percent females. Platform members were from all ten provinces of Zimbabwe, with the most active members coming from Harare, Manicaland, Midlands and Mashonaland West. Recognising that the 2017 ZHDR is focussed on climate change, which is also one of UNICEF's focus areas, UNICEF conducted a U-Report Poll to ensure that the youth had an opportunity to provide input to this national study.

In addition, the authors undertook an extensive review of grey and academic literature, including information/data on trends in pertinent issues from relevant national and regional institutions.

The report was validated at a workshop attended by a wide range of stakeholders representing major interest groups. It was then signed off by the Steering Committee at a meeting where the final report, incorporating all comments from reviewers and the validation workshop, was presented. Comments from the steering Committee were incorporated before the report was submitted.

Analytic Conceptual Framework

The ZHDR 2017 uses the Drivers, Pressures, State, Impact, Responses (DPSIR) framework, used by UN Environment [formerly United Nations Environment Programme (UNEP)] for its Global Environment Outlooks, to analyse the interaction between climate change and human development (UNEP, 2007, 2012). The framework is modified to provide for analyses of the state and trends of selected aspects of human development, the impacts of climate change upon them, and the responses by society, policy makers, the private sector, and development partners to these impacts. It also assesses progress towards meeting internationally agreed goals and identifies gaps in their attainment. The concepts of sustainable development, hu-

man wellbeing and climate change are core to the analysis.

The integrated assessment of the nexus between climate change and human development through the modified DPSIR framework responds to the following questions (which determine the content of each of the following chapters of this report):

- What is the state of a particular aspect of human development and what are the trends regarding the aspect (state and trends)?
- What are the major climate change shocks and stresses on human development, what are their impacts, and which social groups are most vulnerable to these stresses (drivers and pressures)?

- What measures have been taken by government and other stakeholders to address the impacts of climate change on the particular aspect of human development to achieve resilience (responses)?
- What measures need to be taken to address future impacts of climate change on the particular aspect of human development (outlook and recommendations)?

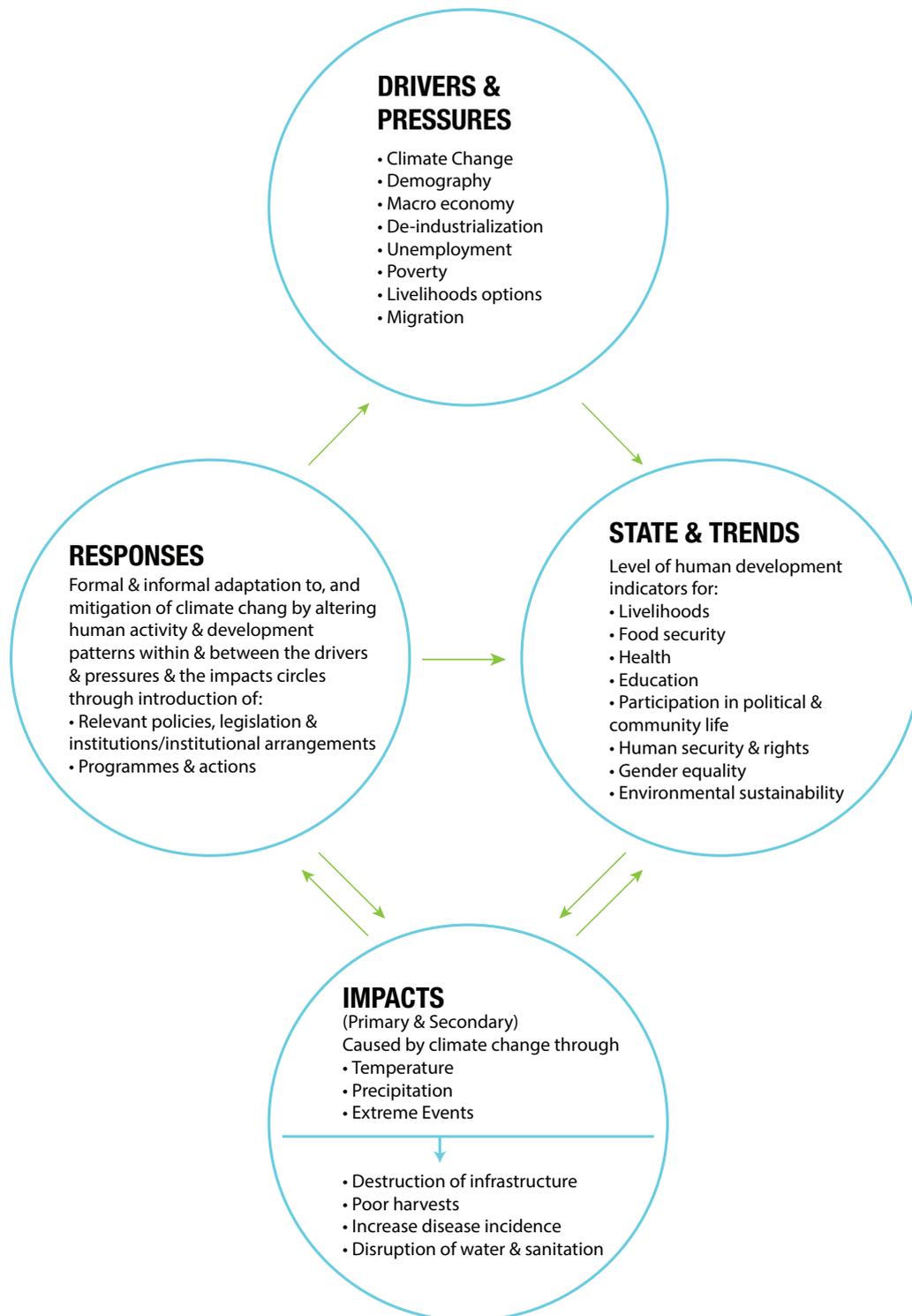
The modified DPSIR framework has been applied throughout this Report but in a generic and flexible manner that allows for the framework of a theme or chapter to be customised as necessary.

The components of the modified DPSIR framework are outlined in Table 1.1 below and illustrated in Figure 1.1.

Table 1.1 Components of modified DP SIR framework

Drivers and Pressures	Fundamental aspects that drive and have direct and indirect impacts upon various aspects of human development. Among the drivers are demography, the macroeconomy, poverty, deindustrialisation, unemployment, livelihood options, migration, availability of inputs, and climate change (the main driver addressed in this report)
State and trends	<p>The state of various human development aspects, including livelihoods, food security, health, education, participation in political and community life, human security and rights, gender equality and environmental sustainability. Livelihoods, food security, health and education are the focus of this report but Chapter 2 covers a broader range of human development indices.</p> <p>Health is analysed using health indicators – life expectancy at birth, child mortality maternal mortality – as well as the prevalence of malnutrition, and the capacity and accessibility of the health delivery system.</p> <p>Education is assessed through educational performance indicators – enrolment ratios, educational attainment indices, school dropout and completion rates. Availability of infrastructure; relevance of the curriculum to human development, and the quality of education (reflected in teacher to student ratios) are also important.</p> <p>Food security is examined in terms of food availability, accessibility, utilisation and stability.</p> <p>Livelihoods are measured through income sources, performance of livelihood and agro-ecological zones and the livelihoods they offer, and degrees of livelihood vulnerability.</p>
Impacts	Impacts of climate change mainly stem from temperature, precipitation and extreme events. They can be primary or secondary, as well as direct or indirect. Direct impacts include the destructive effects of extreme weather events on infrastructure, compromising delivery of services. Droughts and floods can result in poor harvests leading to hunger and food insecurity, and also may cause changing patterns and intensities of disease incidence and reduced availability of safe water and sanitation.
Responses	Including national actions, strategies, plans, laws and policies that address the issues of vulnerability of human development to the impacts of climate change, as well as regional and global level responses, such as the SDGs and multilateral agreements on climate change.

Figure 1.1 DPSIR framework
 Adapted from UNEP (2007, 2012)



Structure of the Zimbabwe Human Development Report

The Zimbabwe Human Development Report 2017 contains seven chapters which provide a comprehensive assessment of the state and trends of human development and climate change for the period 2000 to 2016, and the impacts of the latter on human and sustainable development. It highlights the challenges Zimbabwe faces from climate change and provides policy options and opportunities available to address present and emerging impacts of climate change and variability.

Chapter 1: Introduction, is this introductory chapter, which outlines the objectives of the ZHDR 2017, the Human Development Report process, and the methodology and analytic conceptual framework used.

Chapter 2: The Climate Change and Human Development Context, presents the context for assessing the impacts of climate change on human development. It summarises the state of Zimbabwe's human development from 2000 to 2016 and how this has been and is likely to be affected by climate change. It gives the rationale for producing a national Human Development Report with a climate change theme by illustrating how the climate has changed with regard to temperature, precipitation and the frequency of extreme events over the years and the interlinkages between climate change and human development. Overall, Chapter 2 presents a backdrop for the analyses in Chapters 3 to 6.

Chapter 3: Climate Change and Livelihoods, examines the effects of climate change on human development through its impacts on livelihoods. The chapter uses a modified DPSIR framework that integrates the sustainable livelihoods approach to examine the relationship between climate change, livelihoods and human development in the country.

It presents the impacts of climate change on rural livelihood flows and how the particular nature of Zimbabwe's rural economies makes agrarian livelihoods risky and human welfare vulnerable to shifting weather patterns. Sustainable human development for Zimbabwe hinges on agriculture that is dominated by smallholder farmers (89 percent) relying on rain-fed production, with limited resources and assets, and the

extraction of natural resources that are directly or indirectly vulnerable to climate change is another dominant activity.

The impacts of climate change on urban livelihoods are interrogated, showing that these are directly and indirectly affected by climate change, and that there are interrelationships between urban and rural livelihoods. The salient points raised are that prevailing economic stresses in the country are compounded by climate related extremes which constrain individual and household assets and capabilities, which in turn decreases the quality of life and human wellbeing of communities.

Chapter 4: Climate Change and Food Security, introduces climate change-food security linkages and analyses them using a modified DPSIR framework. Food security is linked to poverty and human wellbeing as the definitions of poverty are, to a large extent, determined by food deprivation, (Manjengwa et al., 2012).

The Chapter interrogates the four dimensions of food security – availability, access, utilisation and stability. A food system is considered vulnerable if one or more of these is uncertain and insecure. The four dimensions of food security are discussed as a context within which to analyse the effects of climate change on food security.

Three climate phenomena – temperature, precipitation and frequency of extreme events (droughts and floods) – and their impacts on food security are discussed. Zimbabwe is shown to be in the serious category of the Global Hunger Index (28.8) and this is likely to be exacerbated by climate change. Trends presented indicate that most of the indicators of food security are declining while food insecurity is increasing. The chapter highlights that, while the focus has been on rural areas, a need also exists to keep track of the ways that urban areas are affected by lack of access to food.

Chapter 5: Climate Change and Health, highlights the importance of health as a component of human development and how it is factored into the determination of the Human Development Index. It presents trends in the major health indicators and how they portray the capacity of the country to adapt to the negative

impacts of climate change.

The chapter addresses climate change and health linkages and presents the causal pathways of climate impacts on public health. Direct and indirect effects, as well as primary and secondary impacts of climate change on health are analysed. The impacts of changes in temperature, including heat waves, particularly on vulnerable groups such as albinos, the young and the elderly are interrogated.

The chapter concludes by presenting recommendations for the strengthening of national capacity to address the effects of climate change on health and health delivery, and to plan for building climate resilient health systems.

Chapter 6: Climate Change and Education, presents the pathways through which climate change affects education and human development and the interlinkages among these three issues. It portrays the importance of education in socioeconomic, technological and political development. The chapter looks at the primary, direct and indirect impacts of climate change on education, focussing on the increased frequency and severity of extreme weather events. The analysis indicates that many school days are lost because of lack of access to schools as a result of destruction of infrastructure, leading to poor education outcomes.

Primary, indirect impacts such as food shortages, reduced water and sanitation, and increased water related disease, are presented and their outcomes on education are discussed, including the gender differentiated impacts. Long term primary, indirect impacts on the health and nutritional status of children of school going age are discussed. One of the main recommendations is that school health and nutrition programmes specifically targeted at the poor, girls and disadvantaged children be introduced as this could provide a cost effective solution to loss of education and learning.

The role of education in adapting to and mitigating climate change is highlighted noting that education can be used as a powerful vehicle for creating a new generation of youth whose knowledge could be used to adapt to the effects of climate change.

The chapter make recommendations on making the education sector more resilient to the impacts of climate change, including climate proofing of education infrastructure, facilitating children's education during displacement caused by extreme events, and addressing issues of school dropouts caused by climate change.

Chapter 7: Conclusions and Recommendations, draws together the content and findings of the earlier chapters around the themes of disaster preparedness, early warning systems and disaster risk management, and strengthening national capacity to adapt to the effects of climate change on livelihoods, food security, health and education.

Conclusion

The production of the ZHDR 2017 is a welcome development, as the previous ZHDR was produced in 2003. The Report is designed to advocate for a widened national response to climate change to include multisectoral developmental interventions. These interventions should complement and strengthen the current, largely environmental, responses to climate change, as it is not just an environmental issue but a threat to Zimbabwe's development that demands an all-encompassing and strategic response.

The Zimbabwe Human Development Report, with its approach of evidence based research and inclusive consultation, is intended to offer effective and contextualised solutions. It has also explored some global best practice within a local context. It should contribute to the pro-poor growth policies of the Government of Zimbabwe in order to empower individuals, households and communities to respond more effectively to climate change and to become more resilient.

THE CLIMATE CHANGE AND HUMAN DEVELOPMENT CONTEXT

Environment and development are not separate challenges; they are inexorably linked. Development cannot subsist upon a deteriorating environmental resource base; the environment cannot be protected when growth leaves out of account the costs of environmental destruction.

Africa Environment Outlook 2

Rationale for the Climate Change and Human Development Theme

Climate Change can have adverse impacts on the lives and wellbeing of Zimbabweans and could constrain or even reverse the progress in social and human development that Zimbabwe has accomplished so far. The 2015 Global Human Development Report points out that, despite some progress in human development throughout the world, there remain considerable challenges caused by climate change and lack of environmental sustainability, among other factors (UNDP, 2015a).

The impacts of climate change and variability are becoming more evident, manifested as increased incidence of droughts, floods and hailstorms, and more hot days and heat waves. These pose serious problems with far reaching social, economic, political and environmental consequences, particularly to vulnerable countries (Government of Zimbabwe, 2015). In Zimbabwe, climate change is likely to stall the country's development, and pose a serious risk to food security and to the adaptive capacity of the Zimbabwean population, especially among vulnerable communities. Therefore, climate change issues need to be integrated into the national development planning processes at all levels, including national, district and local, to ensure coordinated programming and activities.

The production of this Human Development Report comes at an opportune time, when Zimbabwe is putting considerable effort towards responding to the challenges posed by climate

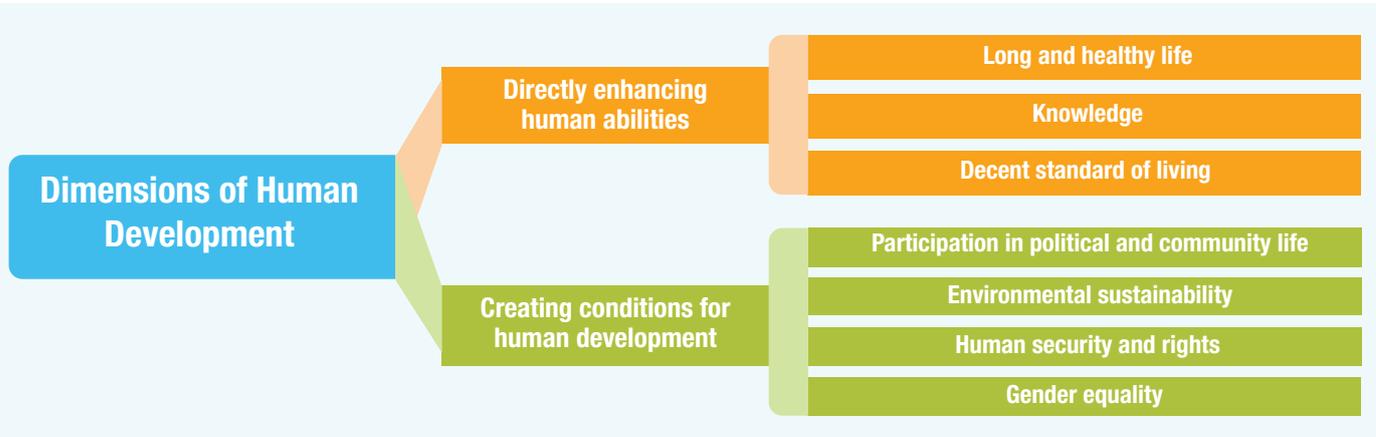
change and variability to the country's development agenda. The country developed and launched its National Climate Change Response Strategy in 2015, completed the development of its Climate Policy, and is in the process of developing a National Adaptation Plan.

Zimbabwe also reconfigured its Ministry responsible for Environment in 2013 to reflect the importance of climate by creating a Ministry of Environment, Water and Climate, with a Department of Climate Change Management. The body of information in this report will cover climate change impacts, the vulnerabilities and risks faced by Zimbabwe in relation to the shocks and stresses presented by climate change, and the implications of these for human development. Current adaptation and mitigation efforts will be reviewed and future actions suggested that could contribute towards Zimbabwe's objective of creating a climate change resilient nation (Government of Zimbabwe, 2015).

This Chapter presents the human development and climate change contexts, the backdrop against which the rest of the Report will analyse the main components of human development and the impacts of climate change upon them. It will present the state and trends of various human development indices including the CCVI, as well as the trends and changes in the components of climate that have the greatest impacts on sustainable human development. The chapter concludes by showing the linkages between climate change and human development.

Figure 2.1 The world through a human development lens

Source: hdr.undp.org/en/content/what-human-development



The State of Human Development in Zimbabwe

Human development is an approach that is focussed on people and considers their opportunities and wellbeing. It is about expanding the richness of human life, rather than just the richness of the economy in which human beings live (UNDP, 2015a). It encompasses both dimensions that directly enhance human abilities and those that create the conditions for human development (Figure 2.1) (hdr.undp.org/en/content/what-human-development). The first group of dimensions are those that directly enhance human abilities – to lead long and healthy lives, be knowledgeable, and have a decent standard of living. They seem to be greater determinants of overall wellbeing than the second group, which comprises political freedom and participation in community life, human security and rights, gender equality and environmental sustainability (Figure 2.1).

Human Development encompasses and is measured using indices that include the Human Development Index (HDI); Inequality-adjusted Human Development Index (IHDI); Gender Development Index (GDI); Gender Inequality Index (GII); Multidimensional Poverty Index (MPI); Environmental Performance Index (EPI); and the Climate Change Vulnerability Index (CCVI).

The Human Development Index (HDI)

The human development index (HDI) is a summary indicator of human development and a composite measure of the three dimensions of

human development, that is:

1. living a long and healthy life, measured by life expectancy;
2. being educated, measured by the mean years and expected years of schooling; and
3. having a decent standard of living, measured by income per capita.

The HDI ranges from 0 to 1, and enables countries to track their progress in health, education and incomes, whilst ranking them in tiers of development (UNDP, 2016c). Mathematically, a higher HDI points to a longer lifespan, higher level of education and a higher Gross Domestic Product (GDP) per capita. It can be disaggregated by province, rural-urban divide, socioeconomic grouping or time series.

Zimbabwe's HDI improved from 0.427 in 2000, to 0.522 in 2015, despite the decline in the country's economic performance (Table 2.1). The HDI value of 0.522 for the year 2015 was computed using the Zimbabwe National Statistics Agency (ZIMSTAT) life expectancy at birth of 60.7 years, which is slightly higher than the UNDP (2016c) figure of 59.2 years. The UNDP figure yields an HDI of 0.516 (for calculation see Annex 1). The rest of the figures for years 2000 to 2014 were adopted from the 2016 Human Development Report.

The HDI trend declined in 2005 but generally showed an increase throughout the 2000 to

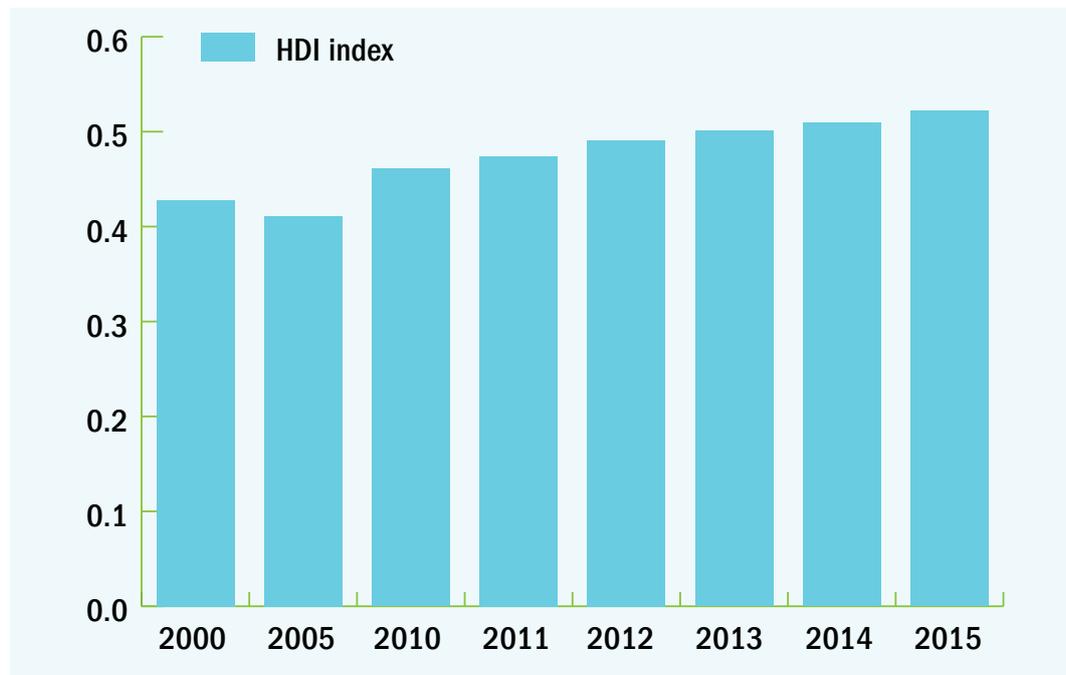
Table 2.1 Zimbabwe HDI trends, 2000 to 2015

Source: UNDP, (2016c) with 2015 figures calculated using the ZIMSTAT, life expectancy at birth value

Year	Life expectancy at birth	Expected years of schooling	Mean years of schooling	GNI per capita (2011, PPP USD)	HDI value
2000	41.7	9.8	6.5	2 375	0.427
2005	41.8	9.5	6.8	1 574	0.408
2010	49.6	10.1	7.3	1 302	0.452
2011	51.6	9.8	7.3	1 398	0.464
2012	53.7	10.4	7.7	1 513	0.488
2013	55.7	10.3	7.7	1 546	0.498
2014	57.5	10.3	7.7	1 565	0.507
2015	60.7	10.3	7.7	1 588	0.522

Figure 2.2 Zimbabwe HDI trends, 2000 to 2015

Source: UNDP, (2016c) with 2015 value used calculated using the ZIMSTAT life expectancy at birth value



2015 period (Table 2.1), (Figure 2.2). The improvement in HDI was a result of corresponding increases in life expectancy at birth, from 41.7 to 60.7 over the same period as well as in mean of years of schooling which have been above 7 years since 2010. The Gross National Income (GNI) per capita (PPP USD) decreased from 2 375 in 2000 to 1 588 by 2015 (UNDP 2016c).

The HDI values for Zimbabwe’s provinces for 2015 are shown in Table 2.2 (above). The highest HDI was found in the two mostly urban provinces, Harare (0.557) and Bulawayo (0.540),

followed by Mashonaland West (0.514) and Midlands (0.500). Mashonaland Central had the lowest HDI value (0.477), followed by Masvingo and Manicaland provinces, both with HDI values of 0.480.

Urban areas had an average HDI value of 0.516, well above that of rural areas at 0.441 (Table 2.3). Life expectancy and the income index showed a similar trend. However, the education index gap between rural (0.501) and urban (0.550) areas was very small.

Table 2.2 Zimbabwe's estimated HDI by province, 2015

Data used to compute the Zimbabwe's Estimated HDI by Province 2015 in the Table are from ZIMSTAT (2013) Poverty, Income, Consumption and Expenditure Survey 2011/2012 (PICES)) and from ZIMSTAT (2015e) Mortality Thematic Report, Census 2012

Province	Life Expectancy	Life Expectancy Index	GNI per Capita (2011 PPP USD)	Income Index	HDI Value
Bulawayo	58.0	0.583	2,673	0.496	0.540
Harare	61.5	0.637	2,697	0.498	0.557
Matabeleland South	53.6	0.515	1,627	0.421	0.490
Matabeleland North	58.7	0.593	1,189	0.374	0.494
Midlands	59.8	0.610	1,207	0.376	0.500
Mashonaland East	57.4	0.573	1,096	0.362	0.483
Mashonaland West	57.7	0.579	1,735	0.431	0.514
Manicaland	60.2	0.617	883	0.329	0.480
Masvingo	58.2	0.586	999	0.348	0.480
Mashonaland Central	57.2	0.571	1,014	0.350	0.477
Zimbabwe	60.7	0.626	1,588	0.418	0.522

Assumption: Mean Years of Schooling (7.7 years) and Expected Years of Schooling (10.3 years) are assumed to be uniform throughout the 10 provinces, yielding an education index of 0.544. The provincial per capita income figures were estimated proportionately using the respective average annual incomes from the PICES Report (Annex 2); and assuming a 2015 GNI per capita (PPP) figure of USD1 588 (UNDP (2016c)).

Table 2.3 Zimbabwe's HDI by urban and rural areas, 2012 to 2015

Source: ZIMSTAT and ICF International (2016)

	Life Expectancy Index	Education Index	Income Index	HDI value
Zimbabwe urban	0.530	0.550	0.4713	0.516
Zimbabwe rural	0.490	0.501	0.3500	0.441

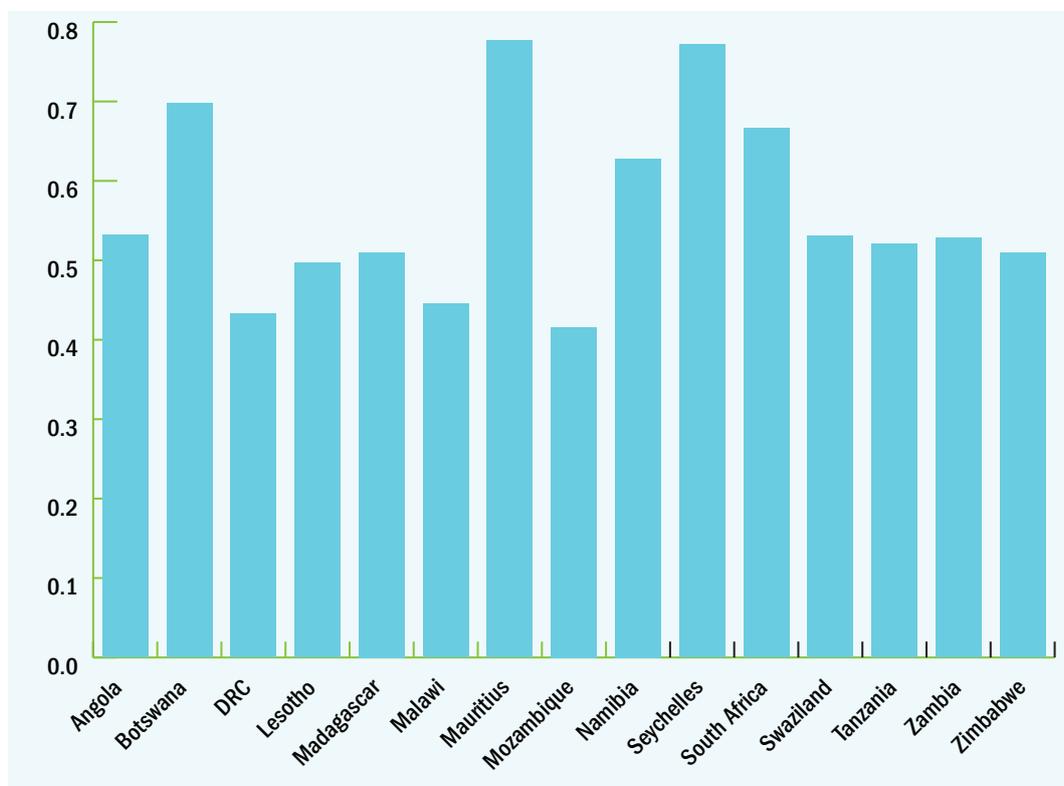
Table 2.4 Zimbabwe's HDI relative to other SADC countries, 2015

Source: SADC database 2015

Country	HDI value	HDI rank	HDI growth (per cent) 2010-2014	GNI (PPP\$)	Life expectancy at birth
Angola	0.532	149	1.11	6 822	52.3
Botswana	0.698	106	0.61	16 646	64.5
DRC	0.433	176	1.52	680	58.7
Lesotho	0.497	161	1.30	3 306	49.8
Madagascar	0.510	154	0.27	1 328	65.1
Malawi	0.445	173	1.49	747	62.8
Mauritius	0.777	63	0.68	17 470	74.4
Mozambique	0.416	180	0.94	1123	55.1
Namibia	0.628	126	0.70	9 418	64.8
Seychelles	0.772	64	0.97	23 300	73.1
South Africa	0.666	116	0.87	12 122	57.4
Swaziland	0.531	150	0.28	5 542	49.0
Tanzania	0.521	151	1.05	2 411	65.0
Zambia	0.586	139	1.36	3 734	60.1
Zimbabwe	0.522	155	2.50	1 615	60.7

Figure 2.3 Comparison of SADC member states' HDIs with that of Zimbabwe for the period 2010 to 2014

Source: SADC database (2015)



The 2015 Zimbabwe HDI of 0.522 is above the average for countries in the low human development group of 0.497, but slightly below the average level for countries in Sub-Saharan Africa (0.523) (UNDP 2016c). Although Zimbabwe's HDI was lower than that of all the other SADC member states (Figure 2.3), it did experience the highest HDI growth (2.5 percent) in the region in 2014 (Table 2.4).

The Inequality-adjusted Human Development Index (IHDI)

The Inequality-adjusted Human Development Index (IHDI), first introduced in 2010, adjusts the HDI for inequalities in the distribution of each dimension of human development – health, education and income – across the population. The IHDI lowers each dimension's average value according to the level of inequality within that dimension, thus it is basically the HDI discounted for inequalities. Under perfect equality IHDI equals HDI the IHDI but falls below when inequality increases.

To compute the IHDI, the distributions of the

three dimensions that define HDI are observed over different units, with life expectancy assumed to follow a model life table, while education and income variables are distributed across individuals. Climate change has differential impacts upon men, women and children as well as other human sub-groups, hence the relevance of the IHDI for this report.

A comparison of the HDI and IHDI values for Zimbabwe and other SADC member states for 2015 is shown in Table 2.5. Zimbabwe's overall loss (27 percent) in HDI after adjusting for inequality is less than that of other SADC countries, with the exception of Mauritius (14.2 percent). This means that Zimbabwe is performing relatively well in terms bridging the existing inequality gaps in health, education and standard of living.

The Gender Development Index (GDI)

The Gender Development Index was first introduced in 2014 and is based on the sex disaggregated HDI, and is the ratio of HDI female to HDI male. It measures the gender inequali-

Table 2.5 Zimbabwe's HDI and IHDI relative to other SADC countries, 2014

Source: SADC Database 2015

Country	HDI value	IHDI value	Overall loss (percent)
Angola	0.532	0.335	37.0
Botswana	0.698	0.431	38.2
DRC	0.433	0.276	36.2
Lesotho	0.497	0.320	35.6
Madagascar	0.510	0.372	27.0
Malawi	0.445	0.299	32.9
Mauritius	0.777	0.666	14.2
Mozambique	0.416	0.273	34.3
Namibia	0.628	0.354	43.6
South Africa	0.666	0.428	35.7
Swaziland	0.531	0.354	33.3
Tanzania	0.521	0.379	27.3
Zambia	0.586	0.384	34.4
Zimbabwe	0.522	0.371	27.0
Angola	0.532	0.335	37.0

ties in achievements in the three dimensions of health, education and command over economic resources, measured by female and male estimated earned income.

The 2015 Zimbabwe GDI of 0.925 reported in the UNDP 2016 Human Development Report (see Annex 3 for computation) was well above the Sub-Saharan average of 0.877, and that of Kenya (0.919), but lower than that for Lesotho (0.962) (Table 2.6). Internationally a low GDI is pegged at 0.849 which is below Zimbabwe's GDI (UNDP, 2016c) (see Annex 4).

Table 2.7 presents the GDI for selected SADC countries for 2013 and 2014; and shows that, in 2014, Zimbabwe had a GDI rank similar to that of Zambia and higher than those of DRC and Mozambique.

Figure 2.4 gives a comparison of Zimbabwe's GDI with that of selected SADC member states, showing that Zimbabwe's GDI was comparable to those of Zambia, Tanzania and Malawi in 2014.

The Gender Inequality Index (GII)

The Gender Inequality Index (GII) reflects gender based inequalities in three dimensions – reproductive health, empowerment and economic activity. Reproductive health is measured according to the maternal mortality ratio (MMR)

Table 2.6 Zimbabwe's GDI relative to Lesotho, Kenya and Sub-Saharan Africa

Source: UNDP, (2016c)

Zimbabwe	Lesotho	Kenya	Sub-Saharan Africa	Low GDI
0.925	0.962	0.919	0.877	0.849

Table 2.7 GDI for selected SADC countries, 2013 and 2014

Source: SADC database (2015)

Country	2013	2014
Zimbabwe	0.909	*0.925
Botswana	0.964	0.982
DRC	0.822	0.833
Malawi	0.891	0.907
Mozambique	0.879	0.881
Namibia	0.978	0.981
Zambia	0.913	0.917
Tanzania	0.916	0.913

* Based on computation (see Annex 3)

and adolescent birth rate (ABR). Empowerment is measured as the share of seats in Parliament held by women (ESP), and the attainment of at least secondary education by each gender (SecF, SecM), Economic activity is measured by the labour market participation rate for women and men (LprF, LprM).

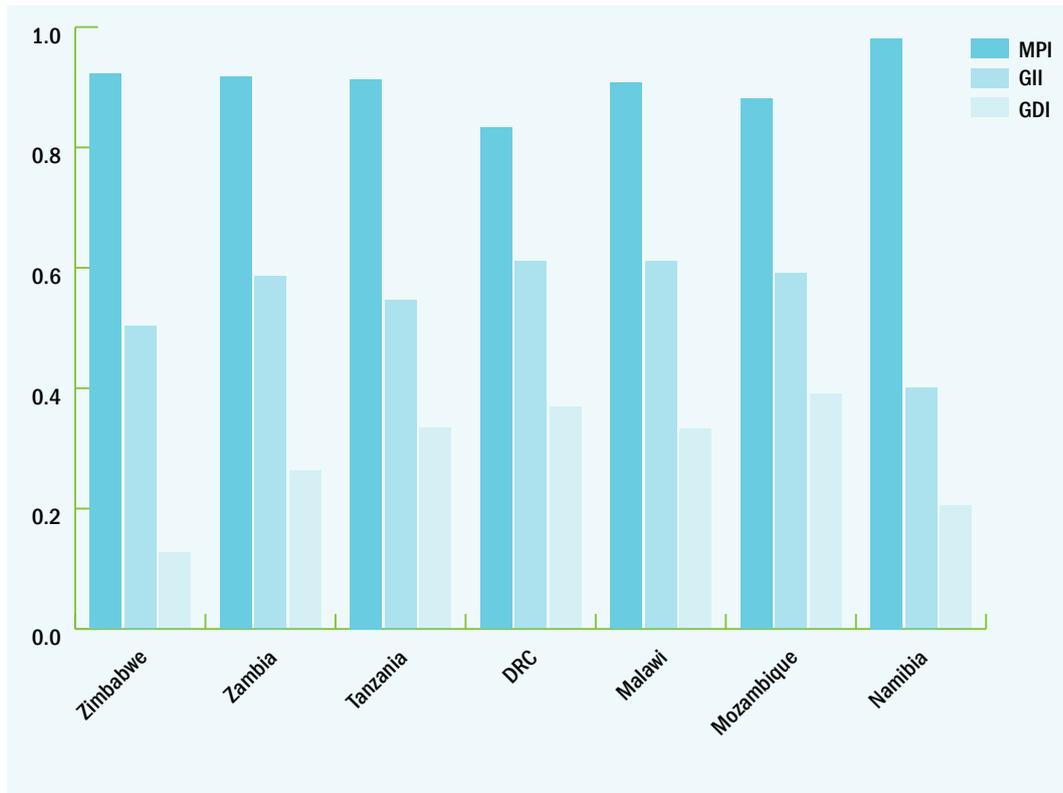
Table 2.8 Zimbabwe's GII profile, 2014

Source: UNDP (2016c) and SADC database (2015)

GII	Rank	MMR	ABR	FSP	SecF	SecM	LprF	LprM
0.540	126	470	60.3	35.1	48.7	62.0	83.2	89.7

Figure 2.4 GDI, GII and MPI for selected SADC countries, 2014

Source: SADC database (2015)



The GII reflects the loss in human development due to inequality between male and female achievements in the above mentioned dimensions. It reveals the extent to which national achievements are eroded by gender inequality. The higher the GII value, the more disparities there are between females and males, pointing to low progression of females across developmental levels.

In 2015 Zimbabwe's GII index value was 0.540 (Table 2.8) and the country was ranked 126 out of 159 countries (UNDP, 2016c). Table 2.8 shows that 48.7 of eligible females compared to 62.0 of eligible males attained at least secondary education in 2014.

Figure 2.5 shows women in Zimbabwe's Nation-

al Parliament and Senate for the period 2010 to 2015. There were 32 women (15 percent) in Parliament for the 2008 to mid-2013 term and the number increased to 85 women (32 percent) after the 2013 elections with an additional woman added to make the number 86 after a by-election in 2014. The number of women in Senate increased from 24 (24 percent) in the 2008 to 2013 term of office to 38 (38 percent) after the 2013 elections.

The increased number of women in political positions has been a result of the introduction of a new Constitution for Zimbabwe in 2013 (Government of Zimbabwe, 2013) which guided the elections and setting up of Government for the 2013 elections. According to Chapter 6, Part 4, Section 124 of the Constitution:

(1) *The National Assembly consists of -*

(a) *Two hundred and ten (210) members elected by secret ballot from the two hundred and ten constituencies into which Zimbabwe is divided; and*

(b) *For the life of the first two Parliaments after the effective date, an additional sixty women (60) members, six (6) from each of the provinces into which Zimbabwe is divided, elected under a party-list system of proportional representation based on the votes cast for candidates representing political parties in a general election for constituency members in the provinces.*

Figure 2.5 Women in Zimbabwe's National Parliament and Senate, 2010 to 2015

Source: SADC database (2016)

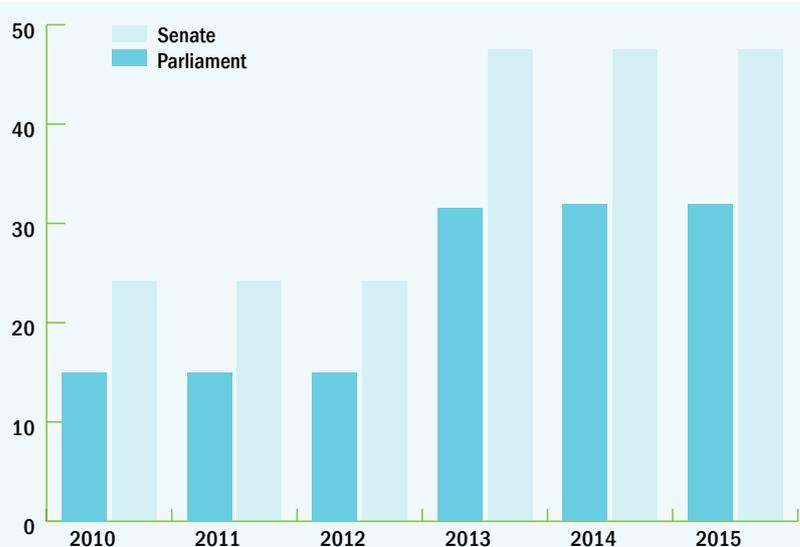


Figure 2.6 Proportion of women in ministerial positions, 2010 to 2015

Source: SADC database (2015)



Regarding the Senate, Chapter 6, Part 3, Section 120 of the Constitution of Zimbabwe on the composition of Senate states that:

(1) *the Senate consists of 80 Senators of whom -*

(a) *Six (6) are elected from each of the provinces into which Zimbabwe is divided by a system of proportional representation conforming with Subsection (2);*

(b) *Sixteen (16) are Chiefs of whom two (2) are elected by the provincial assembly of Chiefs from each of the provinces other than the metropolitan provinces into which Zimbabwe is divided;*

(c) *The President and Deputy President of the National Council of Chiefs; and*

(d) *Two (2) are elected in the manner prescribed in the electoral law to represent persons with disabilities.*

(2) *Elections of Senators must be conducted in accordance with the Electoral Law, which must ensure that the Senators referred to in subsection (1) (a) are elected under a party-list system of proportional representation -*

(a) *which is based on the votes cast for candidates representing political parties in each of the provinces in the general election for Members of the National Assembly; and*

(b) *In which male and female candidates are listed alternately, every list being headed by a female candidate”.*

Figure 2.6 shows the proportion of women in ministerial positions between 2010 and 2015. Women ministers held 19 percent of positions in 2010 but this fell to 16 percent during 2011 to 2013, before increasing to 22 percent for the years 2014 and 2015. The ideal is to have 50:50 representation but Zimbabwe is a long way from

Table 2.9 GII for selected SADC countries, 2011 to 2014

Source: SADC Database (2015)

	2011	2012	2013	2014
Zimbabwe	0.583	0.544	0.516	0.540
Botswana	0.507	0.485	0.486	0.480
DRC	0.710	0.681	0.669	0.673
Malawi	0.594	0.573	0.591	0.611
Mauritius	0.353	0.377	0.375	0.419
Mozambique	0.602	0.582	0.657	0.591
Namibia	0.466	0.455	0.450	0.401
South Africa	0.490	0.462	0.461	0.407
Tanzania	0.590	0.556	0.553	0.547
Zambia	0.627	0.623	0.617	0.587

achieving this.

Having more women in powerful positions of government opens opportunities for women to participate in wide ranging decisions that affect communities, including policies and strategies for mitigation of and adaptation to climate change in all sectors. Women in these positions could help mainstream gender in all actions, including those related to adaptation and building resilience of vulnerable communities to climate change. So far there have not been studies on whether the increase of women in political positions since 2013 has had any positive impacts on the majority of Zimbabwean women.

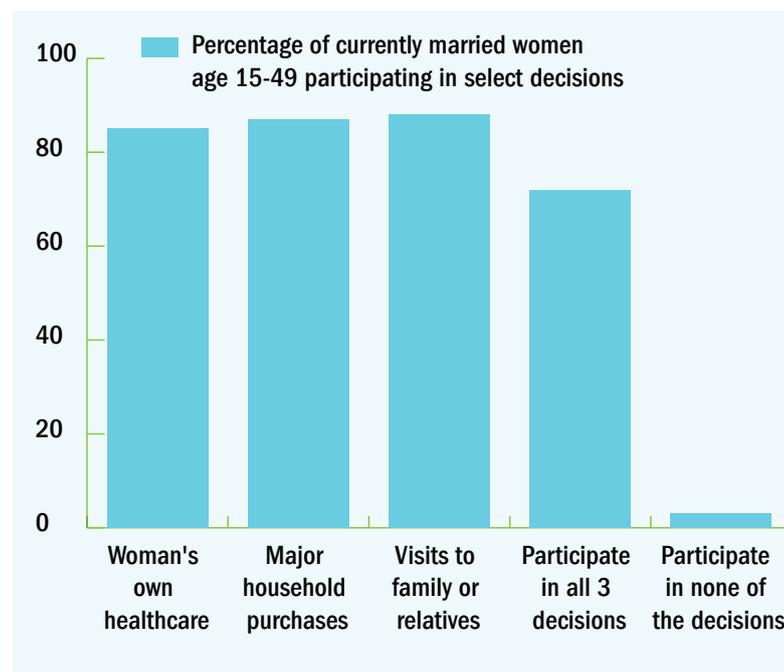
At a lower level, Figure 2.7 shows the participation of married women aged 15 to 49 years in day to day decisions at household level. Women seem to participate in at least 70 percent of all the three areas of decision making. This is a positive trend and should be encouraged in other spheres.

Zimbabwe’s GII for 2015 (0.540) was lower than the average Sub-Saharan Africa value (0.572) and that for Kenya (0.565) (See Annex 5). A similar comparison with selected SADC countries in 2014 (Figure 2.4, Section 2.2.3) shows Zimbabwe’s GII value was lower than those of Zambia, Tanzania, DRC, Malawi and Mozambique, and higher than Namibia’s (SADC database, 2015).

Table 2.9 also shows the comparison of GII trends among ten SADC countries that include Zimbabwe for the years 2011 to 2014. The rank-

Figure 2.7 Proportion of currently married women aged 15-49 years participating in select decisions

Source: ZIMSTAT and ICF International (2016)



ing observed in 2014 was consistent throughout the review period. Generally, Zimbabwe’s GII improved slightly each year for the period 2011 to 2013 but this was reversed in 2014.

The Multidimensional Poverty Index (MPI)

The Multidimensional Poverty Index (MPI) is a measure of acute poverty, which captures severe deprivations in health (child mortality, nutrition); education (years of schooling, school at-

Table 2.10 Zimbabwe's MPI by province and region, 2015

Source: ZIMSTAT and ICF International (2016); OPHI (2016)

	H (Incidence) percent	A (Intensity) percent	MPI H x A
Bulawayo	2.7	43.8	0.012
Harare	6.1	39.5	0.024
Mashonaland East	22.2	40.8	0.090
Manicaland	29.5	43.3	0.128
Mashonaland West	31.7	42.1	0.133
Midlands	33.1	43.7	0.145
Matabeleland South	34.8	43.2	0.151
Masvingo	40.4	43.4	0.175
Mashonaland Central	41.2	43.8	0.181
Matabeleland North	48.5	41.6	0.202
Urban	4.8	39.9	0.019
Rural	39.2	42.8	0.168
Zimbabwe	29.7	42.7	0.127

tendance); and living standards (drinking water, sanitation, electricity, floor, cooking fuel, assets). The MPI creates a comprehensive picture of people living in poverty and enables comparisons across and within countries, by location or at community levels. It complements monetary measures of poverty and captures overlapping deprivations suffered by individuals at the same time. This differentiates it from acute or extreme money metric poverty measures.

The MPI is computed from the above mentioned ten indicators which are weighted to create a deprivation score that is counted for each household in the survey. A person is multi-dimensionally poor if they are deprived in at least one third of the weighted indicators. Thus, a deprivation score of 33.3 percent distinguishes the poor and the non-poor. According to the UNDP 2016 Briefing Note, the percentage dimension contribution to overall poverty of deprivations is as follows: health (34.5 percent), education (10.8 percent), living standards (54.7 percent) (UNDP, 2016c).

The proportion of the population that is multi-dimensionally poor is the incidence of poverty, or headcount ratio (H). The average proportion of indicators in which poor people are deprived is described as the intensity of their poverty (A). The MPI is the product of the incidence of poverty and the average intensity of poverty across the poor population. Thus, MPI

reflects both the share of people in poverty and the degree to which they are deprived.

If a person is deprived in 20 to 33.3 percent of the weighted indicators, they are 'vulnerable to poverty', while with 50 percent or more they are deemed to be in 'severe poverty'. Those categorised as 'destitute' persons are deprived in one third or more of specified extreme indicators ([Oxford Poverty and Human Development Initiative (OPHI), 2016). Examples of such extreme indicators are, two or more children in the household have died, no one in the household has at least one year of schooling, and the household practices open defecation. As the MPI is a measure of persons who are multi-dimensionally poor, the higher the MPI index the greater the incidence and intensity of poverty.

The MPI indices adopted in the text follow the methodology of the Oxford Poverty and Human Development Initiative (OPHI) Country Briefing (2016). The overall MPI for Zimbabwe was 0.127 in 2015 (ZIMSTAT and ICF International, 2016; OPHI, 2016). The UNDP (2016c) presents a similar overall MPI of 0.128. The Demographic Health Survey of 2015 found that 28.9 percent of Zimbabwe's population was MPI poor while 29.3 percent lived in near to this poverty level (ZIMSTAT and ICF International, 2016).

Table 2.10 presents the 2016 Zimbabwe MPI data by province. The MPI was higher in rural

Table 2.11 MPI deprivation of selected SADC countries, 2015

Source: SADC Database 2015

Country	Head count (per cent) (H)	Intensity of deprivation (A)	MPI=H*A	HDI rank
Zimbabwe	28.9	44.1	0.127	155
Zambia	54.4	48.6	0.264	139
Tanzania	66.4	54.4	0.335	151
Lesotho	49.5	45.9	0.227	161
DRC	72.5	50.8	0.369	176
Malawi	66.7	49.8	0.332	173
Mozambique	70.2	55.6	0.390	180
Namibia	44.9	45.5	0.205	126
South Africa	10.3	39.6	0.041	116

areas (0.168) than in urban areas (0.019) with the mostly urban provinces, Harare (0.024) and Bulawayo (0.012), having low values. Predominantly rural provinces had higher MPI values, with Matabeleland North exhibiting the highest value (0.202) followed by Mashonaland Central (0.181) and Masvingo (0.175). Of the rural provinces, Mashonaland East (0.090) had the lowest MPI value (OPHI, 2016; ZIMSTAT and ICF International, 2016). The incidence of poverty was highest in Matabeleland North (48.5 per cent), followed by Mashonaland Central (41.2 per cent) and Masvingo (40.4 per cent) provinces, and was least in Bulawayo (2.7); while the intensity was highest in Mashonaland Central (43.8), Bulawayo (43.8) and Midlands (43.7) (see also Annex 6).

Most of the provinces were vulnerable to poverty, with Masvingo, followed by Matabeleland North and Matabeleland South being the most vulnerable (Figure 2.8). Matabeleland North, Mashonaland Central and Masvingo had a higher percentage of people in severe poverty (OPHI, 2016).

Further interrogation of the OPHI Country Briefing 2016 (Annex 6) reveals portions of the population which are classified as in severe poverty and destitute. The following provinces are in the ‘severe poverty’ category: Mashonaland Central (12.9 per cent), Matabeleland North (12.0 per cent), Midlands (10.2 per cent) and Matabeleland South (10.1 per cent). Matabeleland North (12.8 per cent) had the highest population in the ‘destitute’ category, followed by Matabeleland South and Midlands (both at 10.9 per cent) (Annex 6).

Poverty renders populations more vulnerable to shocks and stresses caused by climate change, as it makes them less capable to cope and adapt. Indices such as the MPI are important for targeting relief programming as they portray both the incidence and intensity of poverty, which can be determined at the national and decentralised levels.

Table 2.11 compares Zimbabwe’s MPI with those of selected SADC member states and shows that, in 2015, its MPI of 0.127 was lower than most SADC countries except South Africa, with 0.041. Hence, all the other selected SADC member states are multi-dimensionally poorer than Zimbabwe.

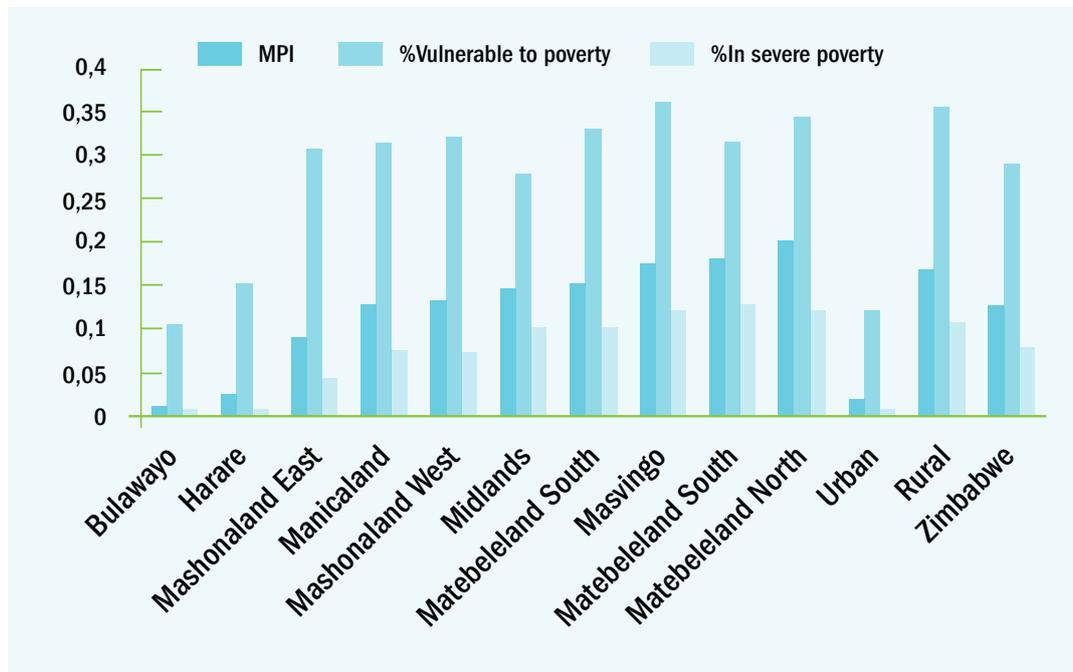
The Environmental Performance Index (EPI)

Since the Earth Summit, environmental sustainability has been a major component of sustainable development. The Rio Declaration on Environment and Development included that the “right to development must be fulfilled so as to equitably meet developmental and environmental needs of present and future generations”. Also, “in order to achieve sustainable development, environmental protection shall constitute an integral part of the development process and cannot be considered in isolation from it”. Hence the need to incorporate environmental indices such as the Environmental Performance Index (EPI) when assessing Human Development.

The Environmental Performance Index (EPI) quantifies and numerically marks the environmental performance of a country’s policies in relation to the protection of ecosystems and human health. It was first published in 2002, and

Figure 2.8 Multidimensional poverty across Zimbabwe's regions, 2015

Source: ZIMSTAT and ICF International (2016) OPHI (2016)



designed to supplement the environmental targets of the Millennium Development Goals on Environment. It uses outcome oriented indicators as a benchmark index that can be used easily by policy makers, environmental scientists and the public.

The EPI aggregates twenty indicators, nineteen of which are easily computed for eligible countries, namely: 1) environmental risk exposure; 2) household air quality; 3) air pollution – average exposure to PM2.5; 4) air pollution – PM2.5 exceedance; 5) air pollution – average exposure to NO2; 6) unsafe sanitation; 7) drinking water quality; 8) wastewater treatment; 9) nitrogen use efficiency; 10) nitrogen balance; 11) change in forest cover; 12) fish stocks; 13) terrestrial protected areas (national biome weights); 14) terrestrial protected areas (global biome weights); 15) marine protected areas; 16) species protection (national); 17) species protection (global); 18) trend in carbon intensity; and 19) trend in CO2 emissions per kwh. The indicators are classified in the following categories: health impacts, air quality, water and sanitation, water resources, agriculture, forests, fisheries, biodiversity and habitat, climate and energy.

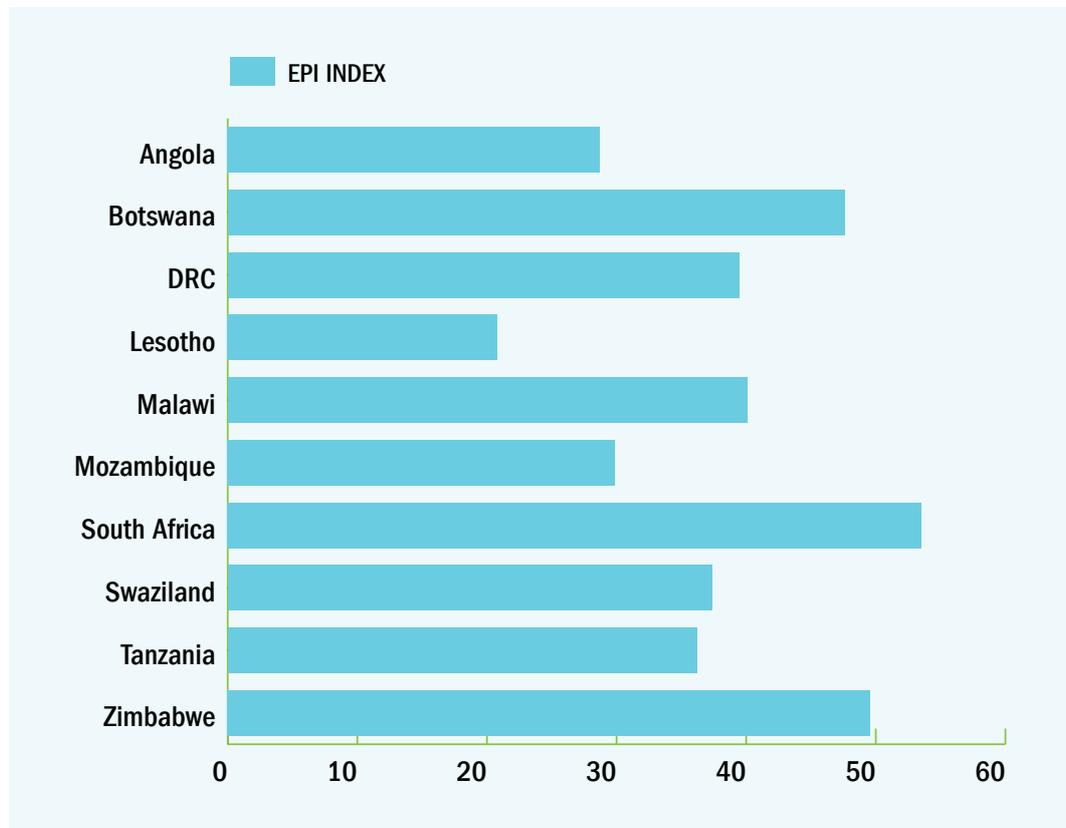
In 2016, the EPI for Zimbabwe was midway at 49.55 (maximum score 100), indicating that there is room for improvement on the index particularly in a changing climate. The Zimbabwe EPI was second only to South Africa among ten selected SADC countries (Figure 2.9) (Also see Annex 7).

The Zimbabwe Climate Change Context

Climate change is the largest threat facing mankind today. Zimbabwe is susceptible to an array of changes in temperature and precipitation with extreme events such as droughts, heatwaves, heavy rains accompanied by flash floods, strong winds and hailstorms becoming common. Climate is the average state of atmospheric conditions at a particular location, expressed through weather elements such as air temperature, precipitation, wind and types of cloud. It is expected to change over time, either naturally, as integral parts of how global and regional climate systems function or in response to additional influences caused by human activity (Government of Zimbabwe, 2015). There is increasing scientific evidence that present day climate change is being caused by human interference with the functioning of the atmosphere (IPCC, 2007a, 2014).

Figure 2.9 Environmental Performance Index (EPI) for ten SADC countries

Source: Hsu et.al. (2016)



There is also agreement among research scientists that the 'greenhouse effect' is making some contribution to global warming. This is a result of the increase in greenhouse gases produced by human activity since the beginning of the Industrial Revolution, a process that continues today with an ever increasing atmospheric concentration of these gases (IPCC, 2007b). Major adverse impacts of climate change include: declining water resources causing water shortages, reduced agricultural productivity contributing to hunger, spread of vector-borne diseases such as malaria to new areas, changes in populations and distribution of biodiversity, and turbulent weather and climatic disasters.

Evidence of climate change and variability in Zimbabwe

Changes in temperature

Zimbabwe is experiencing hotter days generally as well as fewer cold days than previously

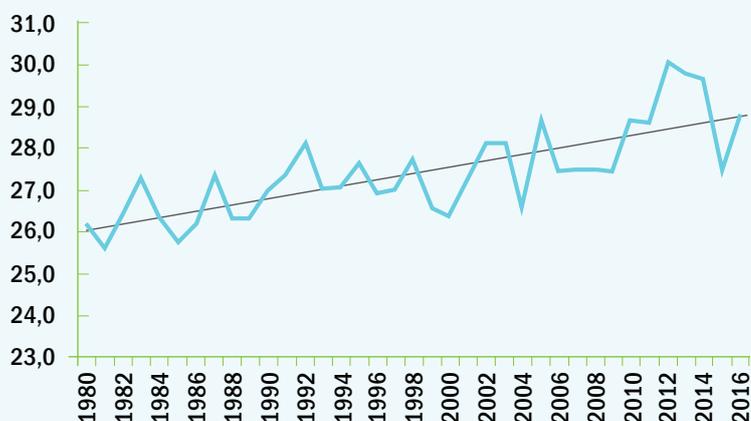
as a result of climate change and variability. The period since 1980 has been the warmest since Zimbabwe started recording its temperature and there is a general increasing trend in the national mean annual maximum temperature (Figure 2.10). Warming between 1901 and 2012 has been about 0.9oC for maximum temperature, with much of the warming taking place after 1980 (Unganai et.al., Atmosphere Chapter, in Zimbabwe Environment Outlook 2, in press).

However, the maximum temperatures have varied between different locations (Figure 2.11), with temperatures being higher in the lowveldt (Beitbridge and Victoria Falls), and lower in the highveldt (Chipinge) but generally showing an increase at all altitudes since 1980. Such variations influence the types of livelihoods that can be engaged in, in the different localities.

There was not much change in the national mean minimum temperatures, which hovered around 14oC from 1980 to 2001, then there was

Figure 2.10 Zimbabwe's national mean annual maximum temperature (OC), 1980 to 2016

Source: Meteorological Services Department



a significant drop from about 140C to 80C between 2004 and 2008 (Figure 2.12). The minimum temperature then increased to over 140C during the period 2009 to 2010 and was above 140C from 2010 to 2016. Such drops in mean minimum temperature have a huge impact on agricultural livelihoods, especially horticulture.

Changes in precipitation

The past 30 years have shown variation in seasonal rainfall but with smaller deviations from the rainfall average since 2001. There has been an overall decline of nearly 5 percent in rainfall across Zimbabwe during the past century (Government of Zimbabwe, 2015). Figure 2.13 depicts the trends for Zimbabwe's average seasonal rainfall from 1981 to 2015, showing variation of rainfall. Some years fall above and others below the average but there is greater frequency of below normal average rainfall and only moderate increases in those years above the average.

There has also been temporal and spatial rainfall variation in mean rainfall received. Figure 2.14 shows that rainfall was below the mean for the years 2001/02, 2002/03, 2004/05, 2006/07, 2011/12 and 2012/13, with the largest rainfall deficit being in the 2015/16 season.

Figures 2.13 and 2.14 show that the recent 2015/16 drought almost matched the 1991/92 drought with an average seasonal rainfall around 400 mm. This had impacts upon food

security and nutrition, provision of water, sanitation and hygiene, and other factors. About 2.8 million people were deemed food insecure, thus affecting human development (ZIMVAC, 2016) (see also Chapter 4).

From Figure 2.15, it can be seen that, although there has been a general decline in rainfall received over the years, this decline has not been uniform throughout the country. The decline has been less defined in the north-eastern parts of the country and most marked in the south and south-eastern districts as well as the Zambezi Valley.

Rainfall distribution information is important as it can be used to determine, for example, the most appropriate crops to grow and livelihoods to undertake in the different regions of the country. In Zimbabwe, rainfall distribution is erratic both in space and time across all the provinces, as shown for the 2015/16 rainfall season in Figure 2.16. It is against such a climatic background that the human development aspects will be assessed in Chapters 3 to 6.

The timing and amounts of rainfall received in Zimbabwe are becoming increasingly uncertain and affect the farming calendar. The rainy season generally starts in October or early November and ends in April to early May. Figure 2.17 presents the onset of the 2012/13 season in different areas, showing that some parts of the country did not receive rain until as late as 18 December. This has a huge impact on the length of the cropping season (for more details see Chapter 4).

The Government of Zimbabwe, led by the Ministry of Agriculture, Mechanisation and Irrigation Development, and with technical and financial support from the United Nations Development Programme, European Union and UK's Department for International Development, has embarked upon a resilience building programme to ensure that recurrent shocks and hazards do not undermine the progress being made to improve the overall wellbeing of Zimbabweans (UNDP, 2016e). As a first step towards designing resilience programming, a joint analysis was conducted to establish the shocks and stresses affecting vulnerable communities, including characterisation and mapping of key hazards. It was anticipated that a thorough understand-

Figure 2.11 Maximum temperatures for locations in Zimbabwe for the decades 1956/1965 to 2001/2010

Source: Meteorological Services Department

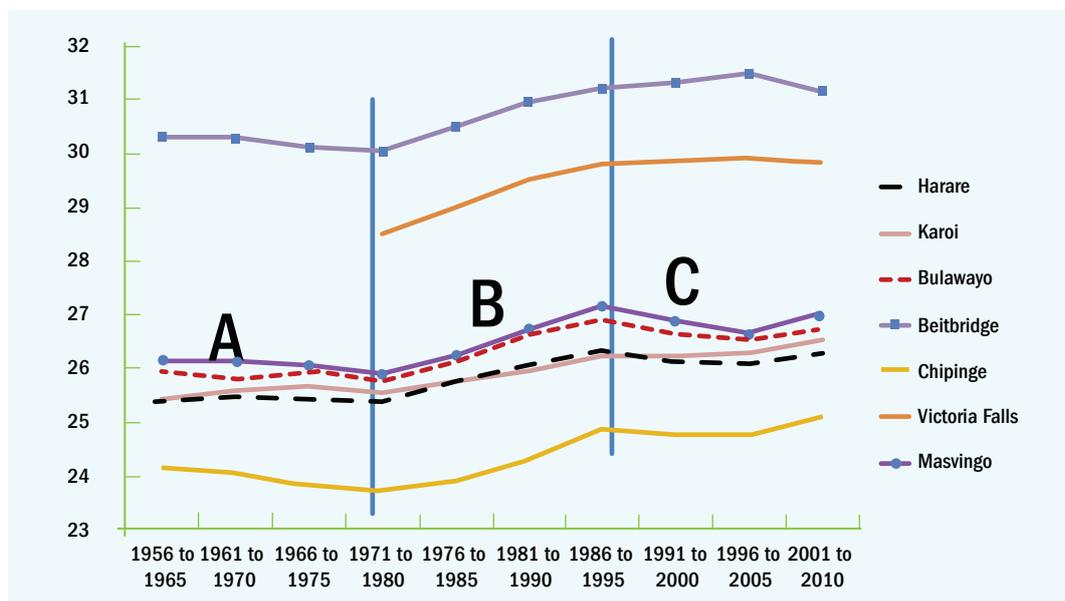


Figure 2.12 Zimbabwe national mean annual minimum temperature (°C), 1980 to 2016

Source: Meteorological Services Department



ing of these shocks would assist in the design of specific resilience building strategies to protect human development (UNDP, 2016e).

Drought is one of the natural disasters that occurs most frequently in Zimbabwe. Given the country’s heavy reliance on rain-fed agriculture and livestock, drought has serious implications on rural livelihoods and the country’s food security (See Chapters 3 and 4) and other aspects of human development and sustainable development. Drought also has impacts on water

availability for domestic and industrial use and power generation, affecting cities and non-agriculture sectors (UNDP, 2016e). Results of the hazard mapping process show that drought is a recurrent feature of climate change that occurs in virtually all climate zones of Zimbabwe, from wet to very dry (Figure 2.18, above), but is more severe in the western and southern parts of the country.

Mid-season dry spells are defined as prolonged periods of dry weather of at least ten consec-

utive days that happen after the onset of the wet season (UNDP, 2016e). The frequency and length of dry spells during the rainy season have increased, while the frequency of rainy days has been reducing. Mid-season dry spells affect crops, especially maize, the main staple cereal in Zimbabwe and in some seasons, such as 2015/16, most crops in many regions of the country were a write off because of their occurrence.

The Ministry of Agriculture Mechanisation and Irrigation Development, with technical support

from UNDP, mapped the mid-season dry spells in Zimbabwe for the season 2014/15, shown in Figure 2.19. The Figure shows that generally the same areas with severe droughts experienced medium high to high frequency of mid-season dry spells, making crop production barely viable, with livestock and wildlife ranching proving better livelihood options (for more details see Chapters 3 and 4).

Another shock that occurs often is flooding, usually as a result of cyclones. Recent meteorological records indicate an increase in the

Figure 2.13 Zimbabwe average seasonal rainfall (mm), 1981 to 2015

Source: Meteorological Services Department

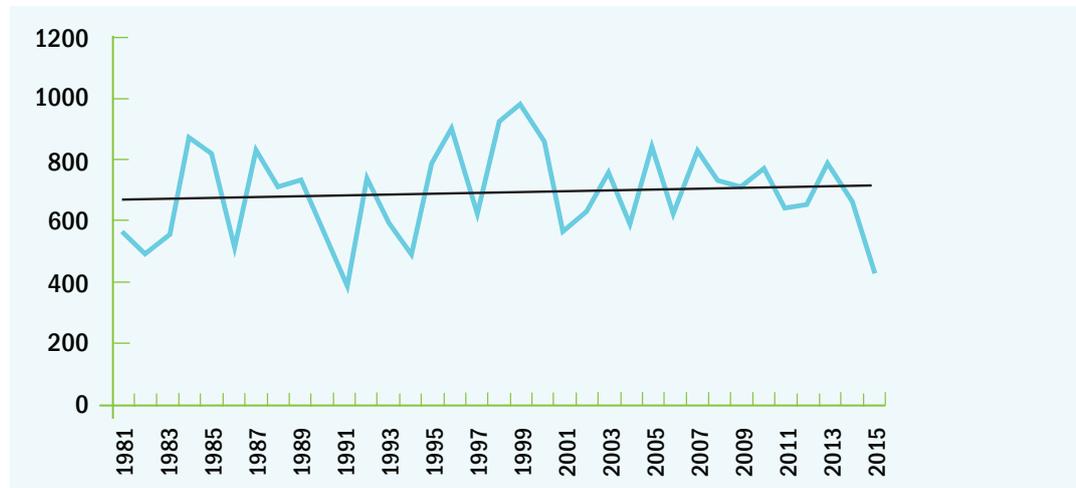


Figure 2.14 Zimbabwe temporal rainfall (mm) variation for the period 1999/2000 to 2015/16

Source: Meteorological Services Department

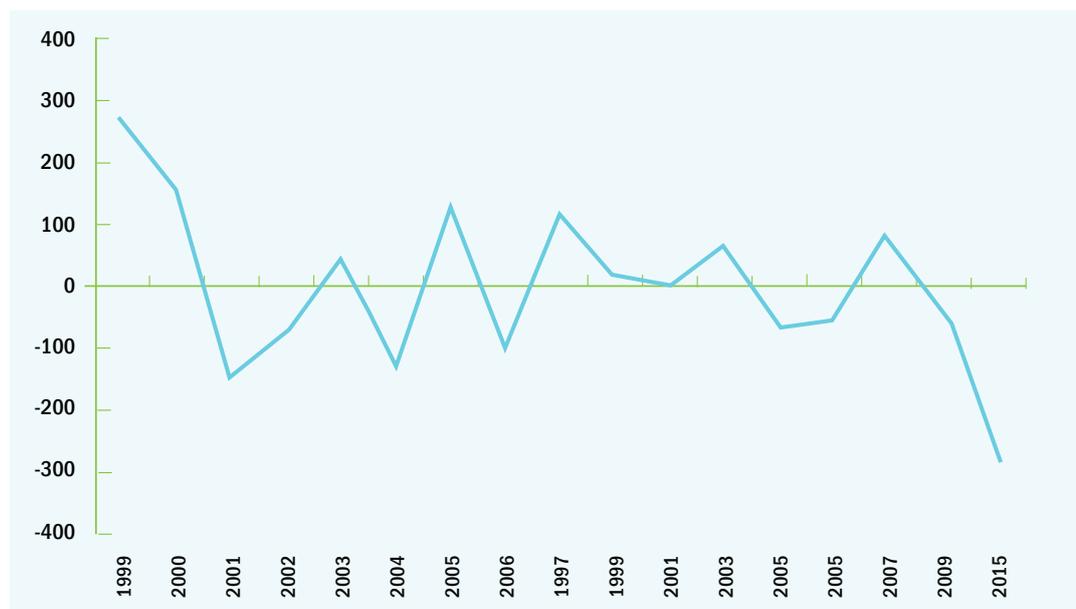


Figure 2.15 Map of Zimbabwe showing rainfall deficits
 Source: Meteorological Services Department

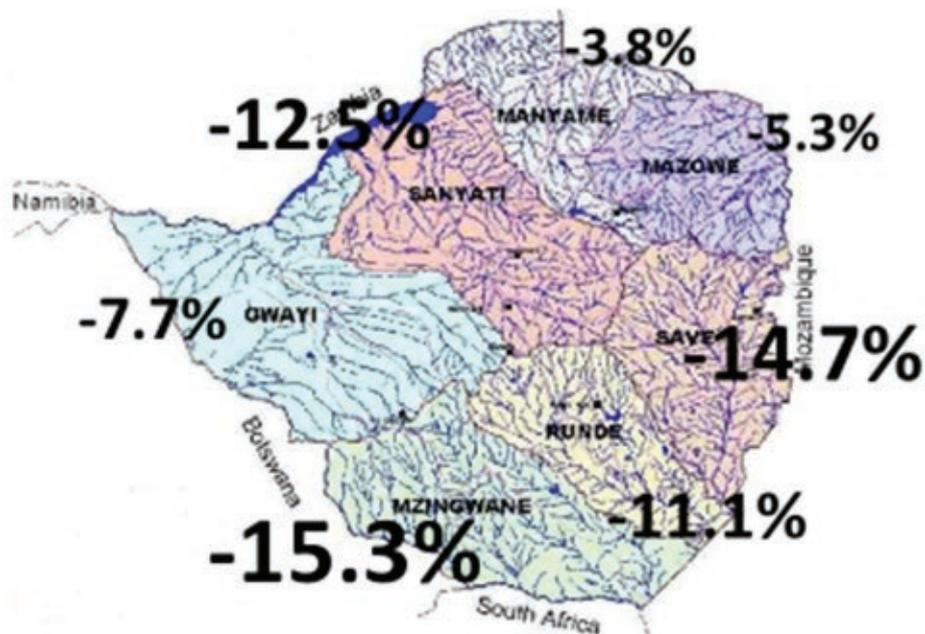
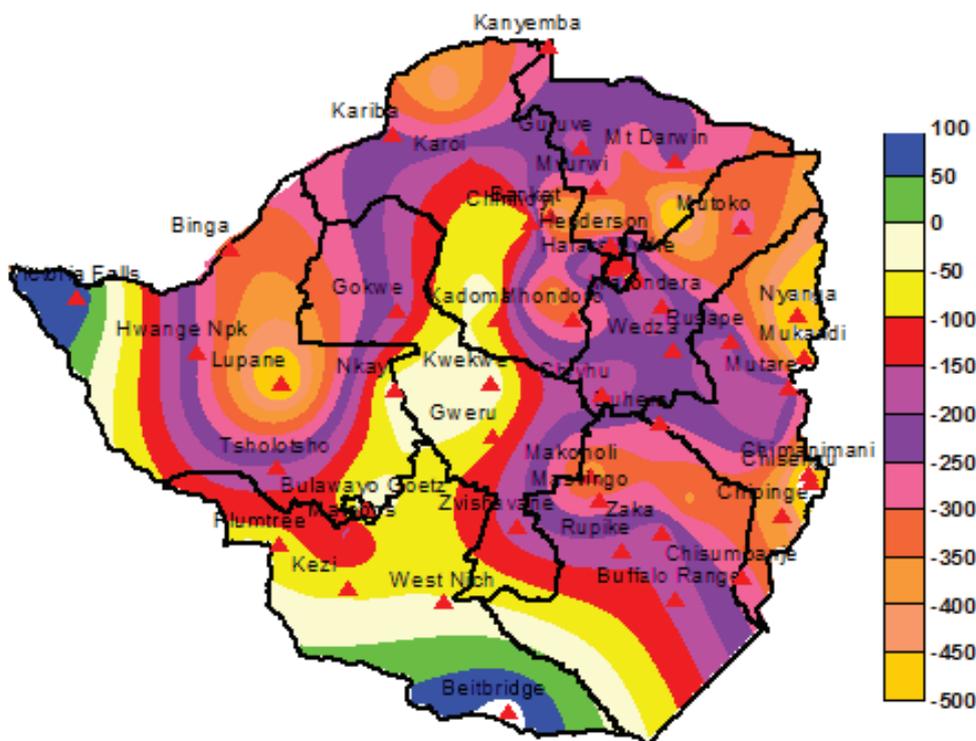


Figure 2.16 Spatial rainfall variations for season 2015/16 relative to WMO climate mean (1981 to 2010)
 Source: Meteorological Services Department



frequency of violent storms, sometimes with hailstones and strong winds that damage infrastructure, property and crops, and cause loss of human and livestock lives (see Chapters 3 to 6). Devastating floods have occurred almost everywhere, including in traditionally 'storm free' zones (as shown in the photo below).

Floods tend to occur in the northern and southern low lying areas of Zimbabwe, usually in the paths of cyclones and near confluences, as well as upstream (as backlash) and downstream of major dams. The UNDP (2016e) mapped flood prone areas of Zimbabwe, based on the recorded frequency of floods over a ten year period (Figure 2.20).

Stakeholders consulted during the process of producing the ZHDR 2017 indicated that winters were becoming severe and prolonged in some parts of the country, for example until September, affecting market gardening and small livestock rearing. The intensity of tropical storms and cyclones is increasing and they are becoming more difficult to predict. Heat waves are also more frequent, with Buffalo range re-

cording 45°C in the recent past. Climate models predict that Zimbabwe's climate will be warmer than the 1961 to 1990 baseline, with warming rates of 0.5 to 2.0°C by 2030 (USAID, 2015a). These projections point to a drying trend that will increase in intensity with time. As such Zimbabwe will become both hotter and drier under climate change.

The foregoing demonstrates that the climate is changing in Zimbabwe and there is a need for the country to build resilience in all its sectors. A new measure the Climate Change Vulnerability Index described in the next Section attests to this need.

The Climate Change Vulnerability Index (CCVI)

The Climate Change Vulnerability Index (CCVI), is a recent index that enables organisations to identify areas of risk within their operations, supply chains and investments. It is a function of exposure to climate variability and natural disasters, sensitivity to the impacts of the exposure, and capacity to adapt to future changes. The CCVI assesses national vulnerabilities across three core areas that include: exposure

Figure 2.17 Onset of the 2012/13 rainy season in Zimbabwe

Source: Government of Zimbabwe (2013c)

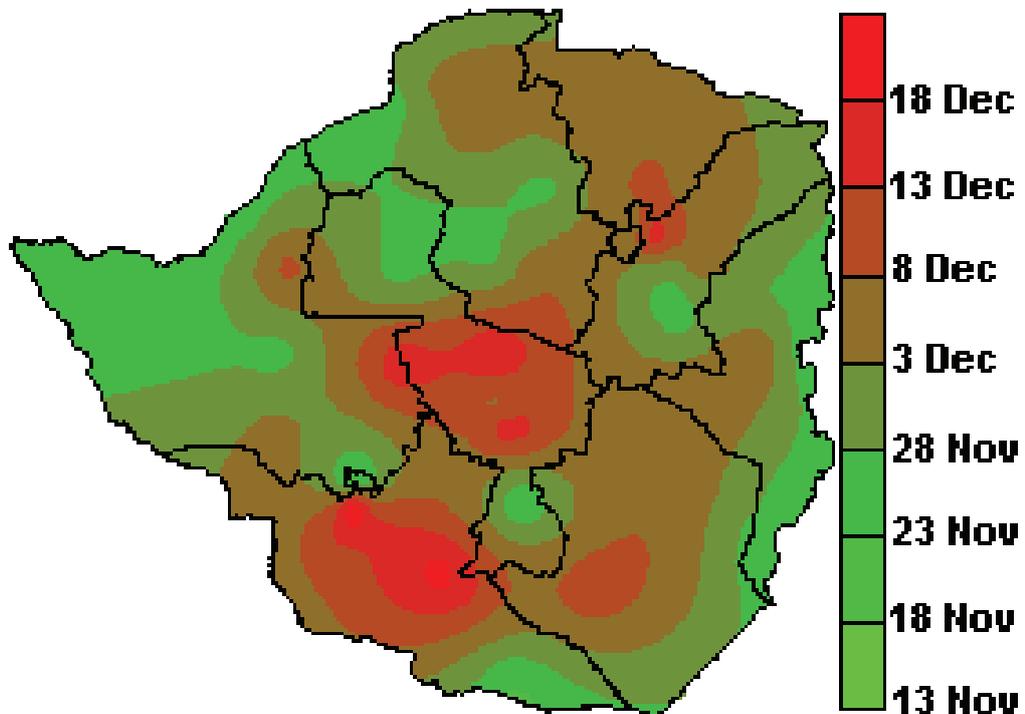


Figure 2.18 Map showing drought proneness in Zimbabwe

Source: UNDP (2016e)

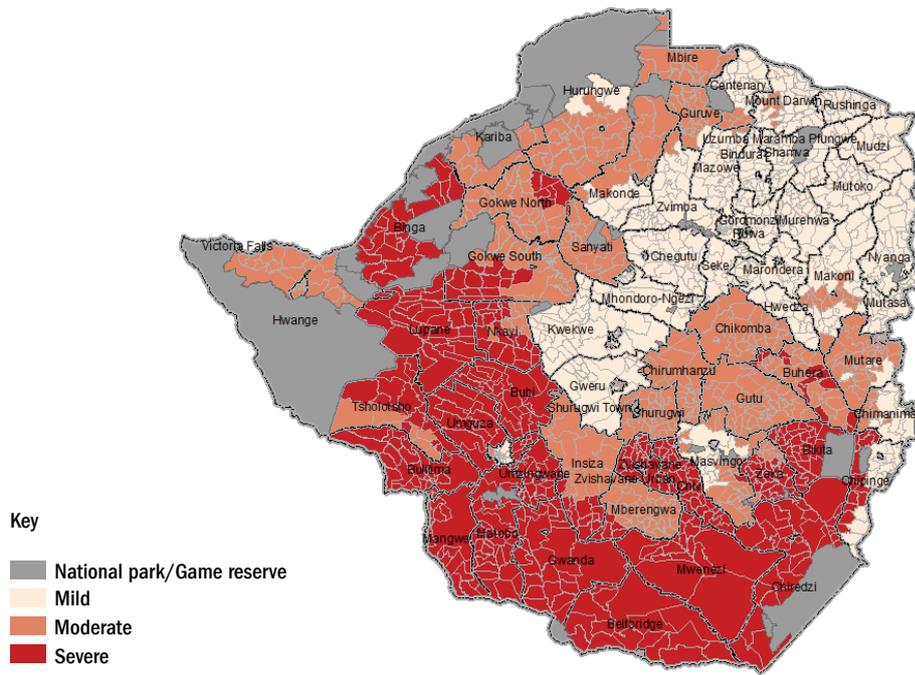
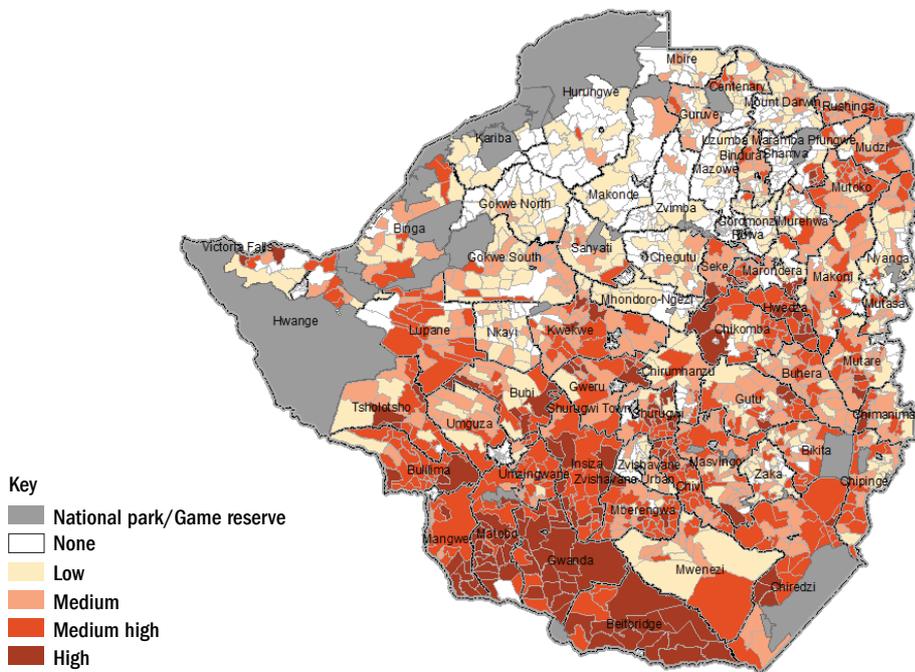


Figure 2.19 Map showing mid-season dry spells in Zimbabwe in 2015

Source: UNDP (2016e)





Floods after a heavy storm in Zvishavane

Source: E Moyo

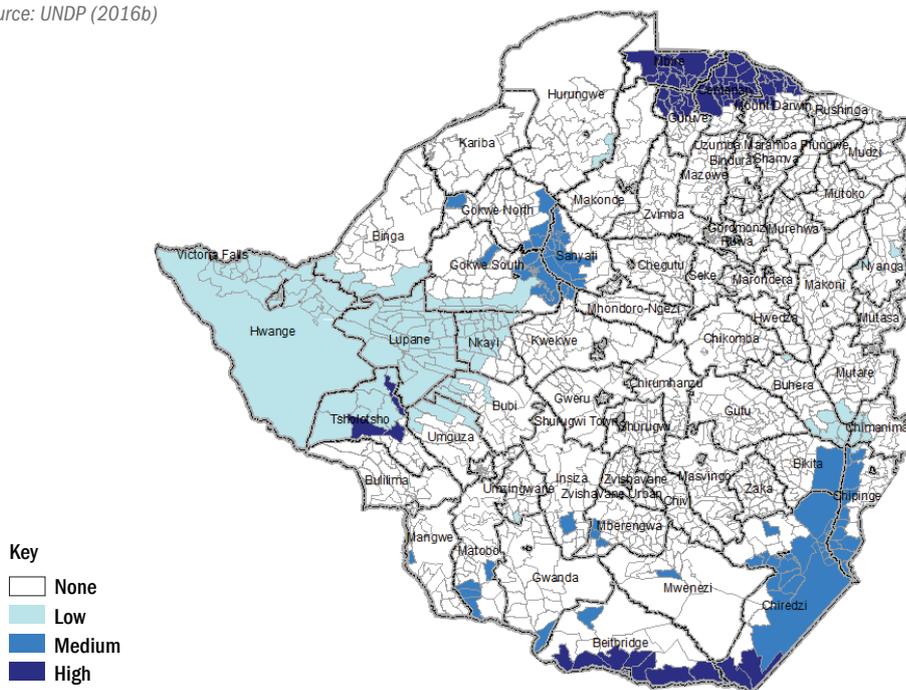
to climate related natural disasters and sea level rise; human sensitivity, in terms of population patterns, development, natural resources, agricultural dependency and conflicts; and future vulnerability (<https://maplecroft.com/about/>

news/ccvi.html). This is done by evaluating 42 social, economic and environmental factors and considering the adaptive capacity of a country's government and infrastructure to combat climate change. Women are effective actors and agents of change in relation to both mitigation and adaptation strategies.

Maplecroft, a UK company, carried out a new global ranking, calculating the vulnerability of 170 countries that included Zimbabwe to the impacts of climate change over the next 30 years (<https://maplecroft.com/about/news/ccvi.html>). The classes of risk were (a) extreme risk, (b) high risk, (c) medium risk and (d) low risk. The results showed that African countries feature strongly, with the continent being home to twelve of the 25 countries at most risk. The countries with the highest risk are characterised by high levels of poverty, dense populations, exposure to climate related events, and their reliance on flood and drought prone agricultural land. Zimbabwe was ranked 9 among 16 countries with the 'extreme risk' rating. This implies that Zimbabwe should prioritise climate change and introduce mitigation and adaptation programmes in order to build resilience across all its sectors.

Figure 2.20 Flood prone areas in Zimbabwe

Source: UNDP (2016b)



Interaction of Climate Change and Human Development

Zimbabwe's economy is primarily agro-based, with over 70 percent of the population living in rural areas and dependant on climate sensitive livelihoods such as arable farming and livestock. Therefore, the impact of climate change is large. Hence, the Government of Zimbabwe regards climate change as a leading threat to the country and its people. It is also of the view that climate change has the potential to undermine many of the positive developments made in meeting the country's development goals, as well as constraining further progress (Government of Zimbabwe, 2015). The impacts are most pronounced among young people, women, people with disabilities, and others who may be marginalized.

As shown in this Chapter, increasing climate variability, combined with significant demographic changes in the most vulnerable parts of Zimbabwe, is worsening the problem of poverty, food insecurity and malnutrition. These and other challenges caused by climate change need to be addressed urgently since they are likely to undermine the achievement of the Sustainable Development Goals (SDGs).

Climate change effects are expected to intensify in the years ahead. The increased incidence of drought and the resulting heightened water stress are already having an adverse effect on crop and livestock productivity, as well as deepening land degradation and threatening the very existence of wild life. Over a million people in Zimbabwe are vulnerable to adverse climatic shocks and are food insecure as climate change is affecting the agricultural sector, groundwater systems and surface waters, environment and other economic sectors. Women, in particular,

are affected seriously by the effects of climate change as they are the most likely to lack adequate coping strategies to withstand such shocks putting them in a highly vulnerable situation.

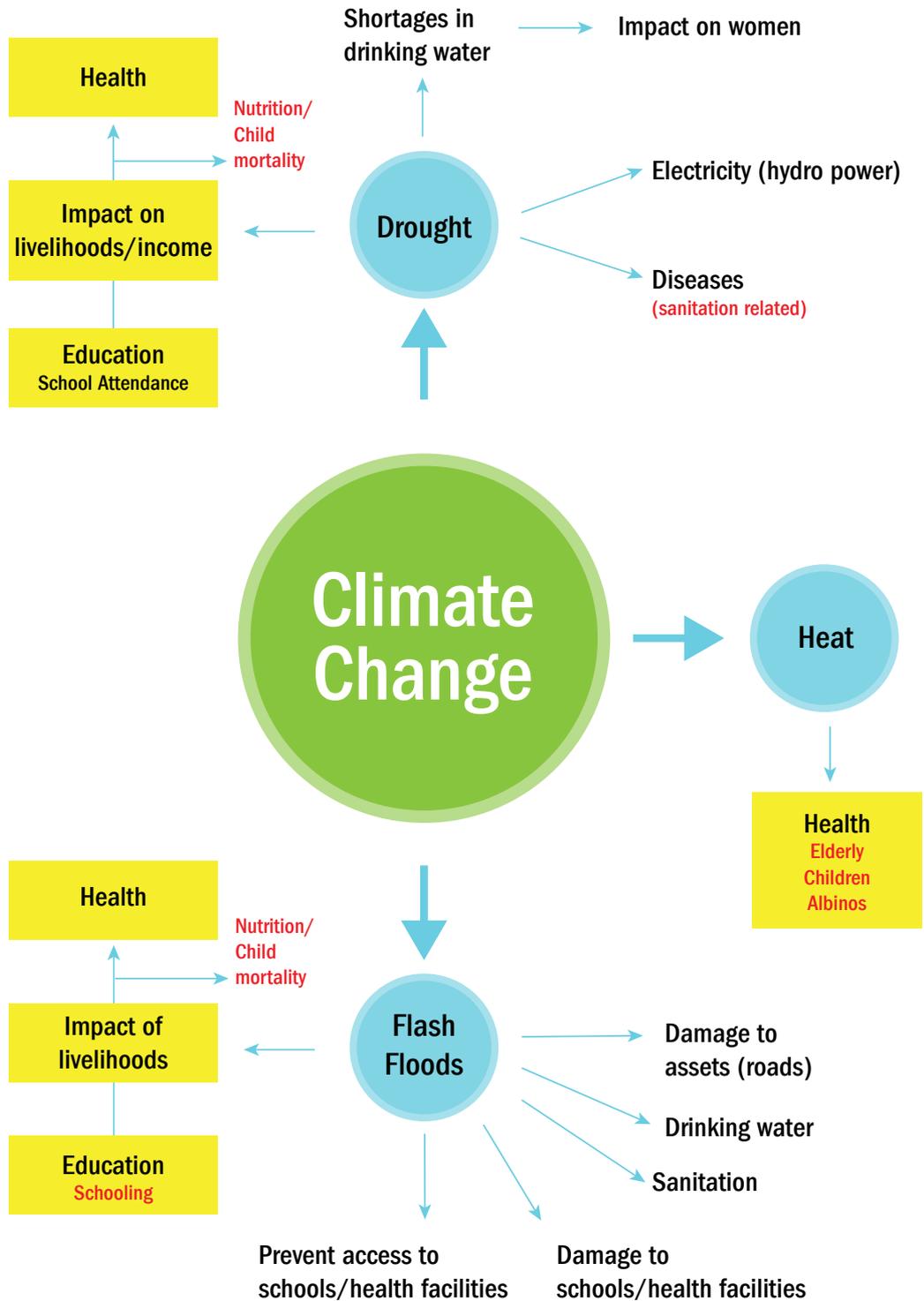
While human development progress in Zimbabwe has been low, overall, its potential to pick up fast should not be undermined. Building on the Zimbabwe Climate Change Response Strategy and Climate Policy, the National Human Development Report will make an attempt to analyse critically the issues pertaining to climate change and human development, in a broader context.

An additional focus within climate change and human development is the Conference of Parties 21 (COP21) which aims to keep global warming below 2 degrees Celsius, through a legally binding agreement. There is a need for greater understanding of climate threats to human development, and for innovative localised approaches to mitigation of and adaptation to climate effects, in order to introduce the requisite institutional and policy environment to take the COP21 commitments forward at country level.

As noted in Chapter 1, this ZHDR will focus on the four themes of livelihoods, food security, health and education which are presented in Chapters 3, 4, 5 and 6, respectively. Figure 2.21 depicts the interlinkages among climate change and human development (livelihoods and income, health and education).

The impacts of climate change on human development will be analysed in the chapters that follow using a modified DPSIR framework in relation to the different aspects and expressions of climate.

Figure 2.21 Interlinkages amongst selected human development components and climate change
 Adapted from Amarakoon Bandara, UNDP



Section B

Human Development Dimensions And Climate Change



CLIMATE CHANGE AND LIVELIHOODS

Introduction

Achieving human wellbeing through improved and sustained livelihoods is a major human development goal. A livelihood is a means of making a living and encompasses people's capabilities, assets, income and activities (Chambers and Conway, 1992). Climate change and its associated stresses influence human development through their support or destabilisation of livelihood systems (Tanner et al., 2014), in particular, those of poor and vulnerable people. This chapter examines the effects of climate change (for detailed trends in climate change, see Chapter 2) on human development in Zimbabwe through its impacts on livelihoods.

Livelihoods in Zimbabwe are climate sensitive. Climate records show that Zimbabwe is experiencing the effects of climate change, particularly, rainfall variability and extreme events (SARUA, 2013; Brazier, 2015). In addition to the spatial and temporal variability in Zimbabwe's rainfall pattern in the past 30 years, there have been shifts in the onset of rains, increases in the frequency and intensity of localised heavy rainfall events, increases in the length and frequency of mid-season dry spells, and/or droughts occurring back to back in the same season (Chagutah, 2010; UNDP, 2016a).

In line with the overall thrust of this report, Chapter 3 uses a modified version of the DP-SIR framework (see Chapter 1) to interrogate the linkages among climate change, livelihoods and human development. Information collected from provincial consultative workshops, the UNICEF U-Report Poll and a review of grey and academic literature (see Chapter 1) was used to address the following questions:

- What is the state/status of livelihoods in Zimbabwe?
- What are the major climate change risks

and their impacts on livelihoods security and in achieving the targets of SDG 1¹ and SDG 8²?

- What social groups are vulnerable to these risks, over what time span and why?
- What measures have been taken by government and other non-state actors to address the effects of climate change on livelihoods, and how effective have these measures been?
- What are the likely future climate change impacts on human wellbeing and what can be done to address these impacts?

The State and Status of Livelihoods in Zimbabwe

Zimbabwe has a population of about 13.1 million people, with approximately 8.8 million (67 percent) residing in rural areas and having livelihood activities centred on or closely related to agriculture (ZIMSTAT, 2013). Agriculture remains the most important source of income with half the country's adult population dependent on it. It provides livelihood options and employment (directly and indirectly) to more than two-thirds of the population. The Labour Force Survey (ZIMSTAT, 2015a) notes that, of 7 million economically active persons, approximately 11.3 percent were in broad unemployment, while the highest labour force (52.3 percent) was own account workers (communal, peri-urban and resettlement farmers), who are mostly dependent on climate sensitive agrobased livelihoods. The importance of agriculture to Zimbabwe's economy and the reliance by most rural households on the quality of rains during the rainy season makes livelihoods particularly sensitive to climate change (Mano and Nhemachena, 2006).

Within the rural areas there are significant dif-

1 End poverty in all its forms everywhere.

2 Promote sustained inclusive and economic growth, full and productive employment and decent work for all.

Figure 3.1 Trends in main income sources for rural households, 2009 to 2016

Source: Zimbabwe Vulnerability Assessment Committee (ZIMVAC) (2016a)

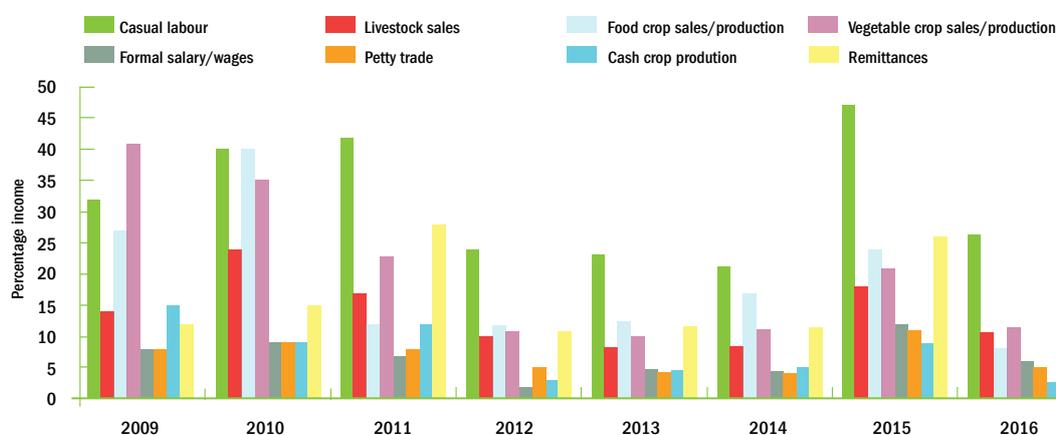
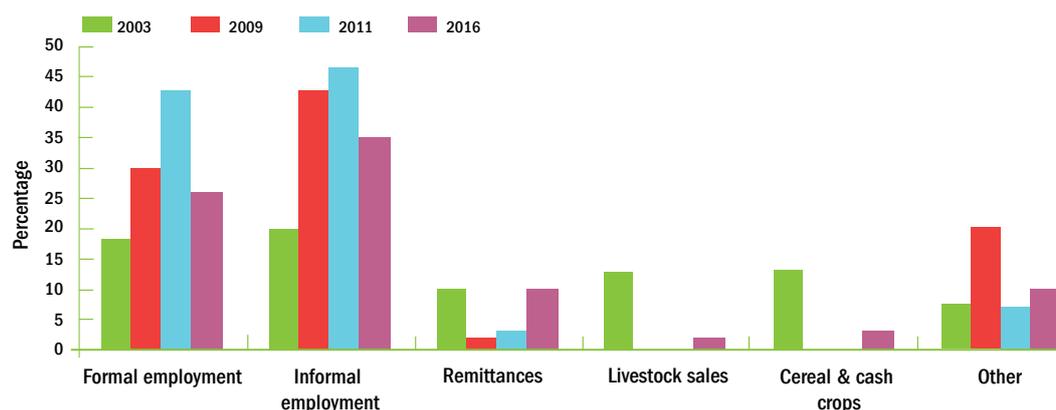


Figure 3.2 Trends in main source of income for urban households

Source: ZIMVAC (2003, 2009, 2011, 2016b)



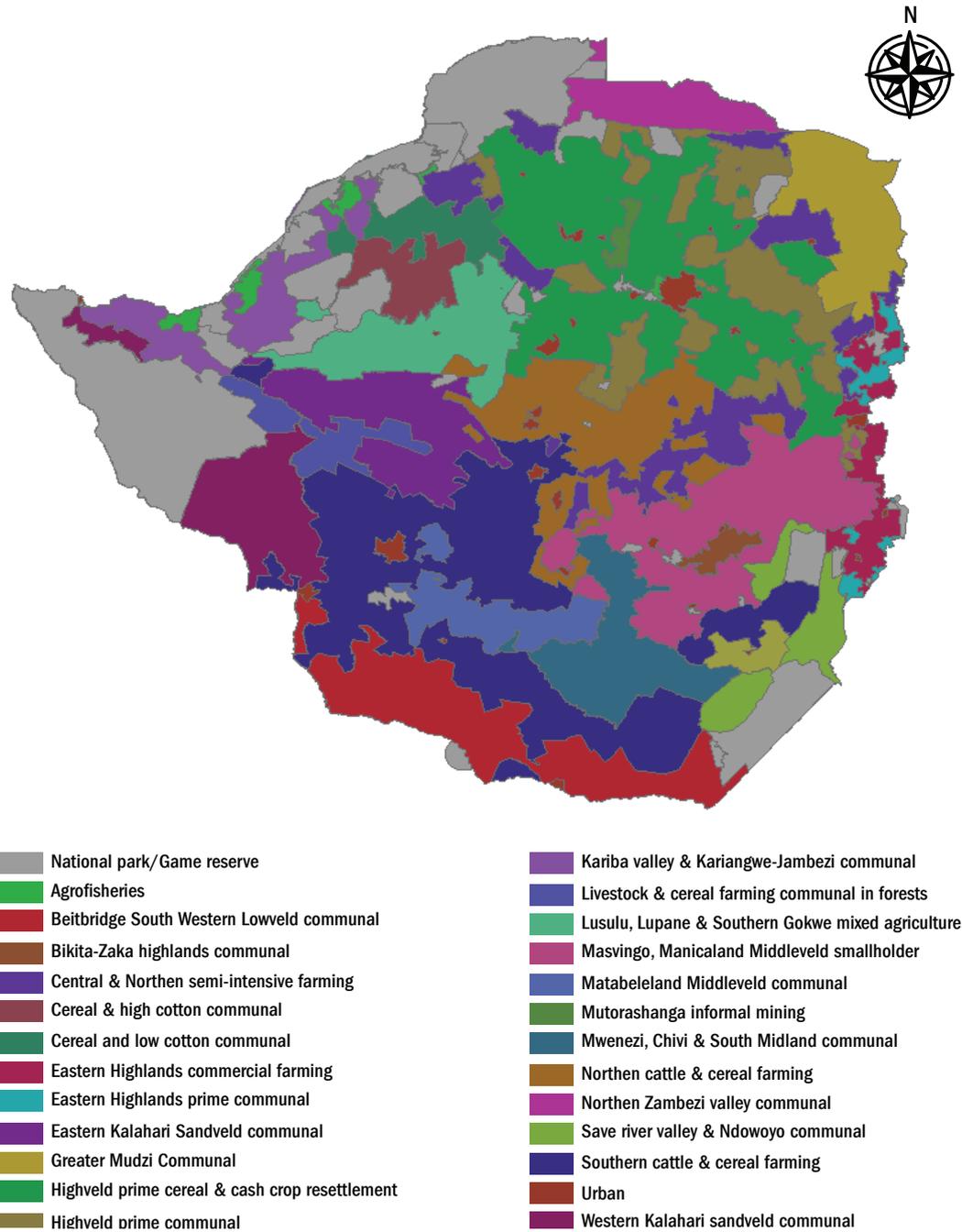
ferences in the ways households earn incomes across wealth groups and geographical areas. As shown in Figure 3.1, rural livelihood activities are centred on rain-fed crop and livestock production, high and low input market gardening, trade of petty commodities (especially of non-timber and forest products), formal employment (retail, civil service, non-governmental organisations), and casual labour. Casual labour, mainly agricultural piecework, is by far the most important source of rural income and its importance is greater for poorer households (ZIMVAC 2016a). All of these income generating activities are highly susceptible to climate related hazards and shocks, thereby rendering rural households vulnerable to shifts and changes in the climate.

The urban population has risen significantly over the years, from 18 percent in 1969 to 33 percent (4.3 million people) in 2012 (ZIMSTAT, 2013). Livelihood options in urban areas comprise earnings from both formal and informal employment. Sources of income are from diverse forms of petty commodity trading/vending, rain-fed urban agriculture, casual labour, domestic work, artisan work, rentals, pensions and remittances. Thus livelihood activities in the country are distinctively divided along rural and urban lines, but there is a significant rural-urban interaction and interface.

Trends in sources of income for urban households for the years 2003 to 2016 are shown in Figure 3.2 and point to the initial reliance of urban households on formal wages which has de-

Figure 3.3 Zimbabwe's national livelihood zone map

Source: ZIMVAC (2010)



creased significantly, from 40 percent to about 25 percent, over the review period because of the current economic challenges. Meanwhile there has been a marked increase in remittances.

Zimbabwe is divided into 24 livelihood zones (Figure 3.3, above), which are geographical ar-

reas defined by the Zimbabwe Vulnerability Assessment Committee (ZIMVAC) in conjunction with the Department of Social Services. These livelihood zones, which are based on a livelihood framework, take into account the resource potential of an area and how people utilise these resources to enhance their livelihoods (Man-

jengwa, et al., 2012).

These zones show that livelihood activities in the country are primarily centred on agriculture (crop production, livestock and fisheries). The poorest zones are found in peripheral parts of the country, in the north-east (Greater Mudzi), extreme north and west (Zambezi/Kariba Valley), and south of the country. Elsewhere, agricultural production and income are normally highest in the Highveldt areas of the Mashonaland provinces, and parts of northern Manicaland. These

areas have the highest concentration of commercial farms and resettlement communities. In the Matabeleland Provinces and in southern parts of Midlands and Masvingo provinces, levels of crop production are lower and livestock are more important. Table 3.1 presents the national livelihood zone profiles. Overall, the high dependence on natural capital by the majority of the population makes the livelihoods of rural communities potentially vulnerable to negative impacts of climate change.

Table 3.1 National livelihood zones profiles

Source: ZIMVAC (2010)

Zone	Livelihood activity
Agro-fisheries	Livelihoods are characterised by fishing and related activities, supplemented by rain-fed agriculture and animal husbandry. There is a distinct gender division of labour whereby men spend most of the year in fishing camps along the lakes (Lake Kariba and Lake Chivero), while women and children live further inland where they practise some limited agriculture and animal husbandry.
Beitbridge and South-Western Lowveldt Communal	A semi-arid, agro-pastoral zone. Although employment is also a key source of food and cash income. Proximity to southern commercial estates and job markets around the border with South Africa and Botswana opens up significant employment opportunities. Sorghum cropping, mopane worm sales and gold panning supplement wage earnings of the poor.
Bikita-Zaka Highland Communal	Intensive farming of maize and groundnuts on this relatively high potential land provides better off farmers with a stable food and income source. Land in this zone is densely populated so farm sizes are small. There is a poor mix of maize cultivation with (limited) gold panning and local employment (such as in the Bikita mines).
Matabeleland Resettled	An area deeply affected by land reform, the new owners of subdivided former beef and wildlife ranches have introduced more mixed agriculture (mainly maize and cattle production). The zone is typically food secure and good incomes can be earned from cattle sales. Poor households (including ex-commercial farm workers) depend on seasonal farm labour – found on productive old resettlement and small scale commercial farms – as well as opportunistic gold panning.
Central and Northern Middleveldt Communal	Maize and small grains are the dominant crops in this agricultural zone, providing both food and income. Better off households are reasonably self sufficient in cereals but poor households depend equally on own crops, daily wages and gold sales to make ends meet.
Cereal and High Cotton Communal	Livelihoods are characterised as primarily agricultural, centred on growing maize for food and cotton for cash. The other pillar of rural income, particularly for better off farmers, is animal husbandry (cattle, goats and poultry). Poor farmers purchase much of their food, generating income through casual labour (e.g., on cotton fields) or through gold panning.
Cereal and Low Cotton Communal	Located in the dry Kariba Valley, livelihoods in this zone can be described as a mixed economy of cash and food cropping combined with animal husbandry. Cotton production spread into the Kariba Valley from Gokwe and provides needed, albeit unpredictable, income. In addition, many of the poor go in search of work in the high cotton producing areas of Gokwe. Income from livestock sales as well as seasonal wild fruits, are other ways that households supplement their income.
Eastern Highlands Commercial	A high potential zone producing many crops for export, including fruit, vegetables, flowers, tea, and coffee. Timber is another important industry in this rugged, forested Highveldt zone. Both the commercial farms and sawmills, offer important labour opportunities to poor farmers as well as to farm workers (who often need to pick up additional seasonal work to supplement on-farm income).

Zone	Livelihood activity
Eastern Highlands Prime Communal	A high potential mountain zone characterised by intensively farmed, small plots of mixed food and cash crops. Maize is the primary crop but diversity is a key feature here (cereals, root crops, fruits, tea/coffee, tobacco and so on). Poor farmers find wage work locally in the commercial agriculture or forestry sector.
Eastern Kalahari Sandveldt Communal	Livelihoods are built around three main activities, agriculture, animal husbandry and labour (local and migratory). Sorghum and maize farming is widespread but production is unreliable as the zone is semi-arid. Livestock and remittances are important safety nets for the better off. For the poor, income earned from local work, forest products and/or gold panning (in Kwekwe and Gweru) is their mainstay.
Greater Mudzi Communal	A lowveldt zone, characterised by extensive rain-fed cultivation of maize, small grains and groundnuts, supplemented by income earned through cotton production, gold panning, animal husbandry and labour. While better off farmers meet most of their food needs through own-crop production, poor households rely on a more diverse mix of food and income sources.
Highveldt Prime Cereal and Cash Crop Resettlement	Covering prime (resettled) agricultural land, this is generally a food secure zone with the potential to produce surplus. The major crops are maize, tobacco, soya beans and groundnuts, which are grown for both food and cash and supplemented by livestock production. There are several distinct population groups. Whereas the A1 farmers and commercial farm owners are typically food secure, the (ex-commercial) farm workers are highly mobile and often at risk of food insecurity.
Highveldt Prime Communal	A prime agricultural zone in which livelihoods centre on rain-fed production of both cash and food crops. Maize is the predominant food crop but cultivation overall is highly diversified and includes groundnuts, paprika, millet, sorghum, bambara nuts, cowpeas, sweet potatoes, soya beans, tobacco and cotton.
Irrigated Commercial Sugar and Fruit Farming	An arid zone in south-eastern Zimbabwe that includes households living and working permanently on the irrigated commercial sugar and fruit estates in Triangle and Hippo Valley, as well as some smallholder (A1) resettled farmers. The commercial farm workers depend on wage earnings and petty trade income to secure their food requirements. In addition, some workers have access to land to grow garden produce.
Kariba Valley and Kariangwe Jambazi Communal	A dry, remote and resource poor area, this zone suffers from chronic problems of food insecurity. Cultivation – mainly millet and sorghum – is unreliable and wild foods are seasonal. Goat sales are the most common source of cash income but local wage work, craft and traditional beer sales are pursued also. Close proximity to Hwange provides some work opportunities for the poor, as well as access to the tourist craft market near Hwange, Kariba and Victoria Falls.
Livestock and Cereal Resettled Farming in Forests	Livelihoods in this forested western zone are built around three main activities, livestock (mainly cattle), cereal cropping, and exploitation of forest resources. Crop yields are reasonable in most years. Livestock sales are a key safety net, and the poor find casual work either on farms or in the timber industry, as well as selling some honey.
Lusulu, Lupane and Southern Gokwe Mixed Agriculture Communal	This middle-veldt zone is relatively favourable for mixed crop and livestock production. Livelihoods are centred around maize, groundnuts and cotton cultivation with animal husbandry providing supplementary food and income. Daily wage work for poor farmers is still essential for much of the year when food stocks run low.
Masvingo, Manicaland Middleveldt Communal	Livelihoods in this middle-veldt zone are characterised by cereal agriculture supplemented by cash cropping (groundnuts, round nuts and cotton), animal husbandry and remittances from migratory labour. A number of other income sources help the poor including sales of wild fruits and vegetables, gold panning, legal gold mining, sales of traditional beer and handicrafts, and casual labour. Fishing is also opportunistically practised in the rivers and streams, and there is some cross-border trade.
Matabeleland Mid/Highveldt Communal	Livelihoods in this zone are characterised by (mainly) cattle husbandry and rain-fed cultivation of maize and small grains. Poor households subsist partly on own-crop production but, more importantly, on cash income earned from employment, beer brewing or gold panning on the various rivers.
Mutorashanga Informal Mining Communities	A collective name given to the poor mining communities on the Zvimba side of the Great Dyke in Mashonaland West. Most households carry out informal chrome mining, supplemented by on-farm casual work, petty trade, garden vegetable sales and maize cultivation (typically eaten green).

Zone	Livelihood activity
Mwenezi, Chivi and South Midlands Lowland Communal	Households in this zone combine some cereal and cash cropping (precarious in such a semi-arid area) with livestock production and market purchases. Casual work opportunities are found on plantations, estates and mines within the zone as well as further afield. A number of rivers provide gold panning and some fishing opportunities. Nonetheless, this is an area of chronic poverty and food insecurity.
Northern Zambezi Valley Communal	Bordering Mozambique, this hot, northern valley region supports extensive small grain, groundnut and cotton production, together with animal husbandry. Due to a number of production constraints, local, seasonal employment on better off farmers' cotton fields helps generate needed income.
Save River Valley and Ndowoyo Lowveldt Communal	A dry, primarily agricultural, lowland area. Households grow mainly small grains (sorghum and millet) as well as maize and groundnuts. The zone boasts good soil but cropping is limited by erratic rainfall. Consequently, cash income earned through seasonal casual work, petty trading and the sale of handicrafts, goats and some cotton is fundamental to the food economy. Remittances are also increasingly important to household income.
Western Kalahari Sandveldt Communal	In general, livelihoods in this zone are based on rain-fed cultivation of sorghum and millet mixed with animal husbandry, and supported by cross-border labour migration. This low lying, dry land zone has the advantage of proximity to labour markets in South Africa and Botswana. Thus an important aspect of the household economy is having someone working elsewhere who remits money home.

The state of livelihoods in all parts of the country needs to be viewed in the context of the country's macroeconomic challenges and in relation to the prevalence of poverty in both rural and urban areas. In the past decade, Zimbabwe has experienced a number of unexpected economic, environmental and political stresses which will have long lasting future effects. The impacts have included a marked decline in GDP, hyperinflation and devaluation of the Zimbabwean currency (2000 to 2008), deindustrialisation and subsequent closure of industries, large scale retrenchments of workers (agricultural and industrial), and the collapse of public service delivery (UNDP, 2015; UNDP, 2016b). These impacts, which are compounded by the negative effects of climate change, undermine the growth of rural and urban livelihoods and human development.

Livelihood activities in Zimbabwe are also closely linked to the agro-ecological regions. The country is divided into five such regions, based on a combination of factors including the climatic conditions (rainfall regime, temperature and the quantity and variability of average rainfall) as well as soil quality and vegetation (Vincent and Thomas, 1960). Rainfall varies widely, both spatially and temporally, among the regions. The suitability of cropping declines from Region I through to Region V. Rainfall ranges from 650 mm to above 1 050mm per annum in Regions I to III, while in Regions IV and V, where the majority of the rural population lives, it is below 650 mm per annum (Government of Zimbabwe, 2016).

The agro-ecological regions determine the type of farming practices and potential productivity/output of a given area (Moyo, 1995). Most of the agriculture is carried out in Regions I, II and III which have favourable climatic conditions for intensive crop and animal production, while extensive livestock production and irrigated crops are suitable in regions IV and V. The majority of the smallholder farmers are mostly located in regions IV and V, with highly variable climate. This arose initially from colonial era land allocation and remains the case even after the recent land redistribution. Regions IV and V have limited climate sensitive resources such as water, vegetation and ecosystem services for use in supporting livelihoods.

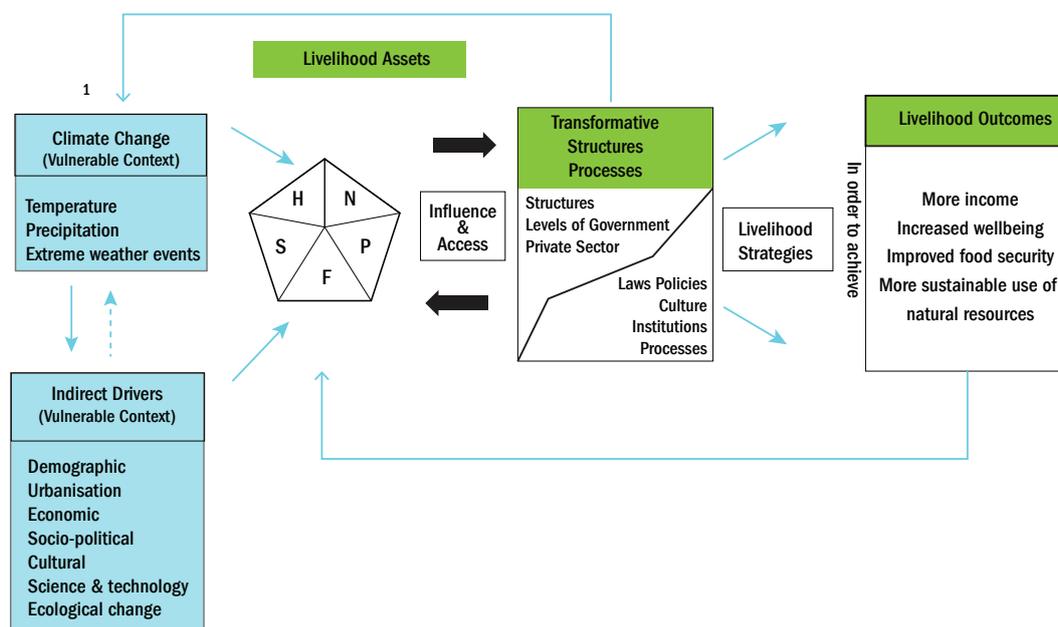
Farmers in these regions are reliant on land based livelihoods that primarily comprise rain-fed agricultural production, which makes them prone to the vagaries of climate. Therefore, it is expected that climate change will have disproportionate effects on natural regions IV and V, where the poorest rural people with the least capacity and opportunity to adapt reside. Climate change threatens to undermine the development goals achieved by the Zimbabwe, which saw the HDI rise from 0.499 in 1990 to 0.522 in 2015 (SADC database, 2015).

Climate Change, Livelihood Systems and Human Development

The modified DPSIR framework used in this chapter integrates the sustainable livelihoods approach shown in Figure 3.4 in order to under-

Figure 3.4 Conceptual Framework for understanding the impact of climate change on livelihoods

Adapted from DfID (1999)



stand the relationships among climate change, livelihoods and human development in the country. From this framework, the critical units of analysis are livelihood assets (or capital), which include natural capital (N) (land, water, natural resources), social capital (S) (health centres, schools, community), human capital (H) (knowledge, skills), physical capital (P) (infrastructure, inputs), and financial capital (F) (income, loans) (Sen, 1992). Fundamentally, people make use of the natural, social, human, physical and social capital to earn a living and circumvent poverty (Matondi and Chikulo, 2014).

Assets are a crucial element of the livelihood framework for they enable individuals, households and communities to survive, engage in labour markets and participate in reciprocal exchanges with other households (Matondi and Chikulo, 2014). It, therefore, means that people, households and communities with little material, financial, natural or social assets are vulnerable to climate-related shocks and stresses. Without assets to form the basis of effective coping strategies and resilience, people can experience catastrophic declines into persistent poverty and face increased morbidity and reduced life expectancy.

Poor people without reserves to face climate

related shocks and stresses may adopt forms of adverse coping strategies, which support short term survival but undermine overall wellbeing in the medium to long term. Such adverse coping strategies can entail the liquidation of crucial productive assets, gold panning and over exploitation of non-timber forest products, reduction of food consumption in ways that have potentially irreversible welfare effects (eating smaller amounts and less nutritious food, especially for people living with HIV), and/or the adoption of behaviour that undermines trust and social standing (theft, begging, commercial sex work, early marriages). While gold panning has become an important coping strategy, it can result in environmental degradation through the release of contaminants such as mercury into soil and water bodies and the reduction of land available for farming activities.

Key to human development under a changing climate is ensuring that livelihoods are sustainable. According to Chambers and Conway (1992), "Livelihoods are only sustainable when people have secure ownership of, or access to these assets, and are resilient to shocks and disasters. The greater and more varied their asset base, the more sustainable and secure their livelihoods will be."

Table 3.2 Livelihoods in Zimbabwe and related climate change effects

Adapted from: ZIMVAC (2010)

Source of Livelihood	Effects of Climate Change
Agro-fisheries	<ul style="list-style-type: none"> • Extreme increase in temperature can lead to diminishing fish stocks as all species have an optimal temperature at which they thrive • Changes in water quantity and water quality as a result of decreased rainfall alter the habitat of the fish species and can result in the proliferation of parasites • An increase in rainfall alters ion balance in the water which can affect the metabolic processes of fish thereby leading to diminished fish stocks and species shifts • Changes in rainfall and temperature affect the diet of aquatic species • Increases in temperature reduce incubation time and growth rates of fish
Farming	<ul style="list-style-type: none"> • Low and erratic rainfall reduces crop production • Periodic occurrence of extreme weather conditions such as frost, cyclones and insufficient rain, leads to low yields. • Increased incidence of attack from crop pests • Grazing pastures/forage for cattle are reduced leading to livestock starvation and death • Increased incidence of water and temperature related livestock diseases • Water logging because of excess rainfall leading to land degradation • Siltation of water sources for irrigation • Increase in veldt fires due to prolonged dry season • Occurrence of malaria which is a major threat on people's ability to work
Conservancies	<ul style="list-style-type: none"> • Reduced forage for wildlife • Scarce water and drying up of drinking sources because of erratic rainfall • Periodic occurrence of floods when there are heavy rains • Increase in human-wildlife conflicts as wild animal predators attack livestock in the area and there is competition for water
Mining	<ul style="list-style-type: none"> • Depleted water resources for mineral extraction • Rains curtail underground mining, which results in losses of income • Increased incidences of malaria in mine workers • Increased occurrence of cholera outbreaks in mining communities

Impacts of climate change on rural livelihood flows

Zimbabwe's rural economies and livelihoods are mostly dependent on rain-fed agriculture (crop and livestock production, fisheries), tourism and extraction of natural resources, all of which are directly or indirectly vulnerable to climate change. Table 3.2 provides a summary of the impacts of climate change through the increased frequency of droughts, long dry periods, floods, heat waves, strong winds and hailstorms on the generalised livelihood zones in the country. The table highlights observed and predicted effects of climate change on the source of livelihood, based on research carried out by ZIMVAC (2010).

The salient points raised are that the prevailing economic stresses in the country are compounded by climate related extremes, which constrain individual and household livelihood assets and capabilities and, in turn, decrease the quality of life and human wellbeing in communities. Several stakeholders at the consultative workshops noted that the reduction in livelihood options and high unemployment from the mainstream economic sectors have resulted in the increased prevalence of criminal activities, gold panning, migration and informal trading. Thus the generalised livelihood zones are susceptible to the effects of climate change and there is a need to reduce these impacts.

Box Story: Stakeholder observation on the effects of climate change on livelihood flows

Harare, Mashonaland East, West and Central Provinces

The effects of climate change that were observed for agrarian-based livelihoods include a general increase in poverty in rural areas because of poor crop yields and poor livestock production, which increase food insecurity. Livestock production was affected through the depletion in livestock numbers because of scarcity of drinking water and grazing pastures. In farming and mining communities, land degradation was observed as more people resort to gold panning as a source of income. There are cases of increased school dropouts in the farming and mining communities as the youth seek employment and a sense of financial security. Family dislocations have occurred because of migrations in search of better employment opportunities. Climate change has resulted in income reduction particularly for households dependent on horticulture. There is an increased dependency on forest products for food and income. People attributed losses in formal work, unemployment and increased informal trading to the impacts of climate change.

Bulawayo and Matebeleland North and South Provinces

The common income streams in rural areas are agriculture, fishing, brick moulding, arts and craft, vending, cross-border trading, harvesting of non-timber and forest products (mopane worms and wild fruit and berries), casual labour and mining. Climate change has increased the vulnerability of rural communities because of low agricultural productivity resulting from low rainfall and malfunctioning of irrigation schemes. There has been a rise in off-farm activities such as firewood vending and illegal mining activities, which increases land degradation and siltation of rivers, and results in less water for agricultural production. Youths have resorted to illegal activities such as squatting, stealing and prostitution. Both rural to urban and cross-border migration have increased in these three provinces, mainly because of their proximity to Zambia, Botswana and South Africa.

In urban areas, livelihoods comprise mostly of gainful employment in the public and private sector and non-governmental organisations. There have been reductions in income streams because of retrenchments and lack of job opportunities in the formal sector. This has forced people to take on illegal livelihood activities, such as urban agriculture and stream bank cultivation.

Manicaland, Masvingo and Midlands Provinces

Women and child headed families are the most vulnerable to climate change effects on livelihood flows. This is because most of the household responsibilities and planning are done by women and, in the case of child headed families, there are no adults to fend for the family. Generally, there have been depleted incomes because of job losses, unemployment and poor harvests in the fields. Livelihoods in these areas have been reduced because of erratic rains, which have led to water depletion for both humans and livestock.

Erratic rains have resulted in the scarcity of suitable pastures, leading to starvation and livestock deaths. Gold panning has emerged as an alternative livelihood and income source because of the unreliability of agriculture. Gold panning has resulted in environmental degradation and has triggered land disputes between gold panners and farmers. People are now scrambling for wetlands because of their high fertility and moisture content. A pattern of collapse of extended family relations has been observed, probably because of increased poverty levels and the inability to assist each other in crises such as droughts or floods.

Figure 3.5 Agriculture's contribution to Zimbabwe's economy

Source: Sukume (2016)

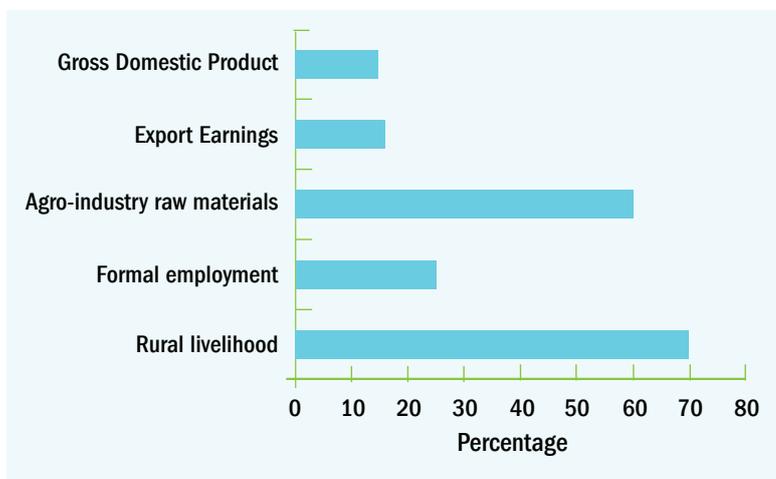
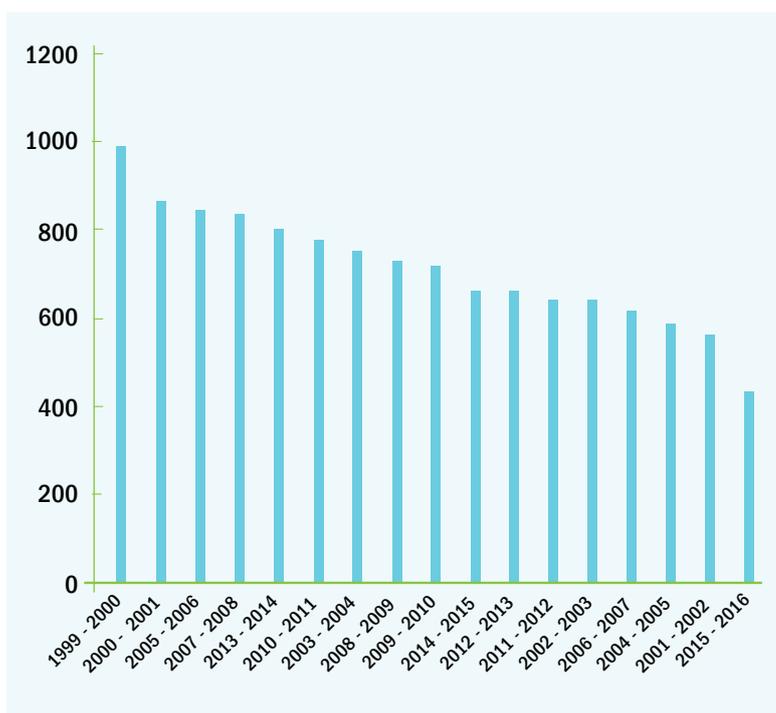


Figure 3.6 Wet and dry years for the seasons 1999/2000 to 2015/16

Source: Meteorological Services Department



The box below provides a summary of the key points raised by stakeholders from the different provinces across Zimbabwe during consultations on the effects of climate change on both rural and urban livelihood flows.

Climate change effects on agriculture

Agriculture plays an important role in support-

ing rural and urban livelihoods in Zimbabwe. The socioeconomic value and role of agriculture to the national economy is substantial as shown in Figure 3.5.

Agriculture underpins the country's economic growth, food security and poverty reduction (Chimhowu et al., 2010; Government of Zimbabwe, 2015). Approximately 70 percent of the population depends directly or indirectly on agriculture, and it provides forward and backward linkages with industry (Government of Zimbabwe, 2015), and employs approximately 54 percent of the country's labour force. In addition, it contributes an average of 15 percent to annual GDP and 16 percent of the country's export earnings. Addressing poverty, food security, and in turn sustainable human development, in Zimbabwe is contingent upon addressing the agriculture sector's shortfalls such as low productivity, especially among smallholder farmers, which are increasingly being exacerbated by weather related extremes.

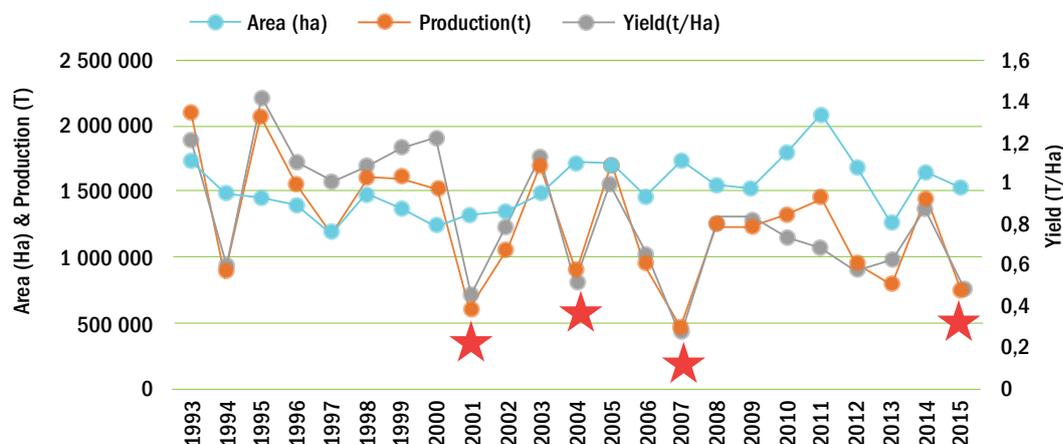
The dominance of smallholder farmers (89 percent) who rely on rain-fed production and have limited resources and assets makes agrarian livelihoods risky and human welfare vulnerable to shifting weather patterns (Moyo and Yeros, 2005). Over the past 15 years, Zimbabwe has experienced significant decreases in its agricultural GDP growth as it has been restricted by both structural challenges in the economy and shocks and stresses related to climatic variability especially the frequency of weather related extreme events, i.e. below normal rainfall years, and longer and more recurrent dry spells (see Chapter 2). For example, the years 2001/02, 2004/05, 2006/07, 2011/12, 2012/13 and 2015/16 were drought years with rainfall below the mean (Figure 3.6).

Crop production

Zimbabwe's main agricultural products are maize, sorghum, millet, wheat, cassava, cotton, tobacco, coffee, sugarcane, peanuts and live-stock. Maize is very sensitive to temperature and precipitation changes, hence production is affected seriously by weather related stresses and shocks. National trends of the main cereal crops point to a fluctuating trend in both yields and production. These fluctuations are mostly driven by weather related patterns and availability of

Figure 3.7 National trends for maize production, 1993 to 2015

Source: Ministry of Agriculture, Mechanisation and Irrigation Development, Zimbabwe National Crop and Livestock Assessment reports and Zimbabwe National Budget Statements



inputs (seeds, fertilisers, chemicals, electricity), although structural issues and the poor macroeconomic environment also come into play (World Bank, 2016a).

The Intergovernmental Panel on Climate Change (IPCC) forecasts a 20 to 50 percent reduction in yields of staples in southern Africa (IPCC, 2014). This outcome is already evident in Zimbabwe as the decline in maize production (Figure 3.7, above) over the past 15 years is closely related to seasons with drought conditions or prolonged mid-season dry spells (2001/02, 2004/05, 2006/07, 2011/12, 2012/13 and 2015/16) (see also Chapter 2).

The photo shows the effects of drought on maize production in Sanyati District during the drought season of 2004/05. This farmer is a representative of the majority of smallholder farmers in drier agro-ecological regions whose reliance on dryland cultivation makes them vulnerable to losses in incomes when crop failure is experienced. Therefore, the continued frequency of drought conditions, heat waves and long dry spells will impact negatively on the incomes realized from crop production from farmers with limited alternative livelihood options that are not climate sensitive.

Drought and increased temperatures

A study by Mano and Nhemachena (2006), which examined simple scenarios of how agri-



Poor plant growth of maize crop- an AI small-scale farmer in Sanyati District during the 2004/5 farming season

Source: Chigumira (2006)

cultural production would respond to climate change, indicates that under uniform scenarios, a 2.50C increase in temperature would result in a decrease in net farm revenues by USD 0.4 billion for all farms. Moreover a 7 to 14 percent decrease in precipitation would result in a fall in net farm revenues by USD 0.3 billion on all farms. Farms that use irrigation showed net in-



Submerged fields in Tsholotsho District after cyclone Dineo in 2017
 Source: Memeburn (2017)



Homesteads affected by floods in Tsholotsho district
 Source: Memeburn, (2017)

creases in revenue under both increased temperatures and reduced rainfall.

These studies concurred with projections made by Magadza (1994) of how agriculture in Zimbabwe is sensitive to climate change as an increase

in ambient temperatures by 20C would significantly lower agricultural yields and reduce the plant crop growth period, particularly during the grain filling and ripening stages.

Heavy rainfall, hailstorm and floods

Floods result in the displacement and loss of land livelihood assets such as crops, livestock and machinery of rural communities, which consequently affects farming and livelihood activities (Tarisayi, 2014). Floods destroy crops (see photo) at all stages of growth and negatively affect agrarian livelihoods.

The indirect effects of floods include loss of human life and livestock, increase in water-borne human diseases (discussed in Chapter 5), reduced access to natural capital such as forest products for food and income, and destruction of infrastructure such as roads, small dams and bridges. Floods particularly affect those who grow perishable products (horticulture), by destroying roads and bridges during flooding episodes, making them unable to send products to market in a timely manner.

Destruction of water reservoirs such as small dams makes communities vulnerable to future drought or long dry periods, particularly those that rely on these dams for low end horticulture production. Moreover, floods result in temporary displacement of households and short term loss of productivity and incomes.

Indirect effects of climate change on crop production

At the national consultations across the ten provinces of Zimbabwe, stakeholders noted that the variability in climate and increased frequency of droughts and long dry spells were affecting rural agro-based livelihoods negatively. Generally, stakeholders cited reduced incomes because of loss of jobs and poor harvests. Livelihood sources and options have declined in most rural localities. Other indirect effects of climate change are related to loss of opportunities to provide casual labour. Many households rely on providing casual labour as a form of employment and income. Findings of ZIMVAC from 2002 to 2016 show a general decrease in casual labour opportunities compared to the pre-2000 period (ZIMVAC 2004, 2014, 2016a), especially in

Reported stories of horticulture farmers on the impacts of heavy rains and floods in Umguza District

Loss of crops

“The rains are too much to a point that they are flooding up the ridges that we made. When the tomato plants are in water for more than 12 hours, they die and as it is, we have already lost a lot of plants. With the plants we have already lost, and if we continue to lose more due to rain, we may face a situation where demand will be more than what we can supply,” said Mr Ncube.



“We had about 70 000 cabbage seedlings of which about 30 000 died because of the rains and we managed to plant the remainder. We also lost all of our pepper plants in the fields and some of the okra plants are also dying.” Said Onias.

Damage to infrastructure: roads, bridges, machinery

“The bridge that we usually use is now often flooded and we are forced to use the alternative road which has potholes and mud. This is causing delays in the transportation of our produce to the market,” said Mr Ncube.

“Continued rains have prevented us from planting maize since Christmas, last year. We are failing to disk because it is too wet and tractors get stuck in the mud when we try to drive in the fields.” said a farmer from the same area.

Source: Sunday News (2017)

communal areas. The combination of drought, frequent dry spell years and the economic difficulties faced even by relatively better off farmers has resulted in the decline in opportunities for casual labour as a source of income.

Livestock production

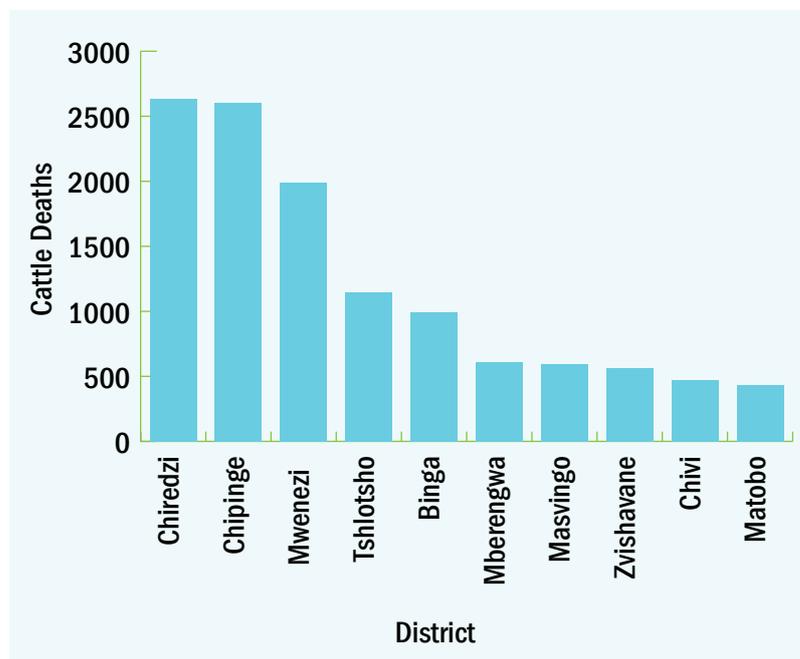
Cattle are our source of wealth and income as Africans and as Zimbabweans in particular. We are losing a lot of cattle as the drought continues and we do not know how we are going to send children to school in the near future as we rely on cattle for our livelihoods. Mwenenzi villager 2016 (New Zimbabwe, 2016).

Livestock, especially cattle, are an important source of food, income, capital and draught power as well as a safety net for individuals and households. The impacts of climate change are expected to heighten the vulnerability of livestock systems and reinforce existing factors that affect livestock production (Ruset and Ruset,

2013). Ownership of livestock, especially cattle, in rural areas, is a key asset that measurably reduces household vulnerability to the shocks and stresses associated with natural and human induced hazards (Shewmake, 2008). When households lose livestock and the herd sizes become smaller during a drought period, they are plunged into transient and/or chronic poverty.

Drought and increased temperatures directly and indirectly affect livestock production. They reduce pastures as they cause ecosystem degradation (i.e. through, moisture deficiency that results in poor forage and increased veldt fires). Cattle and small ruminants are grazed at high stocking rates in most communal lands and their numbers and productivity fluctuate drastically when there is limited rainfall and a reduction in forage (Gambiza and Nyama, 2000). Primary productivity of rangelands and quality of plant material and fodder will be altered by increased temperatures which reduce the nutrient availability to animals (Thornton et al., 2007;

Figure 3.8 Drought related cattle deaths in the ten most affected districts of Zimbabwe
 Source: UNDP (2016b)



Heat stress on cattle during El Nino induced drought of the 2015/16 season
 Source: Manica Post (2016)

Government of Zimbabwe, 2016).

Loss of livestock is likely to occur from heat stress, water stress and malnutrition (through lower feed conversion rates). Campbell et al. (2000) observe that cattle numbers in Zimbabwe increase during years with above average rainfall, whereas numbers decline dramatically in drought years. For example, the 1991/92 drought which ravaged most of southern Africa killed more than one million cattle in Zimbabwe (SARDC, 1994) and left many rural households food insecure and poverty stricken.

The drought and extremely high temperatures observed in the 2015/16 farming season, which were driven by one of the strongest El Niño events over the past 35 years (UNDP, 2016b) had devastating impacts on rural households especially those in Regions IV and V that rely on pastoralism as a livelihood. Figure 3.8 shows cattle deaths in the ten most affected districts in the 2015/16 farming season. The highest rates of death resulting from this El Niño induced drought were recorded in the southern districts of Chiredzi (2 638), followed by Chipinge (2 600) Mwenzezi (1 993), Tsholotsho (1 145) and Binga (993). These are the same districts that were classified as having inadequate to critically inadequate grazing land during the same season.

While Figure 3.8 presents effects on cattle, observations from UNDP (2016b) and the ZIM-VAC rapid assessment (2016a) also show losses in smaller ruminants such as goats and sheep because of the drought. Keeping small ruminants are often a key coping strategy for rural households, and associated losses severely compromise household wellbeing and increase their susceptibility to chronic poverty.

Moreover, drought and increasing temperatures lower the reproduction/calving rates of livestock, particularly cattle, and decrease the herd size in hotter areas (Sango, 2013). Scoones' (1992) study indicated a general shift towards smaller herd sizes, particularly of cattle, in Zimbabwe resulting from mortality and loaning out of cattle during drought periods. His study showed that in the 1982 to 1984 drought, households without livestock doubled, while birth rates of livestock were affected severely and actually fell to zero at the peak of the drought. Heat wave conditions associated with climate change have caused a 10 to 14 percent reduction in milk production in dairy cattle (Ruset and Ruset, 2013). Dairy cattle do not often recover even after conditions return to normal (Valtorta et. al., 2002).

Increases in temperature, affect the spatial distribution and increase the intensity of existing pests, and diseases which, in turn, affect livestock productivity or may cause death of livestock in extreme instances. Usually smallholder farmers' animals are not fed protein supplements, or dosed and vaccinated against diseases.

The box below provides some of the stories

Community voices on the gendered impacts of climate change and on rural livelihood assets in Chiredzi and Mbire Districts

Women's stories from Chiredzi District

I am a widow and my husband left me with ten head of cattle when he died. I was a better widow than other widows who are usually left with nothing and have nowhere to start from. I had hoped that I would be able to look after my children and be able to send them to school. Now all this hope has gone up in smoke because of the devastating drought that we have experienced in the past two to three years. I have never experienced such as desperate situation before.

Four of my cattle died within a week, although my children and I desperately tried to feed them from tree leaves and zombwe tubers and we travelled several kilometres to fetch water for them. We realised that we were going to lose the remaining livestock because the drought was getting worse so we made the very painful decision to sell the remaining ones. We managed to sell them for between USD 60 and USD 80 because they were skinny and could barely walk and, therefore, they could not fetch the usual market price of between USD 300 to USD 400 per beast. This was a huge loss for us, but at least it was better than losing the cattle to drought for nothing. It was devastating for we now do not have any assets to cushion us from the effects of drought. I don't know what to do or what to expect tomorrow. I put everything in the hands of God. *A widow in Ward 24 of Chiredzi District.*

I used to own more than 50 goats, now in a space of a year I have nothing. I had to sell the goats to feed my grandchildren. Now I have nothing to sell anymore. If I was young I would go to the shops and get a man like what these other girls are doing (laughs), but now who would want old bones like me? I have nothing; I don't know how we will survive. *A 70 year old woman looking after orphaned grandchildren in Ward 1 of Chiredzi District.*

Women's stories from Mbire District

We have had three consecutive seasons of hunger, and we have no grain left in our granaries. We used to rely on cotton which was our main cash crop, but the fall in prices to 30 cents per kilogram from a high of 85 cents per kilogram has left us with no option but to abandon the crop because it is useless to grow the crop as we suffer for nothing. We tried maize, but it does not do well here because of poor rainfall. Now we are facing a disaster. I used to own eight goats, but I have sold all of them to buy grain and now I have nothing left. My family has to rely on 'manyanya', a wild tuber which is poisonous if not prepared properly. It does not taste nice and it also leaves wounds in the mouth if you eat it regularly as we do. We eat it because we have no choice but just to keep body and soul together. *In-depth interview with a widow in Masoka Ward of Mbire District.*

shared by communities on the impacts of drought on livelihood assets in a study undertaken by UN Women in 2016 in Mbire and Chiredzi Districts. These findings are similar to those reported by stakeholders at national consultations for this report.

Floods and cyclones pose direct and indirect threats to livestock production in the country. They result in direct loss of livestock and indirectly affect livestock by destroying infrastructure such as dip tanks and paddocks. This, in turn, increases their susceptibility to malnutrition, pests and disease. Flooding that occurs at an unexpected scale and with increased fre-

quency causes damage to life, livelihoods and the environment (Tarisayi, 2014).

Moreover, cyclones and floods place pressure on households to dispose of their productive assets. The income realised from such livestock sales may not be enough to satisfy the food and domestic needs of a household, especially when grain is obtained from the open market where it is sold at exorbitant prices (Sango, 2013).

Coping strategies for crop production and livestock livelihoods

Most stakeholders reported that asset stripping



Pelagic fish (kapenta)

Source: Catholic Relief Services (2016)

was a key strategy adopted by individuals and households in rural areas that are faced with climate related hazards such as drought. Asset stripping involves the sale of assets such as livestock, houses, household utensils and farming equipment, or barter trading assets for food. In many cases, households resort to selling livestock but often the prices they realise from the sale is dependent on the level of desperation of that household. This means that households or individuals often get prices below the market value for their livestock. For example, in the 2015/16 El Niño induced drought, cattle prices plummeted from USD 400 to as low as USD 50 in Masvingo Province, and to USD 30 in Chiredzi, Mwenezi, Chivi and Bikita districts as buyers took advantage of the situation that the communities were in (ZIMVAC, 2015, 2016a).

Climate change effects on fisheries

Zimbabwe has 132 fish species, of which 30 were introduced for angling and aquaculture (Feresu, 2010). The Nile tilapia and the Lake Tanganyika sardine, commonly known as Kapenta, are the main exotic species found in Zimbabwe.

In addition the breams (the Nile tilapia, greenhead tilapia, redbreast bream and the largemouth bass) are some of the common species found in Zimbabwe (Feresu, 2010). Much of the fishing industry centres on the harvest of kapenta in Lake Kariba, though other species are also exploited by small scale commercial, artisanal and subsistence fisheries. Other fish-

eries include Lake Chivero, Lake Mutirikwi and Lake Manyame. Fish is also caught in communal areas in rivers and small to medium sized dams scattered throughout the country (Feresu, 2010).

Fishing is integral to single and mixed livelihood strategies. Fisheries, especially the fishing of kapenta, serve as a vital safety net for people with limited livelihood alternatives and extreme vulnerability to changes in their environment. Fishing communities in Kariba, Binga and Mbi-re that depend on inland fisheries resources are likely to be particularly vulnerable to climate change. The kapenta fishery or pelagic fisheries play a pivotal role in sustenance of livelihoods for communities in the agro-fisheries livelihood zone and for people who sell fish to residents of urban and rural areas across the country.

Climate change and variability are compounding other stresses, such as over exploitation, pollution, habitat degradation, and invasive species, that affect fish productivity and threaten the livelihoods of fisheries dependent communities (Ogutu-Ohawu et al., 2016). Freshwater fisheries in Africa as well as on other continents have recorded reduced productivity caused by climate change (Murisa-Ndebele et al., 2011). Inland fisheries are directly threatened by climate change through reduced precipitation, greater evaporation and, indirectly, when water is used for irrigation to offset reduced rainfall (Brander, 2007). Increasing water temperatures affect individual fish by altering physiological functions such as thermal tolerance, growth, metabolism and reproductive success (Murisa-Ndebele et al., 2011).

It's hard for fishermen when there is drought. I'm depending on the lake. All what I am getting is coming from the lake. (Tendai, Catholic Relief Services, 2016).

Declining fish levels and fishery yields in water bodies have been attributed to the compounding effects of climate change, particularly through increased temperatures and declining water levels (Marshall, 1998; Murisa-Ndebele et al.; 2011; Marshall et. al., 2014; Catholic Relief Services, 2016).

The fishing has been affected by the lower level of water because we used to catch lots of fish.

Now, there is nothing. (Edward, Catholic Relief Services, 2016).

Low water levels, especially in drought years, increase the problem of over harvesting of fish especially by individuals without licences, and make the commercially available product more expensive as fishermen are forced to spend money on travelling to deep waters. In the study by Catholic Relief Services, communities around Lake Kariba commented that the lake was a solution to feed their families, to earn money, or simply provided fish as a last resort for survival.

Climate change effects on non-timber and forest products

Rural communities have adopted alternative livelihood activities, such as firewood trade, sale of wild fruits to middlemen who resell them in the urban areas, honey production and caterpillar harvesting as income streams (Dube and Phiri, 2013). However, these alternative livelihoods are dependent on rainfall quantity and distribution. For example, honey production is affected by inadequate or erratic rainfall because of the impact of this on caterpillar and bee survival.

Climate change affects seasonal livelihood opportunities, especially those related to harvesting of natural resources like mopane worms and thatch grass. The thatch grass is now limited because of degraded grasslands. The availability of the seasonal mopane worm (caterpillars)

and its gathering, preservation and selling are threatened by the frequency of dry spells and drought. Consequently, this limits food and income opportunities for households, particularly for those that are resource poor

Climate change effects on small scale mining and brick moulding

Gold panning and small scale artisanal gold mining have emerged as alternative or complementary livelihoods to farming, especially among unemployed young people. Incomes obtained from panning augment household incomes or are used to purchase productive assets (machinery, inputs, etc). While gold panning has resulted in environmental degradation and has triggered land disputes, this livelihood source is also vulnerable to weather extremes such as heavy rains and floods. These conditions make it difficult and unsafe to mine, and subsequently reduce the ability of people to make a living and supplement household incomes during the rainy season.

Brick moulding is affected by reduced rainfall and droughts because it utilises large quantities of water. On the other hand, its practice has the negative effect of placing strain on the limited water that is available.

Climate change effects on tourism

Tourism is one of Zimbabwe's important economic sectors. Its total contribution to the country's (GDP) for 2016 was 8.1 percent (Turner and

An interview on the decline of mopane worms and thatch grass.

An interviewee from Tsholotsho, in a study done by Tarisayi (2014) observed the following changes in the availability of mopane worms in his district that are a clear indication of the effects of climate change on his livelihood options.

I was born in 1942. There were lots of mopane worms when we grew up, there was no hunger, we used to have them for relish and everything was good. When we went to school our fees were paid using income from the sale of mopane worms. We got married still depending on mopane worms for our living, we sent our children to school using income from mopane worms. Mopane worms have become fewer... sometimes we are not having them for about five years...because of the lack of rain...we do not know if this is the cause of the non-availability of the worms.

Currently we are no longer able to raise income through the sale of thatch grass. Thatch grass has always been an important way of raising income to cover various household needs. Nowadays the quality of the grass is poor and the quantities have been reduced.

Table 3.3 Ecotourism projects in Zimbabwe

Derived from Child et al. (2003); ZIMVAC (2010)

Livelihood Zone	District	Ecotourism Project
Eastern Highlands Prime Communal	Chimanimani	Forest protected for ornithological ecotourism and cultural rites
	Nyanga	Gaerezi River and surroundings protected for ecotourism
Greater Mudzi Communal	Mudzi	Nyatana Wilderness Area
Northern Zambezi Valley	Rushinga	Nyatana Wilderness Area
	Uzumba-Maramba-Pfungwe	Nyatana Wilderness Area
Highveld Prime Communal	Mazowe	Mwenje Fishery Project
Banje mountain reserved for ecotourism		
Beitbridge and South Western Lowveld Communal	Matobo	Ntunjambli Caves
Eastern Kalahari Sandveld Communal	Nkayi	Bee-keeping
Ilala palm plantation		
Beitbridge and South Western Lowveld Communal	Bulilima and Mangwe	Mopane worm harvesting
Northern Zambezi Valley	Pfura	Bamboo forest protection
Highveld Prime Communal	Goromonzi	Ngomakurira hills and caves
Eastern Kalahari Sandveld Communal	Manyame	Woodland area preservation
Irrigated Commercial Sugar and Fruit Farming	Mwenezi	Manyuchi Dam protected

Freiermuth, 2017). Climate change has impacts upon wildlife and water based tourism indirectly through changes in water and vegetation. Hydrology models for Africa suggest reduced runoff as a result of climate change (Hulme, 1996). Declining water levels reduce aquatic life and water levels for fishing and recreation. According to the IPCC (2007) the 1991/92 drought period resulted in reduced river discharge over the Victoria Falls. This reduced flow resulted in a reduction in the spray that maintains the rain-forest resulting in the death of its flora and fauna (IPCC, 2007).

Community based natural resources management programmes, such as Zimbabwe's Communal Areas Management Programme for Indigenous Resources (CAMPFIRE) and ecotourism are important livelihood activities for many rural communities, particularly those based in agro-ecological regions IV and V, which are marginal for crop production (Manwa, 2003; Frost and Bond, 2008). The CAMPFIRE programme was designed to enhance rural livelihood options through managed utilisation and sale of natural resources. Most community based natural resource management projects

focus on activities such as wildlife and trophy hunting, fishing, beekeeping, and art and crafts.

Frost and Bond (2008) point to increased off-farm sources of income for women, especially through employment in lodges and revenue accrued from sale of natural resources. In addition, the revenue from safari hunting is invested into agricultural technologies and infrastructure, such as boreholes, schools and clinics in these marginal communities.

Naturally, following on the successes of CAMPFIRE projects, community led development in Zimbabwe's rural localities expanded into ecotourism. Ecotourism provides an opportunity for localised employment creation and sustainable development for communities that are marginally poor and located in areas with little development and investment. Examples of ecotourism products are cultural villages in Binga, Umzingwane, Matobo and Pfura (Child, 1996; Child et al., 2003). Table 3.3 highlights areas in which ecotourism is established in the country by livelihood zones.

However, community based natural resource

Table 3.4 Potential effects of climate change on community based natural resource management activities

Derived from Child et al. (2003); ZIMVAC (2010)

Livelihood Zone	District	Ecotourism Project
Veld management	Chipinge, Chiredzi, Gokwe North	<ul style="list-style-type: none"> Increased incidence of uncontrolled veld fires Lack of fodder for livestock
Ecotourism	Muzarabani, Guruve, Gokwe North, Binga, Chimanimani, Mazowe, Goromonzi, Manyame, Pfura, Buhera, Matobo	<ul style="list-style-type: none"> Extreme weather conditions will make tourism sites less appealing thus attracting fewer tourists. Decline in tourism revenue Tourism sites such as rivers might dry up due to excessive heat
Game corridor/wildlife management	Gokwe North, Gokwe South, Uzumba-Maramba-Pfungwe (UMP), Mudzi, Rushinga, Nkayi, Umguza	<ul style="list-style-type: none"> Fragmentation of habitats and ecosystems Reduced amounts of vegetation Altered phenology
Fisheries	Hwange, Binga, Mwenezi, Mazowe, Chimanimani	<ul style="list-style-type: none"> Extinction of climate sensitive fish species Lower fish production Alteration of water conditions optimal for survival
Aquatic resources	Beitbridge	<ul style="list-style-type: none"> Depletion of aquatic resources Increased scarcity of water
Natural resource rehabilitation	Gwanda	<ul style="list-style-type: none"> Biodiversity loss Decrease in agricultural productivity Deteriorating water supply Deforestation Erosion Loss of soil fertility
Bamboo and forest products	Pfura	<ul style="list-style-type: none"> Decrease in production of forest products Increased probability of forest fires
Crafts	Beitbridge and Umzingwane	<ul style="list-style-type: none"> Scarcity of grass material needed for craft production
Beekeeping	Binga, UMP, Mutoko, Nyanga, Hwedza, Chirumanzu, Mutasa, Kusile, Matobo, Mudzi	<ul style="list-style-type: none"> Altered plant phenology cycles Reduced pollen and nectar availability Reduced honey production Loss of income dependent on honey production
Woodlots	Umguza	<ul style="list-style-type: none"> Deforestation Forest fires

management and ecotourism are susceptible to the effects of climate change. The increased frequency of drought, heatwaves, wildfires and flooding threatens ecosystems and the wildlife habitat through the reduction in forage and water sources. They also pose direct harm to wildlife and forests from which non-timber forest products are derived, and from which income

and revenue are obtained. These effects also trigger increased competition for natural resources, destroy habitats and decrease wildlife populations. Table 3.4 highlights some of the direct and indirect effects of climate change on community based natural resource management and ecotourism.

Impacts of Climate Change on Urban Livelihoods

In Zimbabwe, urban livelihoods are directly and indirectly affected by climate change. The negative impacts of climate change are compounded by many factors that include poverty, high human population density, unemployment, and poor infrastructure and governance structures. Hardships experienced by urban families may reduce remittances to their rural kin. Similarly, crop failures caused by drought in rural areas undermine food security, among urban households.



Flooding of retail shops in Zimbabwe's high density suburbs

Source: *The Herald* (2017)



The effects of heavy rains on Zimbabwe's roads

Source: *Zimeye.net* (2017)

Drought and increased temperatures

Zimbabwe is a water scarce country, and the frequency of dry spells and drought (see Chapter 2) places increased pressure on water quantity and quality. Urban communities are extremely dependent on reliable delivery of utilities such as water and electricity. When climate change puts the provision of these utilities under strain, urban dwellers are more helpless than their rural counterparts who at least can dig wells and fetch firewood for cooking. Moreover, reduced or disrupted water supply and electricity have an impact on industrial productivity and viability, livelihoods dependent on low input market gardening, especially among the urban poor, and human health (see Chapter 5). As such, they cause an overall decline in living standards.

Drought or flood years are often associated with increased cost of living because of rising costs, particularly of food, as a result of reduced agricultural yields (Long Term Adaptation Scenarios, 2014). In a study carried out in Epworth, increases in food prices associated with drought affected both household consumption and incomes derived from informal food vending (Consuming Urban Poverty, 2017).

Heavy rainfall and floods

Extreme events such as cyclones and their associated storm surges and inland flooding have serious impacts upon infrastructure and livelihoods, particularly those derived from the informal sector, in urban areas. Cyclone related flooding and heavy rains damage roads, bridges, shops, houses and other infrastructure.

Cyclone Dineo (2017) which occurred after the review period but during the writing up of this report, left many parts of southern Zimbabwe (Masvingo, Beitbridge, Bulawayo) flooded and destroyed infrastructure, which requires maintenance and reconstruction (Long Term Adaptation Scenarios, 2014).

Business incurs losses from floods when trading is halted, products are destroyed and repairs are needed to deal with flood and water damage. Moreover, the informal sector, particularly street vending, is affected adversely by heavy rainfall and floods as vendors cannot operate their businesses. Often their livelihood and food security

are highly dependent on income derived from daily sales of commodities. Studies are yet to be undertaken in Zimbabwe on the economic impacts of floods on urban formal and informal businesses. However, studies worldwide point to considerable net losses in income and profits (Ziervogel, 2014).

Illegal, agriculture is part of Zimbabwe's urban and peri-urban landscapes, providing livelihood opportunities and food relief for many food insecure and income poor households. It is expected that climate change (through increased rainfall potential), may have a positive effect on urban agriculture and productivity, because of the location of cities and towns in high potential natural farming Regions I and II (Chigumira and Mbengo, 2016). However, it is anticipated that the temporal and spatial variation in rainfall across most urban localities will lead to conflict amongst urban communities, particularly in terms of access to areas for cultivation, especially in wetlands because of their high fertility and moisture content.

On the other hand, firewood collection and sale as a livelihood strategy has adverse effects on urban climates. In recent years there has been a notable depletion in forests and woodlands, which have been cut for firewood (for both domestic and industrial use), around the peri-urban areas. Cutting of trees without replacing them results in deforestation which reduces the mitigation potential of the country by reducing the carbon sinks.

Impacts of Climate Change on Vulnerable Groups

Climate Change and Women's Livelihoods

The 2015 HDI for females was lower than that for males (0.496, compared to 0.535) (UNDP, 2016b) (also see Chapter 2 for further details), which indicates the feminisation of low human development. Women across Zimbabwe are disadvantaged in terms of control of resources and the means of production, inequality opportunities, and the disproportional burden of unpaid care and domestic work. Women face a range of challenges, including poor access to land, capital, labour, mechanisation, irrigation infrastructure, etc., to their participation in highly capitalised enterprises, and this constrains their ability to adapt to or mitigate climate related stresses (especially in agriculture) (Matondi et al., 2013).

Box Story: Women and asset stripping when faced with shocks and stresses

I had more than six goats and several chickens but we have sold all these to enable us to buy food for the family. The goats and chickens were mine, thus I had no problems with selling them. I just informed my husband and he did not object. After finishing selling the goats and chickens, I tried to persuade my husband to at least sell one of his eight cattle but he flatly refused, arguing that we should find other means of raising money for food. However, five of the cattle died of hunger and we did not get anything from them. He tried to sell the remaining ones but could only get USD 50 per beast because they were skeletons. Now he refuses to release the money saying he wants to use it to restock. *In-depth interview with a woman in Ward 1, Chiredzi.*

UN Women (2016)

The GDI for Zimbabwe stood at 0.927 in 2016, placing the country on medium to low equality in terms of human development achievements (See Chapter 2). Furthermore, Zimbabwe's value for the GII was 0.540 for 2016 and the country was placed 126 out of 159 countries (UNDP, 2016b) (see also Chapter 2). The GII for Zimbabwe shows that women's empowerment in terms of education and representation in Parliament and other decision making bodies, reproductive health, and participation on the labour market which stands at 77.8 percent, is lower than that of men, at 87.3 percent.

Women in Zimbabwe are mostly found in lower paid, irregular and informal employment or as own account workers (mainly vending) (ZIM-STAT, 2016b), which, as already mentioned, are prone to the vagaries of climate. According to the Food and Agriculture Organisation (FAO), women constitute 53 percent of the agricultural labour force in Zimbabwe, yet they do not have equitable access to productive resources and assets (ownership of land, capital, finance and equipment). These imbalances or inequalities are key factors in determining vulnerability, and how women or communities cope with and recover from climate change events (UNDP, 2016a).

Climate change has made women more vulnerable to food and livelihood insecurity. In cases of drought, women's economic positions are affected adversely because they tend to adopt depletive asset stripping strategies to meet the imme-

Box Story: Women and access to information in Binga District

The gendered perspective employed in the fieldwork undertaken in two communities, Ward 8 and 12 in Binga, considered the differences between men and women and how these two groups ranked or prioritised hazards within their localities. Foremost, women were under represented at the community meetings where focus group discussions (FGDs) were conducted. In Ward 8, only seven women compared to 24 men attended the FGDs, with Ward 12 showing a similar trend of 26 men versus eight women. The age of the male participants ranged from 30 to 72 years, while that of women ranged from 23 to 45 years. These demographic data highlight two important issues raised by Masson et al. (2013) which are: (a) the social exclusion of women by age, and (b) women's lack of access to information. In both wards, women indicated that information about the meeting had not trickled down to them and some had accidentally walked into the meeting and then joined the women's FGD.

Most women in these FGDs complained that the dissemination of information was almost always done at the shopping centres and beerhalls, which are mostly frequented by men. Women who are seen in beerhalls are subject to verbal abuse or labelled as prostitutes. Most women dared not frequent these male dominated spaces and therefore failed to receive information on important development issues. The issue of time poverty came out as another key reason for women's failure to attend the FGDs. The early morning schedule for the FGDs meant most women were undertaking domestic chores and preparing children for school. As such, development interventions or programmes are shaped by male-centric views because of women's inability to attend meetings or failure to receive information about these meetings.

Some of the solutions proposed in the FGDs were for information to be disseminated at schools. Most women felt that they were likely to receive information via their children. The younger women suggested the use of cellphone text messaging services or android phone applications such as Whatsapp and Viber for effective dissemination of messages.

Source: UNDP (2016a)

diate needs of the family. Traditionally, women control small livestock and these are the first to be sold when a climate related hazard occurs, primarily because small livestock are considered as quick and easy to sell off and often men are reluctant to de-stock.

Because women have no capital for purchasing animal medication, they are likely to lose livestock when there are temperature extremes. Livestock value depreciates when they are attacked by pests and diseases, resulting in reduced market prices and diminished incomes. Viewed through a gender lens, climate related hazards such as droughts, and frequent prolonged dry spells and floods, are more disempowering to women than men (UN Women, 2016).

Variability in rainfall makes agricultural work more labour intensive and, in many cases, women become increasingly overburdened with the

additional work while having the least access to necessary inputs (IAASTD, 2009). A lot of women are forced to walk longer distances in search of water. This cause time poverty and has negative effects upon their health (Adger, 2000). The time pressures (time poverty) on women in rural areas who have to collect water and firewood often mean they have fewer hours to spend on productive, income generating livelihood activities than men do (Quisumbing and Pandolfelli, 2010) or to devote to coping strategies like internal lending and savings that require time and commitment (UNDP, 2016a).

Findings by the ZIMSTAT (2012) and UNDP (2016a) indicate asymmetries of information dissemination and access to ICTs along gender lines. The gender digital divide, described in the box below highlights the need for women to be exposed to ICTs, such as radio, television and cellular phones which can facilitate access to in-

formation and enable participation in development and climate related activities.

Women, especially many female heads of household in rural areas, do not receive adequate climate information and hence are not able to make appropriate climate related livelihood decisions. This results in the continued impoverishment of women. Moreover, the gender digital divide especially in rural areas marginalises women and renders their livelihood activities vulnerable to climate change. Despite the increase in internet penetration rate, from 15 percent in 2011 to 20 percent in 2012, rural women's internet access is only 0.07 percent (ZIMSTAT, 2015). This means that women have no access to near real time information on market prices or weather information which could guide their agricultural decision making.

The effects of climate change on children and youth

Youth comprise a significant proportion of Zimbabwe's labour force (53 percent) (ZIMSTAT, 2012, 2015a) but young people suffer disproportionately in labour markets, with unemployment being worsened by climate change (UN, 2014). About 48.6 percent of youths are employed in agriculture, which is sensitive to weather related shocks and stresses (ZIMSTAT, 2015a). Only

five percent of youths are in paid employment, while about 80 percent undertake unpaid work and the rest are self-employed (mostly in the informal sector) and/or own account workers (ZIMSTAT, 2012, 2015a; Muyengwa, 2015).

Extreme weather events prevent young people, especially females, from engaging in higher education because of the need for them to contribute economically to households, which increases with age (See Chapter 6). When seeking employment, they are forced to look for jobs in the informal sector, where young people are over represented and vulnerable to lowly paid and low quality jobs, especially if they have migrated to another country to seek employment (UN, 2014).

Gender disaggregated data show that unemployment amongst the youth is higher for girls and women and that they are more likely to undertake unpaid work. Unfortunately, large populations of youth undertake illicit activities as a means of survival with many males resorting to illegal mining and the sale and use of narcotics. Females may be forced to engage in prostitution if there is no alternative livelihood activity in their area (UN, 2014).

Box Story: Case study of male out-migration in Binga

Women at a focus group discussion in Binga indicated that the high poverty rate and lack of alternative livelihood strategies for income diversification affected the community adversely, especially the young people. They reported that young girls partnered with older men as a survival strategy and were consequently exposed to HIV, early pregnancy and early marriage, which led to them dropping out of school. In addition to this, they reported a high prevalence of single mothers caused by the migration of men, including young men, from Binga. Most male migrants were said to never return nor send remittances. Some of the comments made by women at these focus group discussions were:

Because of the poverty in this ward, some households do not have food at home, this results in our young girls entering into relationships with men (mostly older) who can provide for their needs. They end up pregnant, and then get dumped by these men. Now we have many single mothers in this ward.

My father left Binga when I was five years old to look for employment. He never returned. Now my husband has done the same thing. I have not seen him in three years. I have four children to look after on my own"

Source: UNDP(2016a)

The majority of the young people who participated in the UNICEF U-Report poll on climate change across the provinces in the country highlighted that they were knowledgeable about climate change and understood that it would have adverse effects on their ability to maintain sustainable livelihoods.

Climate-induced ecological stresses are likely to lead to increased out-migration and displacement. And these processes are often gendered as male out-migration is more common, leaving female headed households to fend for families (UNDP, 2016a).

Decision making power does not lie in the hands of women, because of a strong patriarchal culture in most parts of the country and thus the women left behind are not always empowered to make decisions for their families' wellbeing, which leaves them very vulnerable. Migration has been found to have both positive and negative impacts. Positive impacts are seen where remittances sent by the migrants become a major source of non-agricultural income for rural households, which then helps in offsetting shocks and stresses. However, in cases where there are no remittances or the spouse never returns to the rural home, negative impacts are experienced (UNDP, 2016a). This can result in the loss of social networks, leading to a decline in social capital, exploitation, and impoverishment of women.

Drought has serious implications for food security and agriculture based economies. If hunger is severe, there is a general trend whereby food expenditure increases and households neglect other critical areas such as investment in education (Mutasa, 2015). In the long term, this results in reduced livelihood and employment options for individuals.

Low income households are more likely to use child labour to augment income and avoid food insecurity, especially in years of crop failure. There is, therefore, a relationship between income or crop yields and the population of children seeking employment to supplement cash or food income in the household. The rate of child labour in rural areas is as high as 97.4 per cent (ZIMSTAT, 2015a). Responses by children aged up to 14 years in the UNICEF U-Report Poll on climate change indicated that 56 per cent

of households undertook food for work in order to combat food insecurity caused by climate change.

Effects of Climate Change on Social Safety Nets

There are several social safety nets that are used by households to reduce the negative effects of climate related shocks and stresses. Remittances have often acted as safety nets for households. They are used to acquire food for human and livestock consumption, and can be invested towards adaptation technologies (ZIMVAC, 2002; Dube and Phiri, 2013). However, at national consultations held during the development of this report, stakeholders indicated that the prevailing poor macroeconomic conditions, compounded by the high rate of deindustrialisation in the country, and the back-to-back droughts in the previous two years, had resulted in a decline in remittances to offset shocks.

Extended family ties, which often act as a social safety net, were seen to be collapsing as richer family members who were also struggling were finding it difficult to provide either food or monetary help to affected extended family members. There was also a decline in remittances from the urban areas to the rural areas. Stakeholders recommended that governmental departments responsible for social services be well financed in order to strengthen safety nets.

Given that Zimbabwe's economy is in recession and experiencing negative growth, and there are massive retrenchments because of deindustrialisation, it is not expected that there will be substantial remittances to rural homes in the near future. As such, out-migration is likely to be a key driver for declining wellbeing and vulnerability of rural households, particularly in localities found in remote, marginal areas.

Future Impacts of Climate Change on Livelihoods and Human Development

Zimbabwe has an extremely variable rainfall pattern (see Chapter 2) and climate change will intensify the variability, making it hard to predict the availability and accessibility of water for human activities, particularly agriculture. According to the USAID Country Development Cooperation Strategy (2016) climate change matrix, the south-western areas of Africa are projected to be at high risk from severe droughts

in the 21st Century. Climate models predict that Zimbabwe's climate will be warmer than the 1961 to 1990 baseline, with warming rates of 0.5 to 2°C by 2030 (USAID, 2015) (Also see Chapter 2). These projections point to a drying trend that will increase in intensity with time. As such, Zimbabwe will become both hotter and drier under climate change.

The potential impact of decreases in rainfall and increases in temperature will affect Zimbabwe's agricultural sector. Mano and Nhemachena (2006) note that a 7 percent decrease in precipitation would lead to a drop in farm level revenues of at least 27 percent.

The most serious impacts of climate change will be on the country's water resources. The World Bank, in partnership with the Government of Zimbabwe produced a report predicting that climate change is likely to lead to an annual rainfall decrease in all Zimbabwean catchments, except Mazowe and Manyame (Davis and Hirji, 2014). The largest decline will be experienced in the Runde and Mzingwane catchments where average rainfall could decrease by 12 to 16 percent by 2050.

The decrease in water availability will affect the quantity of water accessible for irrigation in agriculture, energy generation for mining, manufacturing and commerce, tourism and human health (Brown et al., 2012; Davis and Hirji, 2014). Climate change will also cause increasing dependence on groundwater sources as current surface water resources will dwindle in urban and rural areas, especially in the southern and western parts of the country.

Communities that have already been made vulnerable by economic hardships and increased disease incidence will find it even harder to cope under a changing climate. Climate change may make it difficult for poor people to increase their income and to accumulate assets, or it may lead to extreme cases 'poverty traps' (that is, when people own so little that they cannot invest to increase their income).

While evidence on the existence of poverty traps is mixed, surveys across the globe suggest that poor people experience slow income growth and slow recovery from shocks (Kraay and McKenzie, 2014). An agricultural study done by

Elbers, Gunning and Kinsey (2007) found that the impacts from increased weather risk, such as drought, result in the reduction of almost half of household income. Water shortages will cause disruption to the economy in the sectors of agriculture, industry and tourism, thereby threatening rural and urban livelihoods (Brown et al., 2012; Davis and Hirji, 2014).

Responses to Livelihood Challenges caused by Climate Change

The Government of Zimbabwe has responded to the challenges to livelihoods from climate change by putting in place policies, economic instruments and legislative frameworks and strategies that are conducive to human development.

Zimbabwe's national policy, economic instruments and legislative framework on livelihoods and climate change

The Constitution of Zimbabwe, which was adopted in 2013, enshrines the principles required for sustainable human development. The principles required for securing livelihoods and human development in the country are primarily enshrined in Sections 13 and 14, the provisions of which focus on national development and empowerment as well as employment creation (Government of Zimbabwe, 2013). Furthermore, the principles for human development are enshrined through the Constitution's catalogue of economic, social, cultural and environmental rights. Section 30 of the Constitution provides for the right to social security and social care, while Section 73 includes every person's right to an environment that is not harmful to their health or wellbeing, as well as an obligation to protect the environment for the benefit of present and future generations, through reasonable legislative and other measures. These rights are in line with Article 13 of the International Covenant on Economic, Social and Cultural Rights.

Similar to the Constitution, the Zimbabwe Agenda for Sustainable Socio-Economic Transformation (ZimAsset) aims to achieve sustainable development and social equity anchored on indigenisation, empowerment and employment creation that is driven by capitalising on the country's abundant human and natural resources (Government of Zimbabwe, 2013c). This medium term development plan recognises the nexus of economic stabilisation and increased

Table 3.5 Key policy and legislative frameworks that support livelihoods in Zimbabwe

Policy and Strategies Agriculture	Key provisions
Comprehensive Agricultural Policy Framework (2015-2035)	Recognises that the country is susceptible to droughts and looks at the development of sound strategies for combating the effects of climate change. Some specific parts of the policy focus on ecosystem services and include the expansion of irrigation in the smallholder sector, construction of dams, and efficient use and allocation of water. It is operationalised through the Conservation Agriculture Strategy.
Conservation Agriculture Policy (2010-2015)	Conservation agriculture is part of a package of climate smart agriculture initiatives that allows agrarian communities to adapt effectively to climate change and variability. The policy encourages the promotion and practice of conservation agriculture in Zimbabwe as a sustainable agricultural technology that increases crop productivity, while preserving and conserving the environment. Policy intentions are to increase and sustain agricultural production and farm incomes, thereby ensuring household income and livelihood options.
Zimbabwe Agriculture Investment Plan (2013-2017)	Aims to increase the production, productivity and competitiveness of Zimbabwean agriculture by building the capacity of farmers and institutions. It prioritises improved management and sustainable use of resources and aims to increase the participation of smallholder farmers in domestic and export markets.
National Policy and Programme for Drought Mitigation	Recognises the effects of drought on rural communities and encourages strategies that aid communities to adapt to climate change. These encompass planting early, choosing drought tolerant and early maturing seed varieties, water conservation measures, and cross breeding and selling of livestock.
Climate Change Policy and Strategies	Key Provisions
Climate Policy	Fits well into the Post-2015 global development agenda where climate change remains a key issue for sustainable development, specifically, SDG 13 on climate action. The policy seeks to reduce vulnerability to climate change and variability and to strengthen the adaptive capacity of the key economic sectors, such as health, water, agriculture, forestry and biodiversity. It commits Government to ensuring that mitigation and adaptation measures enhance agriculture based livelihoods, food security and poverty alleviation. It also calls on Government to strengthen the capacity of the National Meteorological and Hydrological Services and Climate Change Management Departments to carry out research on climate change through improved data collection and management, as well as climate modelling.
Zimbabwe's National Climate Change Response Strategy	<p>Provides a framework for a comprehensive and strategic approach on aspects of adaptation to and mitigation of climate change. It recognises the critical role of agriculture as sustainable development for Zimbabwe will hinge on a robust agricultural sector that supports rural and urban livelihoods.</p> <p>Provides a framework for a comprehensive and strategic approach on aspects of adaptation to and mitigation of climate change. It recognises the critical role of agriculture as sustainable development for Zimbabwe will hinge on a robust agricultural sector that supports rural and urban livelihoods.</p> <p>The strategic objective is to promote and enhance agricultural production, ensure food security and maintain ecosystem integrity.</p> <p>The strategies include:</p> <ul style="list-style-type: none"> • Developing frameworks for sustainable intensification and commercialisation of agriculture at different scales across different agro-ecologies. • Strengthening capacity to generate new forms of empirical knowledge, technologies and agricultural support services that meet emerging development challenges arising from increased climate change and variability. • Strengthening early warning systems on cropping season quality, rangeland conditions, droughts, floods, disease/pest outbreaks and wildlife movement, in order to enhance farmer preparedness. • Developing frameworks for supporting agricultural specialisation according to agro-ecological regions, including mechanisms for commodity exchange, trade and marketing.

Policy and Strategies for Social Protection	Key Provisions
Social Transfer Policy Framework	Aims to strengthen existing social protection systems, increase harmonisation across programmes, strengthen administration and ensure overall policy coherence to address the varied vulnerabilities of the population (Government of Zimbabwe, 2011). It provides a suite of assistance (education, health, nutrition etc.) together with cash transfers to identified families. It also includes initiatives that address food security, including agricultural input support for households that are not labour constrained, and a Public Works programme. Cash transfer schemes help to maintain, improve and upgrade the livelihood strategies of individuals, households and communities. They have a human development impact in moving households out of poverty. By providing cash to improve and upgrade their livelihoods and for training and looking for employment, vulnerable households can absorb and bounce back from climate related shocks and stresses.
Revised Indigenisation Policy (2004)	Identifies indigenisation as 'a real foundation for economic empowerment'. While the thrust of indigenisation and economic empowerment does not directly address environment and climate change issues, its emphasis on access to and control over natural and mineral resources and economic activities that can benefit all Zimbabweans makes it important in addressing the associated livelihood issues that constrain human development under a changing climate.
Revised National Youth Policy	In this report, youth have been identified as a group vulnerable to climate related hazards. The youth policy seeks to empower young people by creating an enabling environment and marshalling the resources necessary to undertake programmes. The aim is to develop young people's mental, moral, social, economic, political, cultural, spiritual and physical potential fully in order to improve their quality of life. Its focus on eradication of poverty and all forms of social and economic exclusion of the youth makes it important for promoting livelihoods and human wellbeing.
Gender Policy (2017)	Promotes the mainstreaming of gender in environmental and climate change policies and strategies. It recognises that women, in particular, are vulnerable to the impacts of climate change. The key strategies proposed in the Policy are anchored on increasing gender responsiveness in national policies and strategies on climate change adaptation and mitigation, disaster management and risk reduction, and coping mechanisms.
Zimbabwe National Employment Policy Framework, 2010	Fits well with improving Zimbabwe's human development under a changing climate. It provides approaches for promoting decent and productive employment essential for the eradication of poverty. The national employment policy framework seeks to provide the necessary coherent and coordinated approach, an integrated strategy for economic growth and job creation, and targeted interventions to help unemployed and underemployed people to overcome barriers to their entry into the labour market.
Information and Communication Technology Policy	Effective communication and early warning systems are crucial for maintaining climate resilient livelihoods. The policy provides strategic direction on how ICT development and application enables national socioeconomic transformation. The objective is to use ICT as an enabler to achieve the objectives of the four ZimAsset clusters. The policy recognises that ICT is not a standalone sector, but it is embedded in all national development strategies and is a tool to enable all economic sectors. At stakeholder consultations, the role of ICT was emphasised as being critical to information provision and dissemination, especially on agricultural production and early warning of climate hazards.

production in maintaining economic growth and human wellbeing.

The implementation of the ZimAsset is through four clusters, namely: Food Security and Nutrition; Social Services and Poverty Eradication; Infrastructure and Utilities; and Value Addition and Beneficiation. The ZimAsset addresses livelihood issues across all four clusters, with agriculture projected as the key driver for growth and employment. The thrust of the Social Services and Poverty Eradication cluster is to enable the Government of Zimbabwe to improve

the living standards of its citizenry and the country's economic growth. It recognises gender mainstreaming as central to social equity and improved human welfare. The four clusters are fundamental therefore for promoting and realising livelihood strategies that result in increased human development under the stresses and shocks of a changing climate and associated weather related extremes. Table 3.5 provides the key policy and legislative frameworks that support livelihoods that are associated with combating the effects of climate change in Zimbabwe.

Although most of these policies were not crafted for coping with climate change and livelihoods, some of their policy directions aid in building the resilience of communities and improving their livelihood opportunities under a changing climate. However, they might need to be revised to address more clearly the impacts of climate change on livelihoods. The detailed recommendations for the changes required to address climate change in existing policies and for introducing other relevant adaptation and mitigation policies are given in Chapter 7.

Programmes and interventions to address climate change and livelihoods in Zimbabwe

Zimbabwe's policy and legislative framework on livelihoods and climate change have created an enabling environment for the introduction of programmes and interventions by Government and allowed for civil society and development partners to complement government efforts.

Social safety nets

The initiatives in place are the Drought Relief Public Works programme, and the Harmonised Social Cash Transfers programme. The objective of the former programme is to supplement and quickly transfer incomes to the poorest households through temporary employment in labour intensive public works. It provides free cash assistance to the elderly, chronically ill and disabled persons. The able bodied benefit on condition that they participate in community projects for a 15 day working month. The programme is self targeting and only the poor participate. The Harmonised Social Cash transfers programme involves direct cash transfers to ultra-poor and labour constrained households. It is mainly financed through donor funding. The major technical partner is UNICEF. However, the current liquidity crisis and cash shortages pose a threat to the successful implementation of this programme.

Donor partners and civil society schemes for livelihood security and social protection

International development agencies and numerous other organisations have been involved in enhancing human wellbeing in Zimbabwe through various programmes, which include harmonised social cash transfers as well as livelihood and resilience building programmes.

The role of the World Food Programme (WFP) in livelihood support under a changing climate includes its contribution to the social protection system, especially for vulnerable populations, in order to enable them to meet their most basic needs all year round. In addition, the WFP carries out vulnerability analyses and is an active member of the ZIMVAC. The WFP's Seasonal Livelihood Programming and Productive Assets Creation programmes, which currently assist 92 915 households, aim to enhance the livelihoods of the most food insecure rural households by developing and protecting their productive assets to achieve food security and resilience to seasonal shocks and stresses under a changing climate.

The Food and Agriculture Organisation (FAO) in Zimbabwe, works with national and local authorities to increase the resilience of agriculture based livelihoods and communities in the face of natural hazards and shocks in communities. The FAO currently administers the Livelihoods and Food Security Programme funded by the UK Department for International Development (DfID). This focuses on climate smart agriculture for improved productivity, nutrition, and income security for smallholder farmers in districts that are considered food and nutrition insecure. In addition, FAO is at the fore in providing early warning information on hazards (droughts, floods, pests and disease) that serves as a crisis modifier for humanitarian aid. In 2016 the agency provided emergency support, particularly for vulnerable households affected by El Niño induced drought.

The Zimbabwe Agricultural Income and Employment Development programme of the United States Agency for International Development (USAID) is working with smallholders around the country to commercialise more than 35 irrigation schemes through the introduction of horticultural crops. While the programme is not premised on climate change, its key tenants address income and livelihood challenges that are exacerbated by climate change. It provides farmers with links to banks and microfinance institutions for credit and loans.

The five-year Enhancing Nutrition, Stepping up Resilience and Enterprise (ENSURE) programme is also funded by USAID. It is designed to improve the nutrition of women of repro-

ductive age and children under the age of 5, increase and improve agricultural production and marketing, and increase communities' resilience and response to disasters and shocks. World Vision is implementing the ENSURE in partnership with Care, SNV and SAFIRE in Manicaland and Masvingo. The intention of the programme is to increase agricultural production and market linkages, diversify incomes and improve nutrition.

The Amalima development food assistance programme, which aims to improve nutrition and support rural households in Matabeleland North and South by providing fortified supplementary food to pregnant and lactating women and children under the age of two years, is also supported by USAID. The programme is implemented by a consortium of non-governmental organisations (NGOs) led by CNFA including ORAP, Dabane International Medical Corps, the Manoff Group and Africare. Target districts are Gwanda, Bulila, Mangwe and Tsholotsho.

The Zimbabwe Resilience Building Fund (ZRBF) managed by the UNDP has funding support from DFID, the EU and Sweden. It works in partnership with the Ministry of Agriculture, Mechanisation and Irrigation Development to build resilient livelihoods and wellbeing for individuals and communities in Zimbabwe through innovative programmes and interventions that not only focus on climate change but on both human induced and natural hazards.

Effectiveness of Institutions in Responding to Climate Change Induced Livelihood Insecurity

Capacity weaknesses of both state and non-state actors affect implementation of the adaptation programmes that could allow for sustainable livelihoods in the face of stresses from climate change. Capacity for coordination is often undermined by several factors – weak institutional links (between sector ministries) as well as low budget allocation and budgetary rivalries among implementing departments or agencies.

The Government of Zimbabwe faces financial constraints, which hamper its ability to spearhead and fully implement social, economic and climate related programmes to improve human wellbeing. This reduces the effectiveness of technical support provided by the extension work-

ers of local authorities and sector ministries, especially in agriculture at community level. The District Development Fund is responsible for building and repairing roads, dams, etc. as well as drilling wells and boreholes but has limited resources to implement its programmes. Therefore, some of the infrastructural challenges identified in this report that compromise human wellbeing require financial and technical support to government institutions, local authorities and communities.

There are about 25 non-state actors or civil society organisations (CSOs) in the country involved in advocacy and implementing climate related programmes and projects (UNDP, 2016a). Several programmes have been adopted by CSOs to strengthen rural and urban livelihoods. However, the challenges faced by CSOs working in climate change include:

- Poor understanding and awareness of the impacts of climate change, which leads to poor programming and introduction of projects that do not have much impact;
- Limited knowledge of vulnerability assessments, which hinders effective project interventions; and
- Duplication of climate related projects and targeting of projects in the same geographic area (UNDP, 2016a).

Recently, CSOs have paid greater attention to programming that provides for building resilience to climate related stresses and shocks through the Government and UNDP's Zimbabwe Resilience Building Fund. Noteworthy, is that development partners are now placing emphasis on climate change, livelihoods and environmental security as a central components of their country strategies for development assistance.

Churches have emerged as important institutions in development assistance programmes and as providers of social safety nets for the urban and rural poor. In the U-Report Poll, a large proportion of respondents noted that the church was a key social safety net in their communities. Moreover, churches, such as the Catholic Bishops Conference, are well positioned through their dioceses for targeted and context specific

Table 3.6 Sustainable Development Goal targets closely linked to climate change and livelihoods

Goal	Target number	Target
Goal 1 End poverty in all its forms everywhere	1.1	By 2030, eradicate extreme poverty for all people everywhere, currently measured as people living on less than US\$1.25 a day
	1.2	By 2030, reduce at least by half the proportion of men, women and children of all ages living in poverty in all its dimensions according to national definitions
	1.3	Implement nationally appropriate social protection systems and measures for all, including floors, and by 2030 achieve substantial coverage of the poor and the vulnerable
	1.4	By 2030, ensure that all men and women, in particular the poor and the vulnerable, have equal rights to economic resources, as well as access to basic services, ownership and control over land and other forms of property, inheritance, natural resources, appropriate new technology and financial services, including microfinance
	1.5	By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate related extreme events and other economic, social and environmental shocks and disasters
Goal 2 End hunger, achieve food security and improved nutrition and promote sustainable agriculture	2.3	By 2030, double the agricultural productivity and incomes of small scale food producers, in particular women, indigenous peoples, family farmers, pastoralists and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment
	2.4	By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality
	2.5	By 2020, maintain the genetic diversity of seeds, cultivated plants and farmed and domesticated animals and their related wild species, including through soundly managed and diversified seed and plant banks at the national, regional and international levels, and promote access to and fair and equitable sharing of benefits arising from the utilisation of genetic resources and associated traditional knowledge, as internationally agreed
Goal 8 Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all	8.2	Achieve higher levels of economic productivity through diversification, technological upgrading and innovation, including through a focus on high value added and labour intensive sectors
	8.3	Promote development oriented policies that support productive activities, decent job creation, entrepreneurship, creativity and innovation, and encourage the formalisation and growth of micro, small and medium sized enterprises, including through access to financial services
	8.5	By 2030, achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value

crisis modifiers and mainstreaming adaptive strategies in communities in response to climate change related hazards and stresses.

Livelihoods, Climate Change and the Sustainable Development Goals

Climate change has important consequences for livelihoods, ranging from the immediate impacts of extreme weather events to longer term impacts of drought and desertification, which can increase resource scarcity and undermine livelihoods. Its impacts are particularly severe

for vulnerable people and those with low levels of human development. Climate change can reverse positive trends, introduce new uncertainties, and increase the costs of building resilience, thereby making delivery on the sustainable development agenda more difficult (IPCC, 2007). Already, as discussed in Chapter 2, climate change combined with significant demographic changes in the most vulnerable parts of Zimbabwe, is worsening the problems of poverty and livelihoods. It is creating barriers that inhibit people from engaging fully in decent work, re-

Table 3.7 Examples of targets in other goals linked to livelihoods

Goal	Target number	Target
Goal 5 Achieve gender equality and empower all women and girls	5.4	Recognise and value unpaid care and domestic work through the provision of public services, infrastructure and social protection policies and the promotion of shared responsibility within the household and the family as nationally appropriate
	5.5	Ensure women's full and effective participation and equal opportunities for leadership at all levels of decision making in political, economic and public life
Goal 12 Ensure sustainable consumption and production patterns	12.2	By 2030, achieve sustainable management and efficient use of natural resources
Goal 13 Take urgent action to combat climate change and its impacts	13.1	Strengthen resilience and adaptive capacity to climate related hazards and natural disasters in all countries
Goal 15 Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss	15.2	Promote fair and equitable sharing of the benefits arising from the utilisation of genetic resources and promote appropriate access to such resources, as internationally agreed

sulting in huge amounts of human potential remaining untapped and prohibiting the country from attaining SDG 1 (on poverty) and SDG (on sustainable economic growth and employment).

The Government has responded to the challenges of climate change to livelihoods through commitments to international and regional protocols, as well as by putting in place policies, economic instruments and legislative frameworks that are conducive to human development. Zimbabwe has committed itself to implementing the Sustainable Development Agenda and has incorporated achievement of the SDGs through its policy the ZimAsset.

Table 3.6 provides the SDG goals and targets that are closely linked to climate change and livelihoods for Zimbabwe's human development progress, mainly focused on Goal 1 and Goal 8 and some of those related to the sustainable agriculture aspect of Goal 2 – end hunger, achieve

food security and improved nutrition and promote sustainable agriculture – as Zimbabwe's rural livelihoods are mainly dependent on agriculture.

In addition to the targets on the two focus goals (Goals 1 and 8) for livelihoods and relevant Goal 2 targets which have been assigned to livelihoods, there are additional targets in other Goals presented in Table 3.7.

Zimbabwe is already aligning its policies, legislation and programmes with the directions given for implementing these relevant targets. This includes through measures such as increasing investment (including through enhanced international cooperation in rural infrastructure), agricultural research and extension services, technology development and plant and livestock gene banks, in order to enhance agricultural productive capacity. The country is also undertaking reforms for women's empowerment and

promotion of gender equality. Attainment of these SDGs targets will ensure that livelihoods are protected and expanded to cope with some of the impacts of climate change and help create resilient communities.

Conclusions

This chapter has reviewed the state of livelihoods in Zimbabwe and highlighted the major climate change risks and their impacts on both rural and urban livelihoods and human development. Both the direct and indirect impacts of climate change on rural and urban livelihoods are transmitted through increasing temperature, precipitation and extreme events.

Most livelihoods in Zimbabwe are dependent on natural capital (crop and livestock production, fisheries, tourism and extraction of natural resources), which is vulnerable to climate related shocks and stresses. The negative impacts of climate change are compounded by other factors,

such as a poorly performing macroeconomic environment, unemployment, ecosystem service degradation and poverty. Given the strong interface between rural and urban areas through backward and forward linkages, it is evident that people, households and communities with little material, financial, natural or social assets to form the basis of effective coping strategies and resilience to the negative impacts of climate change, can experience catastrophic declines into persistent poverty and face increased morbidity and reduced life expectancy.

Policy measures therefore require Zimbabwe to build rural and urban resilience to the shocks and stresses of climate change and variability. The country is already committed to alignment with the global development agenda, particularly the targets set for SDGs 1 and 8. However it needs support from civil society, the private sector and development partners.

CLIMATE CHANGE AND FOOD SECURITY

Climate change puts millions of people’s lives at risk, and traps poor households in food insecurity and poverty. Climate shocks disproportionately affect the most vulnerable people at risk of hunger, especially women and children. The vast majority of the world’s hungry people live in fragile environments prone to climate hazards with which they cannot cope. When climate disasters strike, the situation of already vulnerable people can quickly deteriorate into a food and nutrition crisis

World Food Programme

Introduction

The attainment of food security underlies all the components of human development as without adequate food, one cannot live a long and healthy life, be educated and knowledgeable, have a decent standard of living and participate in community life with dignity and self respect (UNDP, 2012). Food availability is closely linked to poverty. Although poverty has multiple dimensions, the worst case scenario is deprivation of food (food poverty) and essential basic non-food items (total consumption poverty) (Manjengwa et al., 2012).

The poverty lines are set by ZIMSTAT, with the total consumption poverty line being the minimum amount of money required to meet the basic food and non-food requirements of a household. People who live below the total consumption poverty threshold but above the food poverty line are classified as ‘poor’ while those who live below the food poverty line, meaning that their total household monthly expenditure is unable to meet the minimum recommended food requirements of 2 100 calories per capita, per day, are considered ‘very poor’ and in extreme poverty (ZIMSTAT, 2011).

Figure 4.1 Prevalence of poverty in provinces and districts of Zimbabwe

Source: ZIMSTAT (2015e)

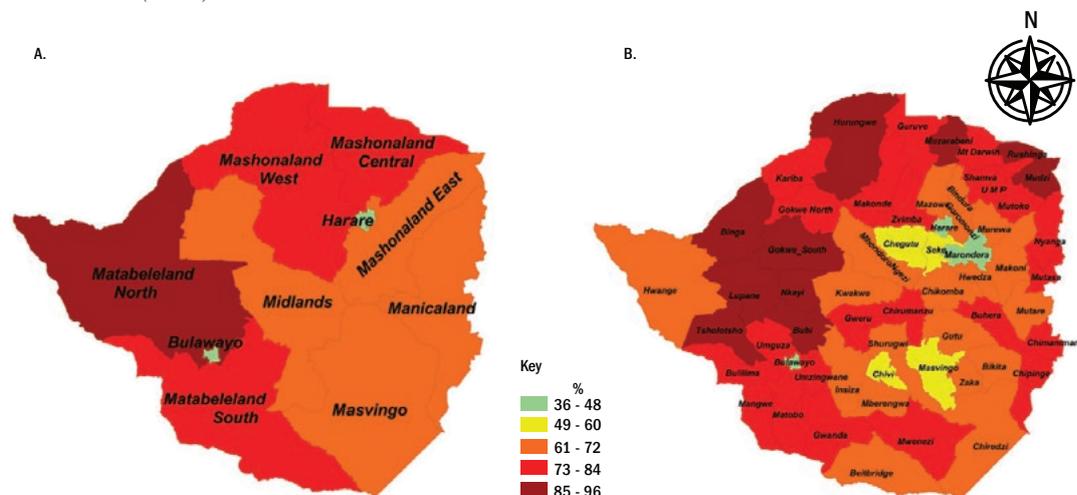


Table 4.1 Zimbabwe's position on the Global Hunger Index severity scale, 2016

GHI Severity Scale				
Less than 9.9	10-19.9	20-34.9	35-49.9	50 +
low	moderate	serious	alarming	extremely alarming

all times have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life”. This means that food security extends beyond the production level and encompasses socioeconomic variables that contribute to the four food security outcomes – food availability, food access, food utilisation and food stability. A food system is considered vulnerable if one or more of these components are uncertain and insecure (FAO, 2008).

This chapter first presents the state of these four food security outcomes to establish the context for analysing the effects of climate change on food security, as well as current and future responses. The chapter uses a modified version of the DPSIR framework (see Chapter 1) to interrogate the aspect of food security in human development, with the main driver being climate change. Extensive literature review, UNICEF’s U-Report Poll and results from provincial workshops have been used to analyse:

- The status of food security in Zimbabwe and its linkages with climate change.
- The impacts of climate change on food security and how this affects people, especially vulnerable groups and is an impediment in achieving the targets of SDG 2 (End hunger, achieve food security and improved nutrition and promote sustainable agriculture).
- The responses and measures taken by households, communities, state and non-state actors to curb food insecurity under a changing climate.
- The effectiveness of measures and responses to address the negative effects of climate change on food security and human development in Zimbabwe.
- Future projections of climate change and food security in the country.

This section addresses the four components of food security and shows their current status. The International Food Policy Research Institute calculates the Global Hunger Index (GHI) each year, which is a tool designed to track hunger in order to assess progress in decreasing it. The 2016 GHI scores computed for 118 countries place Zimbabwe in the ‘serious’ category with a score of 28.8. The GHI scores are on a 100-point scale: 0 (no hunger) is the best score and 100 indicates the worst scenario. Table 4.1 shows the GHI severity scale and where Zimbabwe falls on the scale. It is noteworthy that, although Zimbabwe still falls in the serious category, its score went down by 6.3 percentage points from a high of 35.1 in 2008. Zimbabwe’s GHI was high because of socioeconomic factors, such as the rise in price of staple foods/grains

Figure 3.3 Zimbabwe's national livelihood zone map

Source: ZIMVAC (2010)

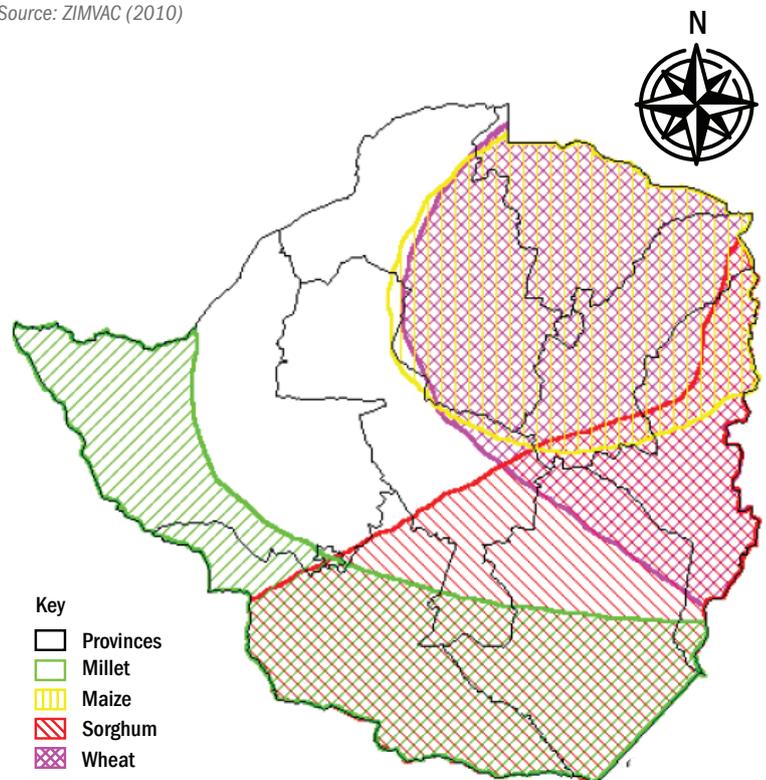


Figure 4.4 Maize production and consumption trends, 2010 to 2015

Source: Sukume (2016)

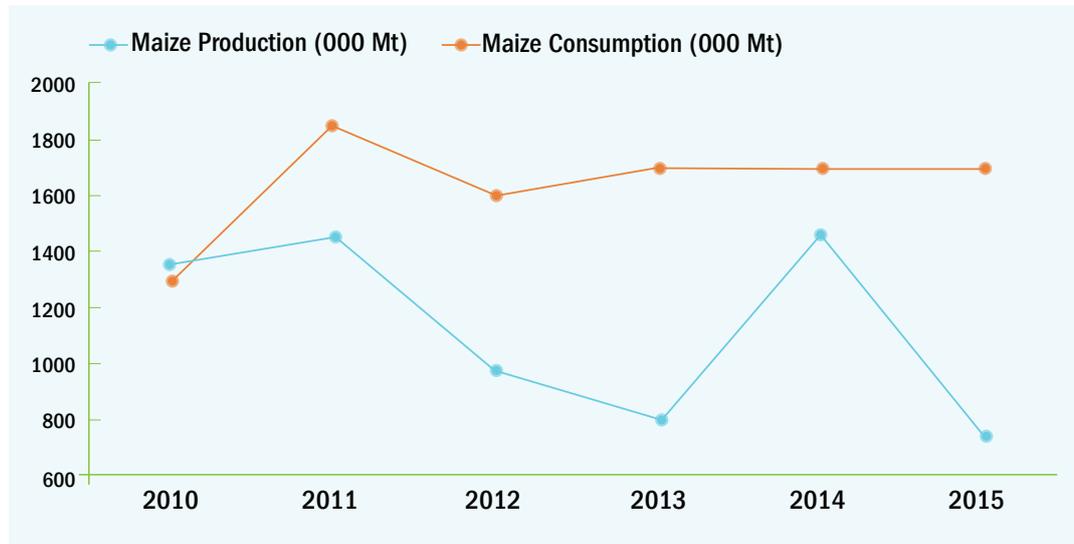
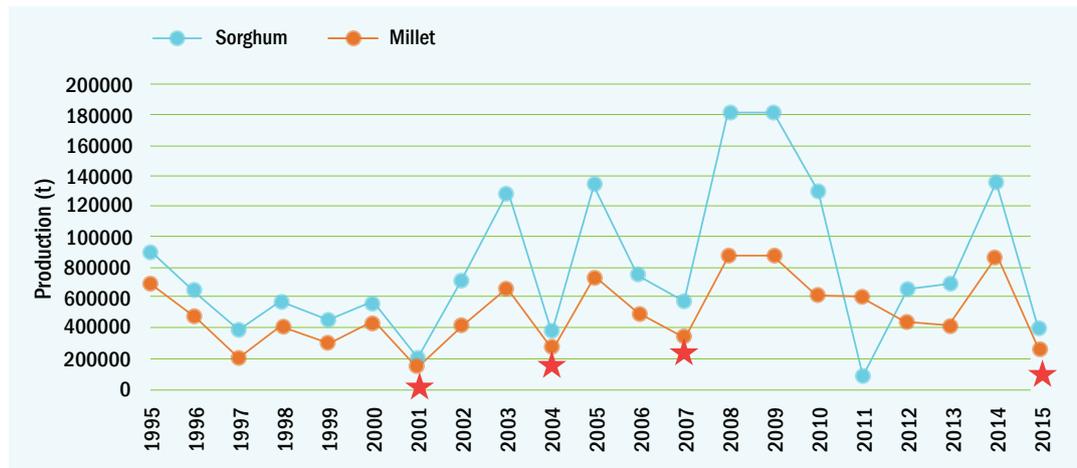


Figure 4.5 National small grains production, 1995 to 2015

Source: Ministry of Agriculture, Mechanisation and Irrigation Development, and Crop and Livestock Assessment Reports



and lack of income.

Food availability

Crop production

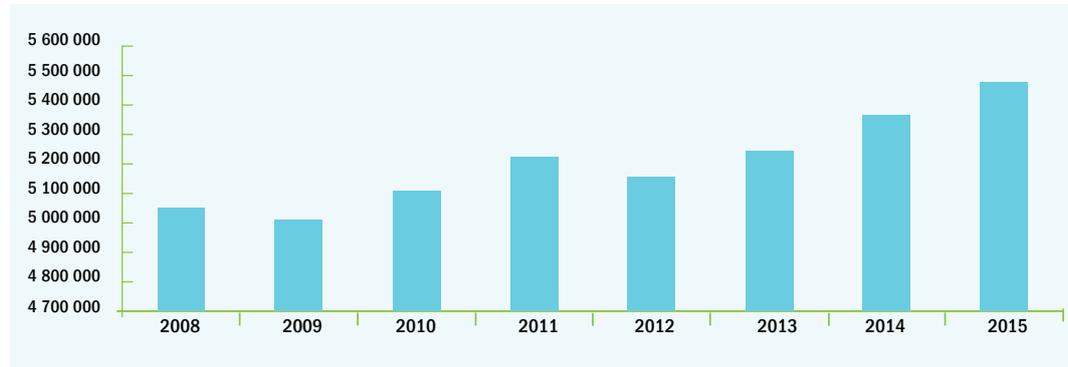
Zimbabwe's main agricultural products are maize, sorghum, millet, wheat, cassava, cotton, tobacco, coffee, sugarcane, peanuts and livestock (cattle, goats, sheep, pigs, chickens). Maize dominates the national diet and agricultural production. It typically accounts for 80 to 90 percent of the domestic staple production (USAID, 2014). Maize is very sensitive to temperature and precipitation changes, hence its production is affected seriously by weather related stresses

and shocks. Figure 4.3 shows areas of Zimbabwe in which the four key food crops (maize, millet, sorghum and wheat) are grown. Maize and wheat are mostly grown in the north and eastern parts of the country, and sorghum and millet in the less arable parts of the country, the southern and western zones.

The Government of Zimbabwe estimates the national cereal grain requirement (including strategic reserves) at 2.5 million metric tonnes, of which 1.8 million metric tonnes are required for domestic consumption (Murisa and Mujeyi, 2015). Over the past 15 years, there has been a significant deficit in cereal grain production, re-

Figure 4.6 National production level of non-dairy cattle 2008 to 2015

Source: Ministry of Agriculture, Mechanisation and Irrigation Development, and Crop and Livestock Assessment Reports



sulting in the country failing to meet these required amounts. National trends for the main cereal crops fluctuate in terms of both yields and production. These fluctuations are largely driven by weather patterns and the availability of inputs (seeds, fertilisers, chemicals, electricity) although structural issues and the poor macroeconomic environment also come into play (World Bank, 2016a).

Recent maize production and consumption trends, reflected in Figure 4.4, indicate that Zimbabwe is becoming increasingly food insecure. Maize stock deficits continue to widen and in its efforts to bridge the staple food gap, the country has become a net importer of maize and reliant on food aid. Food aid accounts for at least one third of the total supply of maize in Zimbabwe (Murisa and Mujeyi, 2015). It is usually imported from neighbouring countries but also sometimes from abroad. Reliance on imports places Zimbabwe in a vulnerable position, particularly when countries in the region experience similar drought conditions and place restrictions on food exports.

Production trends in small grains (finger millet and sorghum), which are capable of withstanding long dry spells, were generally low in the 1990s. Figure 4.5 shows fluctuating trends in small grain production that mirror the periods of low rainfall and agricultural or hydrological drought in the country. For example, the years 2011/12, 2012/13 and 2015/16 were drought years, with rainfall below the mean (for more details see Chapter 2). Moreover, the fluctuations shown in Figure 4.5 indicate that, in years following a drought, farmers seem to respond by growing more small grains and then reduce

production in good rainfall years until another drought occurs. A portion of the sorghum produced is used for brewing opaque beer.

Diversification to small grains is currently promoted as a means of countering the negative effects of climate change on maize production and as an adaptation measure to alleviate food shortages, strengthen grain reserves and build resilience. However, there are production challenges for farmers who grow small grains, such as non-availability of certified seeds, labour intensive harvesting and processing, and poor market prices. These act as compounding factors that curtail intensive farming of small grains.

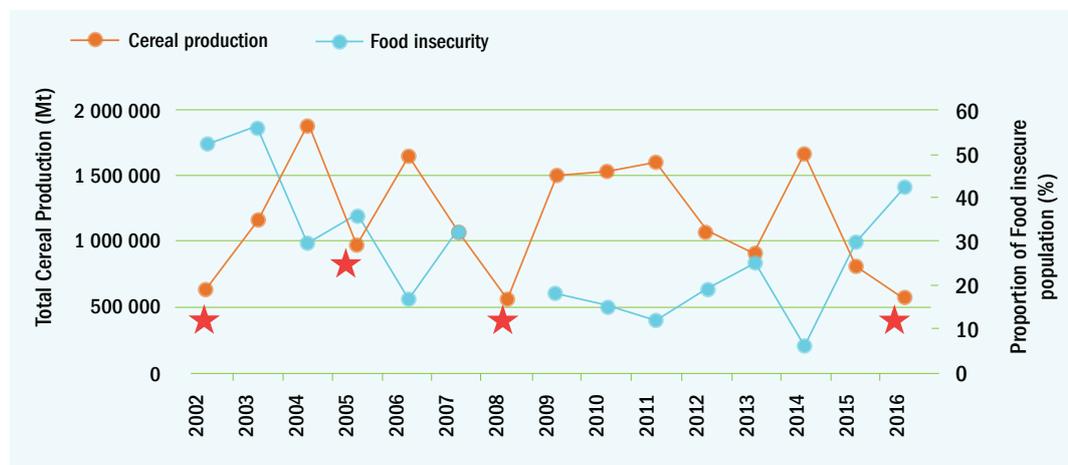
Livestock production

Livestock production is a significant component of agricultural production and food security. Communal farming areas hold most of the cattle, goats and sheep in Zimbabwe. A significant proportion of livestock production is found in the provinces of Matabeleland North and South, parts of Midlands, parts of Manicaland and Masvingo. These drier areas follow an extensive system of livestock production based on rangelands, which are sensitive to climatic changes.

The productivity of smallholder herds is generally low, largely because of poor nutrition and animal health. The average calving rate is about 45 percent, and off-take rates are 6 percent, against a recommended 20 percent needed to meet internal and export demand (Sukume, 2016). The national cattle herd has increased since 2008 and is currently estimated to be about 5.4 million (Figure 4.6).

Figure 4.7 Trends in cereal production and food insecurity, 2002 to 2016

Source: ZIMVAC (2016)



The same trend has been observed for small ruminants like goats and sheep. Smallholder farmers own about 4 million goats, and about 450 000 sheep. A mix of breeds exists, including indigenous types such as Matabele goat and Sabi sheep, which are well adapted to local conditions. Small ruminants play an important role in supplying animal protein at household level.

Food access

The incidence of food insecurity in Zimbabwe is a result of the interplay of progressive low or poor investment in the agriculture sector, poverty and the inelasticity of the food production sector. These factors are compounded by the negative effects of extreme weather events and climate change. Climate is involved in most shocks, such as natural disasters (e.g. droughts and floods), that keep or bring households into poverty, notably by causing crop and livestock losses as well as food price shocks (World Bank, 2014a).

Zimbabwe has highly volatile food prices, which can increase by 30 to 40 percent in a season. Price instability, especially during the lean season, compromises households' ability to obtain adequate food year-round through markets. Food prices are a direct determinant of affordability, and hence access. Price shocks have an immediate negative effect on food security. High prices may make certain foods unaffordable which, in turn, affects individual nutrition and health. Changes in seasonality or extreme weather lead to a decline in agricultural produce

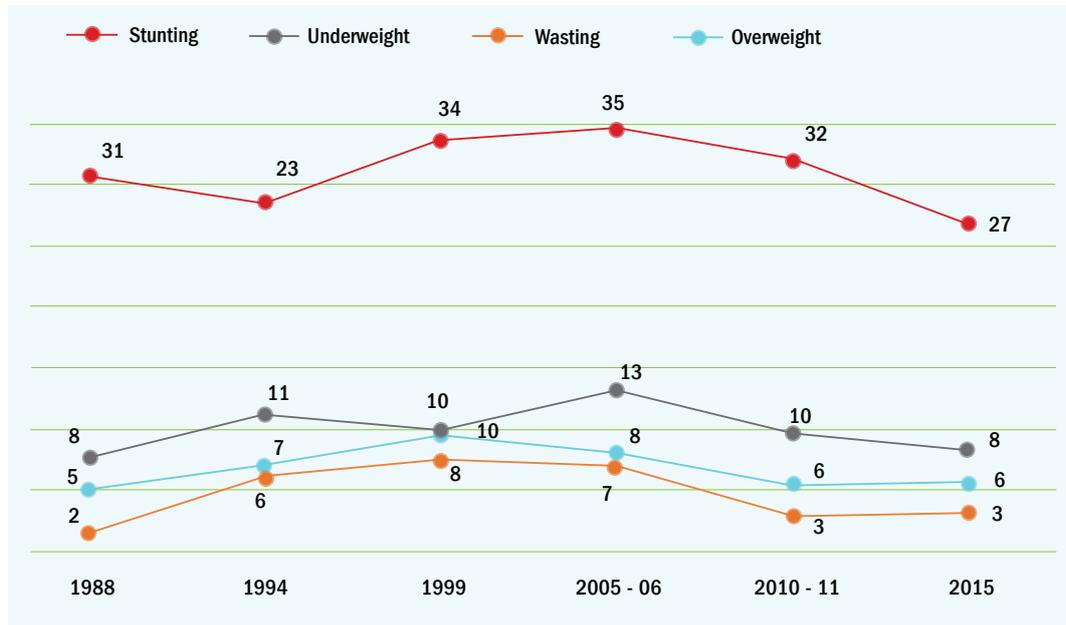
and scarcity of certain food products at certain times of the year.

Figure 4.7 provides food insecurity trends from 2009 to 2016, and shows that the drought seasons (2001/02, 2004/05, 2006/07, 2011/12, 2012/13 and 2015/16) were the poorest cereal production years for rural households. A decline in agricultural harvests and/or scarcity of agrarian products is likely to lead to increases in food prices and constrains the ability of households to gain access to food. It forces households to spend a disproportionate amount of their income on food and reduce their dietary diversity, and may lead to them selling their household productive assets. In emergency cases, land or houses and breeding livestock are sold in order to purchase food (ZIMVAC, 2016). These desperate actions further compromise the ability of households to bounce back from a climate related shock, and thereby reduce human wellbeing and exacerbate individual and household poverty levels.

At the national consultations, women from across the ten provinces pointed to the lack of dietary diversity when faced with climate related shocks. They considered this lack of dietary diversity a key developmental challenge and linked it to poor performance of children in schools. This observation is also noted in a three-year analysis of ZIMVAC findings which found an increase in the proportion of households that consumed poor and borderline diets (ZIMVAC, 2016). Many households consume

Figure 4.8 Percentage of children under age 5 classified as malnourished

Source: ZIMSTAT (2016)



cereals, oils and vegetables, and few protein rich and iron fortified foods.

The national dietary diversity score stands at 5.5 out of 12. The household dietary diversity is an indicator of food access, and is based on the number of different food groups consumed by the household or any member of the household. It comprises twelve food groups and ranges from 0 to 12, with lower numbers denoting less dietary diversity.

While much focus has been on the rural areas, there is a need to understand the ways in which urban areas are also affected. Food remittances from rural areas are critical to low income households in urban areas. When rural areas experience low production or scarcity, the urban areas face a negative spin-off as very little food filters into towns and cities.

Formal and informal sector retailers have proliferated in Zimbabwe’s cities and continue to re-shape urban food networks and consumption patterns. The informal markets in urban areas have become critical sites for the urban poor to obtain food. This is because most products are broken into small and affordable portions, a process called ‘bulk breaking’. However, bulk breaking allows poor households to gain ac-

cess predominantly to cereals (rice and maize), which have limited nutritional value.

Food utilisation

As noted in the box above, food utilisation refers to the use of food and how a person is able to gain nutrients from the food they consume. Indicators of food insecurity are related to health in the form of malnutrition, stunting and wasting (for more details see Chapter 5). Malnutrition is the outcome of chronic food insecurity and hunger. While Zimbabwe has made remarkable progress in keeping the underweight and wasting in children under the age of 5 years in check, the level of stunting has been remarkably high, remaining above 30 percent in most years, with a recent decrease to 27 percent in 2015, as shown in Figure 4.8 (ZIMSTAT, 2016). Stewart et al. (2013) describe chronic malnutrition that leads to stunting as ‘devastating’ to young children as it causes impaired brain development, lower intelligence quotient (IQ), weakened immune systems and greater risk of serious diseases like diabetes and cancer later in life (for more details see Chapter 5).

Dietary diversity is used as a proxy for adequate micronutrient density of food. Micronutrient deficiencies and stunting associated with poor levels of food security are considered an ‘ex-

tremely serious development issue'. The prevalence of micronutrient deficiencies is high across all age groups of the Zimbabwean population. Overall stunting and wasting for children below 5 years has continued to decline since 2005/06, the prevalence remains high (ZIMSTAT, 2016). Thus, the high prevalence of stunting in children under 5 years of age remains Zimbabwe's top nutrition challenge.

Fruits, vegetables, meat, and aquaculture products, which contain vital micronutrients (vitamins and minerals) are more perishable than grains, and difficult to store. People in the poorest regions often lack infrastructure, such as refrigeration in their homes or cold storage facilities, hence the preference for cereals as the basis of their diets. Evidence shows that stunting caused by chronic malnutrition is consistently highest in the poorest socioeconomic groups, driven by low income, limited employment

opportunities, and chronic illnesses (Rukuni, 2012).

Preference for maize as a staple crop, over small grains which fare better if there is less rainfall, renders most households in southern Africa vulnerable to drought and food insecurity. Continuing to plant maize despite poor yields will result in food production, access and utilisation becoming even more threatened with future climate change (Government of Zimbabwe, 2015).

Food stability

Volatility and spikes in food prices can have adverse effects on the welfare of poor people, particularly on their food and nutrition status. The complex set of extreme weather events, alongside global spikes in food demand and poor market controls can destabilise food availability and accessibility. In Zimbabwe, the prices of cereals are generally high in drought prone

Figure 4.9 Linkages between climate change and food security

Source: Ziervogel and Frayne (2011)

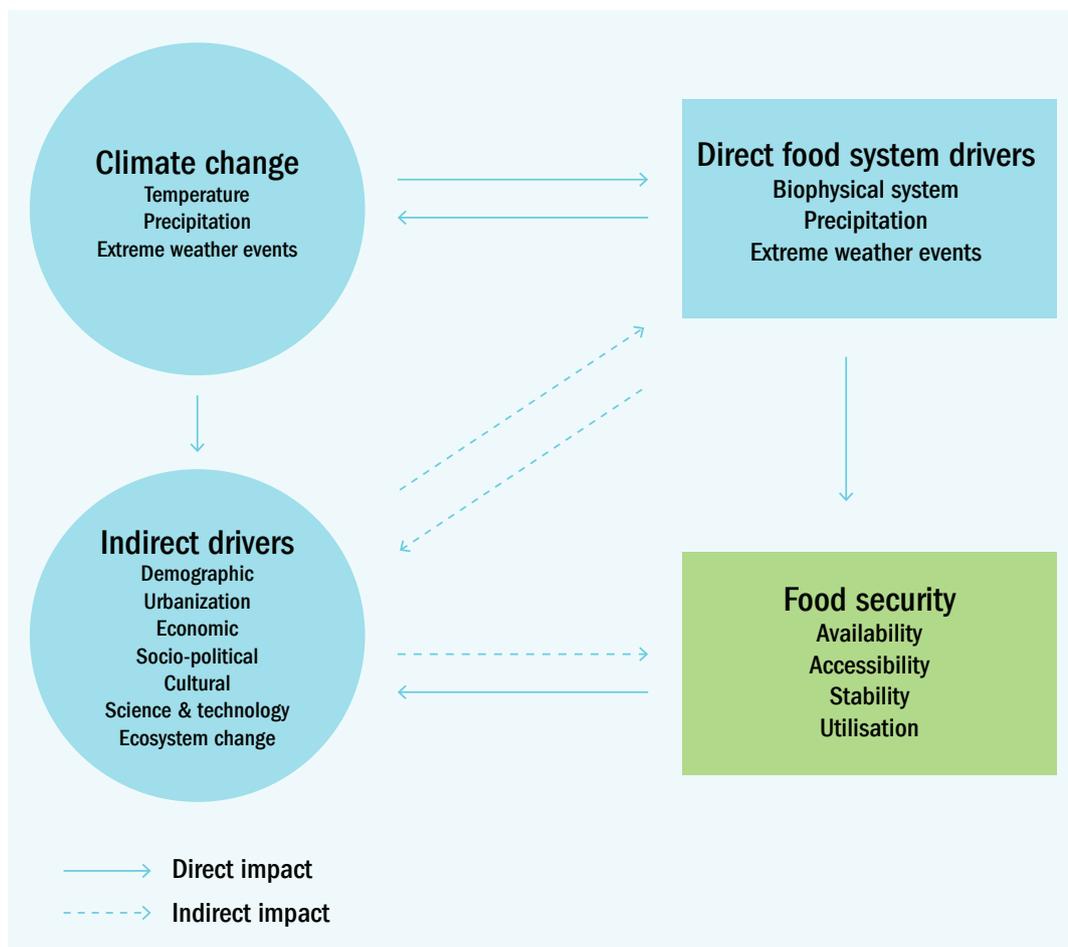
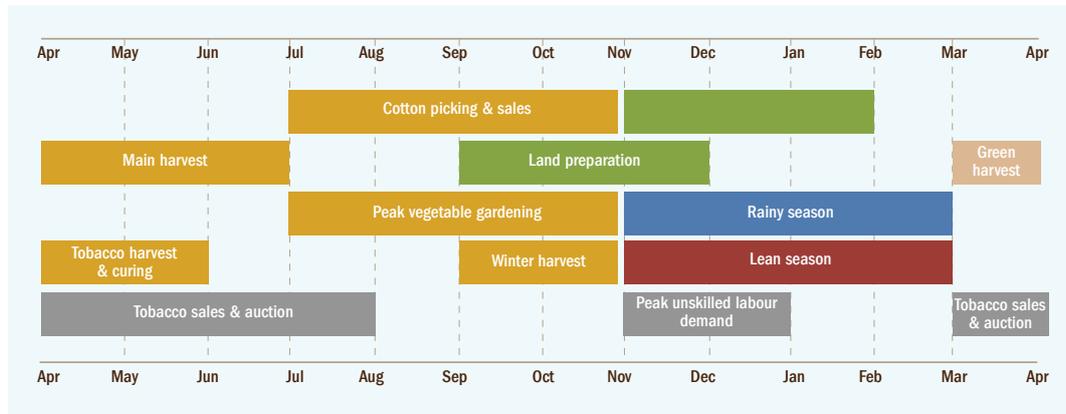


Figure 4.10 Zimbabwe's seasonal calendar

Source: *The Famine Early Warning Systems Network (FEWSNET), (2013)*



areas while the price of livestock is generally low because of the urgent need for de-stocking during drought years.

Climate Change-Food Security Linkages

Climate change and variability are expected to affect both the agricultural and non-agricultural parts of the food system at the global, national and local levels. This is because climate is an important driver of food system performance on-farm and in terms of consumption. At the farm level, climate change and variability affect the “quantities and types of food produced and the adequacy of production related income” (FAO, 2008), while at the consumption level, changes in the frequency and severity of climate extremes can affect the stability of food availability and prices, with consequent impacts on access to food and nutrition.

The impacts of climate change on global food production are unevenly distributed geographically. Evidence from the IPCC (2007b) indicates that countries in temperate regions are likely to enjoy some economic advantage from climate change because additional warming will benefit their agriculture sector and food production. However, countries lying at low latitudes and in tropical regions are expected to be more vulnerable to warming, with losses felt mostly in the arid and sub-humid tropics in Africa and South Asia (Parry et al., 2001).

There are discernible linkages among climate change, food security and overall human development. Countries with low levels of development, high dependence on climate sensitive

livelihoods and food systems, and with a low capacity to adapt to climate change will be adversely affected (Kurukulasuriya et al., 2006). The IPCC predicts that the worst affected region will be Africa, particularly southern Africa. The Fifth Assessment Report of the IPCC (2014) highlights that Africa will most likely face significant changes in its climate over the next 50 to 80 years. Moreover, because of factors such as poor socioeconomic and political conditions, weakened government capacity and institutions, and dependence on rain-fed agriculture, shocks related to climate change are expected to deepen the existing poverty-environment linkages and increase vulnerability to food insecurity.

As such, countries with a low capacity to adapt to climate change are less likely to attain SDG 2, which aims to “end hunger, achieve food security and improved nutrition, and promote sustainable agriculture.” Already, analysis of global agricultural production (Tubiello and Fischer, 2007; Hanjra and Qureshi, 2010) shows that there will be increased food shortages because of a decrease in net global agricultural production, which when compounded by poor storage and distribution facilities, will result in an increase in the number of people at risk of hunger, undernourishment, poor health and poverty.

Food security in Zimbabwe is connected to domestic agricultural production and access to agricultural inputs and food, some of which are directly related to shifting climate patterns. The conceptual framework for this chapter (Figure 4.9), which is a modified version of the DPSIR framework, shows three climate phenomena



A field in Chivi waiting for rain in January 2013

Source: E. N. Moyo



Destruction of crops

Source: E. N. Moyo

that have an impact on food security in Zimbabwe. These are changes in temperature, precipitation and the frequency of extreme events (droughts and floods).

Zimbabwe has always experienced droughts, however, the frequency and intensity of these have increased in the past 15 years (Government of Zimbabwe, 2015), which has threatened the

country's ability to achieve food security. The Framework also incorporates components that reflect a wider set of driving forces that govern food system activities and food security, such as demographics, urbanisation, socioeconomic factors, science and technology developments, and shifts in cultural practices. While these driving forces are important, their intersection with climate change allows for the analysis in this chapter to disentangle the pathways through which climate change affects food systems and food security outcomes in Zimbabwe. The ensuing section describes the manner in which these three broad phenomena (temperature, precipitation and frequency of extreme events) affect food security.

Changes in precipitation

Zimbabwe, like other southern African countries has a unimodal rainy season. The rainy season generally runs from October/November until April, and the dry season is from May until October. However, there are slight variations across the country. The seasonal calendar (Figure 4.10) shows the rainy seasons, harvests, livestock migration period and the lean season in a typical year. Farmers are generally encouraged to follow this calendar as it defines when to start planting crops and the optimal period for plant growth.

However, during the consultations, both community members and policy makers pointed to shifts in the country's rainy season. Foremost, they pointed to increased incidence of long dry spells and shorter rainy periods. Stakeholders across the country indicated that the rains were starting much later, often towards late December (see Photo 4.1) and, in a few cases like Manicaland province, rains were observed to come earlier than anticipated or 'unexpectedly', followed by a prolonged dry spell.

Stakeholders also pointed to heavy rainfall at the beginning of the season followed by drought like conditions in the same season.

Consequently, most people found it necessary to review the seasonal calendar because they were no longer certain when to start planting their crops and reported that these shifts in rainfall patterns affect their crop production and livelihoods negatively. These observations are consistent with key weather and climate drivers in the

Destruction of a bridge near Filabusi on the Masvingo-Mbalabala Highway, and Heavy rains sweep bus off the road on the Masvingo highway

Source: *Herald* (2017); *Standard* (2017)



literature (Nhemachena and Mano, 2007; Brazier, 2015; USAID, 2015a) as well as documented evidence in the National Climate Change Response Strategy (Government of Zimbabwe, 2015) and the Third National Communication to the United Nations Framework Convention on Climate Change (UNFCCC) (Government of Zimbabwe, 2016). In the latter, the country is reported to be experiencing decreases in the total amount of rainfall, and having shifts in the onset and duration of rainfall as well as high dry spell frequencies and rainfall intensity.

Floods and extreme events

Major floods do not occur frequently in Zimbabwe, when compared to droughts. Nevertheless, major flooding has often been associated with the La Nina Oscillation phenomenon and cyclone induced weather such as that cause by Cyclone Eline in 2000. Floods have impacts upon both individual and community wellbeing and have a negative effect on food availability and accessibility. The social, economic and environmental consequences of flooding include loss of human life, loss of livestock, deterioration of health conditions owing to water-borne diseases, and damage to infrastructure such as

roads, electric power lines and bridges. Floods resulting from Cyclone Eline caused over USD 1 billion worth of infrastructural damage in the Zambezi Basin alone (Shumba, 2000; Wamukonya and Rukato, 2001).

Damage to infrastructure has a negative effect on the food system because, when roads and bridges are destroyed, individuals and communities, especially those in remote areas, are not able to transport their produce to markets or to gain access to food and food aid. Moreover, relocations from flooded areas disrupt normal life and make it difficult for farmers to undertake their agricultural activities, which in turn leads to declining wellbeing indicators for nutrition and health (UNDP, 2016).

Heavy storms have caused destruction of crops, killing poultry and destroying property and infrastructure.

Transport, bad roads and having to travel long distances to service centres are the main challenges faced by rural households, especially those in marginal areas, affecting their access to inputs for agricultural production and food. Re-

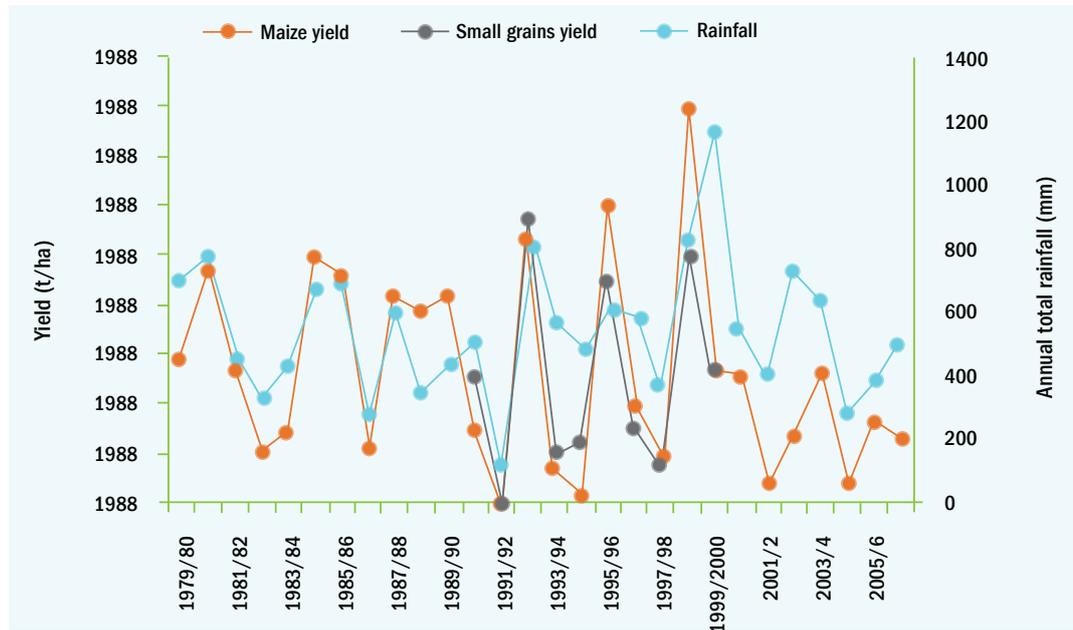
Table 4.2 Seasonal mean rainfall per season, 1999/2000 to 2015/16

Source: Meteorological Services Department

Season	1999-2000	2000-2001	2005-2006	2007-2008	2013-2014	2010-2011	2003-2004	2008-2009	2009-2010	2014-2015	2012-2013	2011-2012	2002-2003	2006-2007	2004-2005	2001-2002	2015-2016
Percentage of Normal	153	134	131	129	124	120	116	113	111	102	102	100	99	96	90	87	67

Figure 4.11 Crop yield and rainfall trends in Chiredzi district, 1979 to 2006

Source: Government of Zimbabwe (2016)



mote areas like Binga District, which are found off the main railway line and at a distance from larger urban centres, tend to have poor access to markets and market integration, which increases the cost of agricultural production. This geographic disadvantage is exacerbated when extreme weather events, such as cyclones and resultant flooding, destroy roads and bridges, creating food deserts, which in turn affect diet and nutrition. The photos below show the devastating flooding effects of cyclone Dineo on roads and infrastructure (bridges) that occurred during the write-up of this report.

High temperatures and drought

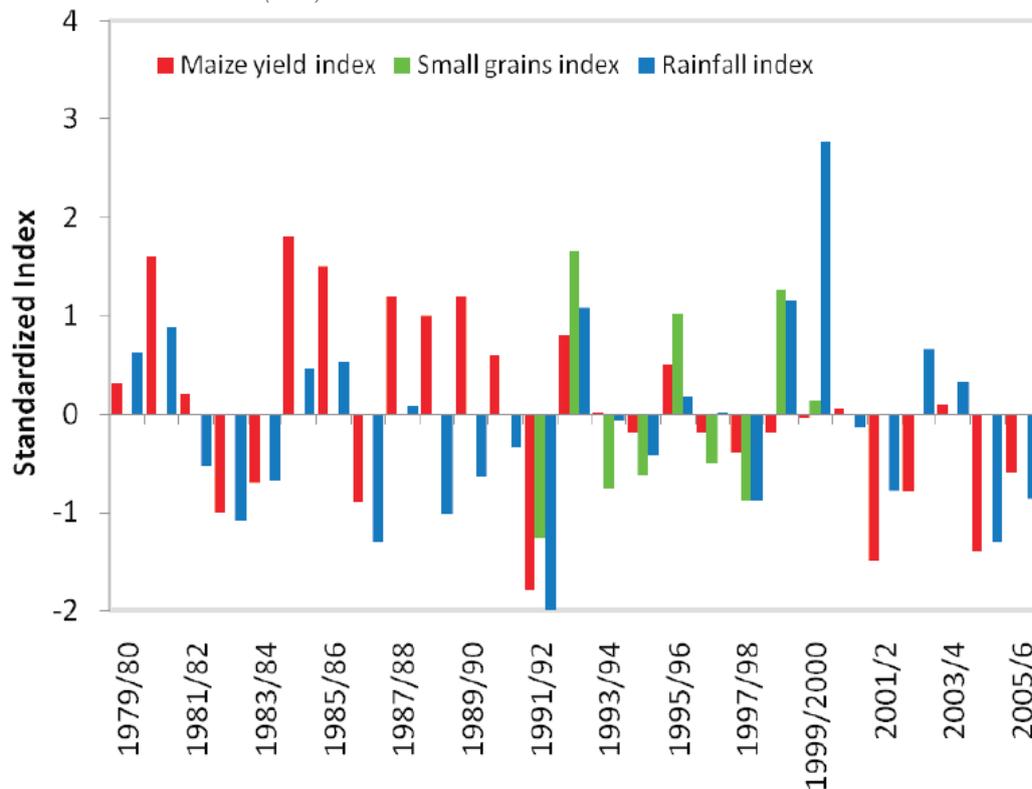
Zimbabwe has been affected by numerous shocks and stresses in the past several decades, many of which have had long lasting impacts. National consultations raised the frequency of drought and heat waves across the country. Cli-

mate records show that there are now more hot days and fewer cold days than in the past (SARUA, 2014). Studies by Unganai (1996) showed a net warming of 0.3°C to 0.6°C in the country's mean ambient surface temperatures between 1933 and 1993, while Davis (2012) places Zimbabwe's annual increase in surface temperature since 1900 at 0.4°C. The frequency of extreme heat and erratic rain patterns have impacts on the common food crops – maize, sorghum and millet – which are susceptible to wilting, poor germination, pests and microbial diseases. Extreme heat also has a negative effect on ruminant production systems, especially on cattle which are sensitive to heat stress, and exposes livestock to increased disease.

Drought and dry spells are the most common natural disasters affecting Zimbabwe. Significant droughts observed in the past sixteen years

Figure 4.12 Comparison of standardised indices of maize and sorghum yields and annual rainfall for Chiredzi district, 1980 to 2007

Source: Government of Zimbabwe (2016)



include 2001/02; 2002/03; 2004/05; 2006/07 and 2015/16 (see Table 4.2). Normal mean rainfall in Zimbabwe is about 675mm although there is spatial variation across the country. A variance from this normal mean rainfall is often linked with dry or drought conditions (Mazvimavi, 1989).

Qualitative results from the U-Report Poll electronic survey done by UNICEF Zimbabwe on climate change in 2016 indicated that many respondents were concerned about drought, long dry spells and lack of water which they associated with hunger and reduced food security. Most stakeholders cited reduced agricultural productivity because of frequent drought conditions. Drought and dry spells undermine rain-fed crop production and compromise livestock production by decreasing the forage, fodder and water available for animal growth and reproduction. Dry spells that occur during the critical stages of crop growth result in lower yields from poor pollination and grain filling, and failure of crops to reach their key growth stages because of wilting. Drought, therefore, leads to poor har-

vests and deficits in food supply.

The Third National Communication to the UN-FCCC presents a case study which, although the data are dated, shows the close relationship of crop yields for both maize and small grains, to rainfall (Figure 4.11) (Government of Zimbabwe, 2016).

More recently, the decline in maize production over the past 15 years has been related closely to seasons with drought conditions or prolonged mid-season dry spells. Of these droughts, the 2015/16 season was the driest in the past 35 years and 2.8 million people (30 percent of the rural population) were food insecure and required humanitarian assistance (www.unocha.org/zimbabwe). There were high levels of acute malnutrition among children under the age of 5 years, with 99 243 children estimated to be acutely malnourished nationwide (ZIMVAC, 2016). Nhemachena and Mano (2007) indicate that crop based systems, particularly those based on maize, are most vulnerable to drought conditions, with yield losses of maize projected

to be 30 percent by 2050.

Another factor of historical importance is that southern Africa has seen a reduction in the varieties of seeds planted for food and other uses because of the legacy of colonial crop production and postcolonial development priorities. Thus, seeds that had adapted successfully to various climate conditions for many decades are no longer available for use in current climate conditions. However, efforts have been made by seed companies to introduce drought resistant crops or seed varieties that can adapt to the present climate changes (such as short season, early maturing maize varieties like SEEDCO's SC403, SC407 and SC411).

Food production systems (especially food prices) can be more sensitive to supply and demand shocks during drought years when food stocks are low (Bobenieth et al., 2012) because weather related shocks and stresses result in low crop yields, which consequently result in volatilities in the supply chains of food commodities, leading to price shocks. For example, during the 2015/16 drought season, the price of cattle in high rainfall areas ranged from USD 351 to USD 450, while communities in Zaka District, a low rainfall area, were selling cattle for as little as USD 20 in order to find money for food (ZIMVAC 2016, UNDP, 2016). These findings show that households de-stock when they experience climate related shocks but do not get the real value of the livestock, as they are paid far below the normal market price in most cases (UNDP, 2016).

Associated decreases in cattle prices are attributed to increased supply of cattle on the market compared to demand, as well as low quality of the cattle because of poor body conditions. Households often try to retain livestock because cattle are considerably more valuable for farming (draught power and manure) and as a safety net to sell for raising school fees and buying food and non-food items. As such de-stocking is the last option and is often done when cattle are malnourished.

Rises in food prices are also correlated to weather related phenomena. In lean seasons or seasons affected by an extreme event the price of food increases. Food expenditure makes up an average of 56 percent of rural household ex-

penditure (FEWSNET, 2014b), thus any shocks and stresses to household income increase the household's vulnerability in terms of food access.

Drought also has impacts upon the availability of water for domestic and industrial use, and power generation, which has the effect of curtailing production in both the agricultural and non-agricultural sectors. The national consultations identified drought as a major threat for vulnerable groups in society (children, orphans, pregnant women, widows, elderly people and people with disabilities), and those with life threatening conditions such as HIV related illness.

Hoddinott and Kinsey (2001) identify the effects of droughts and variable precipitation as major drivers of stunting and wasting in children. A longitudinal study by Alderman et al. (1992, 1994, 2001) that tracks the welfare of households and children in rural Zimbabwe since 1982 points to drought, especially back-to-back droughts, as contributing to stunting (Alderman et al., 2006). Droughts decrease household food production, especially of staples, which conversely increases the prevalence of malnutrition and undernutrition. They particularly affect women's ability to provide adequate nutrition to children. Women (especially single mothers and female heads of household) are forced to leave children behind during the day as they search for food or alternative livelihoods, and the caregivers, often older siblings, do not provide adequate nutritional support for the children (UNDP, 2016).

Pregnant women are more prone to nutritional deficiencies and disease as a result of drought induced food shortages. Elderly people are often not able to cope with mid-season droughts and the need to re-plant crops, and this makes them especially vulnerable to food insecurity and hunger. Rural to urban food remittances are reported to have decreased and this tends to affect the urban poor negatively.

Drought induced stresses were reported as an important driver of out-migration, especially from rural communities. Migration is often gendered, as male out-migration is more common, leaving de facto and de jure female headed households to fend for families. Both young and

older men are forced to undertake rural to urban or international migration in search of employment and income.

Though migration is a coping strategy that can have a positive effect when remittances are sent back, a study undertaken by the Zimbabwe Resilience Building Fund in Binga, Zaka and Gwanda found that, in some cases, the remittances received were not enough to supplement the household food budget and, in areas such as Binga, men never returned and did not send back remittances (UNDP, 2016). Moreover, decision making power does not lie in the hands of women because of the strong patriarchal culture in most parts of the country. Thus, the women left behind are not always empowered to make decisions for their families' wellbeing, which leaves both the woman and her family very vulnerable (UNDP, 2016g).

Gender, climate change and food security

“One of the most distinguishing factors of Zimbabwean agriculture is the high prevalence of female-headed households. Women typically remain at their rural home to supplement income through labour and production” (USAID, 2015a). The importance of climate change was echoed by females aged 20 to 24 years who represented 3 percent of the participants during a UNICEF U-Report Poll. They were most concerned about the impacts of climate change in the country. Moreover, 85 percent of young people between 15 and 39 years were concerned about climate change and urged government to take urgent action in mitigating its adverse effects.

In the same U-Report Poll, 63 percent of respondents indicated that climate change was the most pressing concern for both females and males, with 86 percent of children below 14 years age group expressing such sentiments. The issues that most worried respondents about climate change were related to shifting seasons, dry spells, lack of water, walking long distances to get water, hunger and food insecurity. A greater proportion of respondents from Harare, a mostly urban province, highlighted food security, hunger and water scarcity as leading concerns related to climate change. Female respondents across all the provinces noted that they did not have enough food, thus there was an increase in food insecurity and a great deal

of hunger, for example, “Climate change affects agriculture, so my worry is food security.”

There are clear gender specific impacts of climate change, especially on women in the global South. The gendered implications of climate change in Sub-Saharan Africa arise from patriarchal norms and inequalities that often place women in disadvantageous positions in their ability to respond to and cope with climate change (Sultana, 2014, UNDP, 2016). The reliance of women on natural resources for food and income, and their limited access to productive resources, combined with their disadvantaged position in society increases their vulnerability to climate change induced stresses (Government of Zimbabwe, 2013).

Zimbabwean women are often engaged in subsistence farming and their food insecurities are, therefore, related to food production. They are frequently the farmers who cultivate food crops and produce commercial crops as a source of income alongside the men in their households. When women have an income, substantial evidence indicates that the income is more likely to be spent on food and on children's needs. Women are generally responsible for food selection and preparation and for the care and feeding of children, making them the key to food security for their households (Quisumbing et al., 1995).

Women become overburdened with labour intensive chores in years of drought, such as replanting in the event of crop failure, ploughing and carrying inputs, in addition to their domestic responsibilities. Pregnant and lactating women have to work more which puts a demand on their bodies for additional energy requiring more food and water (UNDP, 2016g).

The asymmetries in ownership of, access to, and control of, livelihood assets (such as land, water, energy, credit, knowledge, and labour) negatively affect women's food production capacity. Women are less likely to own land and usually enjoy only use rights, mediated through a man. Women's lack of entitlement to productive resources, including land, livestock, agricultural implements and credit, render them more vulnerable to food shortages. Research shows how social and cultural norms can translate into gender specific vulnerabilities even early in life, with girls tending to be more seriously affected

Table 4.3 Key policy and legislative frameworks on food security in Zimbabwe relevant to addressing climate change impacts

Policy and Strategies	
Food and Nutrition Policy and Strategies	Key Provisions
Food and Nutrition Security Policy (2013)	Fosters a multisectoral approach to solving food and nutrition security problems in the country. Its goal is to promote and ensure adequate food and nutrition security for all people, particularly amongst the most vulnerable, and in line with Zimbabwe's cultural norms and values and the concept of maintaining family dignity.
National Nutrition Strategy (2014-2018).	Aims to ensure nutrition security for all through the implementation of evidence based nutrition interventions that are integrated within a broad public health framework, including health services, water and sanitation.
Agriculture Policy and Strategies	Key Provisions
Comprehensive Agricultural Policy Framework (2015-2035)	<p>Works towards achieving access to adequate food and nutrition. Its policy objective of improvement of farm incomes and agricultural production focuses on the dimension of food availability through the development of sound strategies that ensure the production of critical food security crops (maize, wheat, soybean, sunflower and groundnuts) to combat the effects of climate change. Other policy objectives that are important for food and nutrition security are:</p> <ul style="list-style-type: none"> • Guaranteeing farmers a market at viable prices • Maintaining strategic grain reserves • Mainstreaming gender into agriculture, recognising the important role of women in ensuring household food and nutrition security.
Conservation Agriculture Policy (2010-2015)	Speaks to food security under a changing climate as it promotes the practice of conservation agriculture, which is regarded as a key adaptive strategy for agrarian communities to achieve crop productivity while, at the same time, preserving and conserving the environment.
National Drought Management Policy	The National Drought Management Policy aims to build community resilience through better resource and land management, resettlement, rural industrialisation and indigenisation, water and irrigation development.
Climate Change Policies and Strategies	Key Provisions
National Climate Change Response Strategy (2015)	<p>Recognises that sustainable development in Zimbabwe hinges on a robust agricultural sector that can support household and national food security. It notes that food shortages have become a perennial feature, resulting in a high prevalence of undernourishment and lack of food self sufficiency. It recommends better handling of food during periods of climate induced disasters as the basic systems to ensure proper handling, preparation and storage of food are often compromised, leading to frequent outbreaks of food-borne diseases.</p> <p>The strategy also recommends support for sustainable access to production resources to maximise production in the country's high potential agro-ecological zones while creating appropriate market links with farmers in low potential zones. It recommends the building of infrastructural and logistical mechanisms for easy procurement, transportation and transfer of food to needy areas within and across major agro-ecological zones.</p> <p>It recommends community empowerment to enable farmers to self mobilise and self organise for collective action towards increased production, risk management and enhanced market participation to improve their adaptation to climate change.</p> <p>One of the adaptation options is to enhance the capacity of farming communities to maximise production during favourable cropping seasons so as to be able to fall back on such harvests during poor years. It recommends advances in post harvest processing and storage technologies so that harvests from good years can be stored for longer periods to cater for the drought years.</p>

	<p>Relevant strategic objectives are to:</p> <ul style="list-style-type: none"> • Promote sustainable land use systems that enhance agricultural production, ensure food security and maintain ecosystem integrity. • Institutionalise climate change strategies, actions and budgets into (amongst others) health and food security. • Strengthen the capacity of farmers, extensions agencies, and private agro-service providers to take advantage of current and emerging indigenous and scientific knowledge on stress tolerant crop types and varieties, including landraces that are adaptable to the climatic scenarios now arising.
Climate Policy	<p>The agriculture section of the Climate Policy commits government to food security and availability through the following:</p> <ul style="list-style-type: none"> • Promoting irrigation and water use efficiency in agriculture, including adequate assessment of irrigation potential and irrigation demand under climate change. • Encouraging use of efficient irrigation technologies, including precision irrigation, and setting of appropriate water prices. • Promoting sustainable land use systems in line with the principles of climate smart agriculture. • Ensuring that mitigation and adaptation measures enhance agriculture based livelihoods, by promoting food security and poverty alleviation.
Nationally Determined Contribution (2015)	<p>Places climate change adaptation in the agricultural sector as a national priority. It recognises the vulnerability of the agricultural sector to climate change and its negative impacts on livelihoods and food and nutrition security. It focuses on achieving adaptation and mitigation measures in the agriculture sector through initiatives such as climate smart agriculture and sustainable agro-forest based adaptation and management practices, which can enhance food security and livelihood options.</p> <p>The Nationally Determined Contribution commits Zimbabwe to:</p> <ul style="list-style-type: none"> • Promoting adapted crop and livestock development and climate smart agricultural practices. • Strengthening management of water resources and irrigation in the face of climate change. • Promoting practices that reduce the risk of losses in crops, livestock and agricultural incomes.
Policy and Strategies for Social Protection	Key Provisions
Social Safety Nets Policy Framework	Advocates for initiatives that address food security, including agricultural input support for non labour constrained households, and public works programmes.
Gender Policy (2017)	<p>Promotes the mainstreaming of gender in environmental and climate change policies and strategies.</p> <p>The key policy objectives related to food and nutrition security include:</p> <ul style="list-style-type: none"> • Creating a supportive environment for gender parity in politics and decision making positions. • Increasing the gender responsiveness of the environment and natural resource management strategies and in climate change adaptation and mitigation initiatives • Transforming informal livelihoods and income generation activities into viable economic activities and broadening agro-entrepreneurship in disadvantaged rural, resettlement and urban areas.

by food shortages than boys are.

Responses to Food Security Challenges of Climate Change

The Government of Zimbabwe has responded to the effects of climate change on food security by developing policies and strategies and enacting laws that are conducive to food security in the face of a changing climate.

Zimbabwe's national policies, economic instruments and legislative framework on food security

Zimbabwe developed a new Constitution in 2013 which promotes food security and makes it a right, including under a changing climate. The Zimbabwe Constitution enshrines the principles required for promoting food security in the country through Sections 14 and 77. Section 14 guides the state in encouraging people to grow safe and adequate food, establishing sufficient food reserves and promoting enough and proper nutrition. Section 77 on the other hand, states that every person has the right to safe, clean and portable water, and to sufficient food.

The Zimbabwe Agenda for Sustainable Socio-Economic Transformation (ZimAsset) seeks to boost economic growth and development by investing in sustainable and robust solutions to address the challenges of food insecurity in Zimbabwe. The Food and Nutrition Cluster of ZimAsset provides a comprehensive suite of strategies to stimulate agricultural productivity and safeguard food security. Some of the cluster outputs include strengthening and implementing the climate and disaster management policy, adopting conservation agriculture, rehabilitating irrigation schemes, and promoting high yielding drought tolerant crop varieties and livestock, all of which address climate change and its impact on food security.

The Food Security and Nutrition Cluster thus dovetails with the core principles and objectives of SDG 2, which aims to end hunger. Within this framework, Zimbabwe has also developed a zero-hunger strategy. Table 4.3 outlines the most important policy and legislative frameworks that provide an enabling environment for the assurance of food security in the country.

Legislation, policies and strategies for climate informed food security need to be complemented by targeted adaptation interventions and a more

robust safety net system. People can become more resilient to shocks in agriculture when they are able to overcome local food shortages and have better access to relevant infrastructure, and improved technologies and production systems. Both communities and individuals need to be resilient to climate related stresses.

Programmes and interventions to address climate change impacts on food security in Zimbabwe

This Section discusses schemes which have been put in place by Government and its partners which have a bearing on climate change and food security.

Government schemes for food provision

The Government of Zimbabwe has a Grain Loan Scheme Policy to avert hunger crises in rural areas, through which villagers can borrow grain from the Grain Marketing Board in one season, with the proviso that they will either pay back similar amounts of grain or make cash repayments in the next season. Other forms of drought relief have involved free distribution of grain and food-for-work programmes run by both Government and NGOs. Government has also introduced programmes like the Presidential Inputs Scheme, Command Agriculture, Maguta and Champion Farmer, which support farmers with inputs for agriculture. However, stakeholders at national consultations indicated that the subsidies tend to be thinly spread and do not benefit a large proportion of farmers, especially in communal and old resettlement areas.

Civil society response to food security

Responses to food security in Zimbabwe have varied among NGOs and donor governments. Humanitarian assistance has often centred on the distribution of food aid, particularly in areas affected by climate related shocks and stresses. Generally, the effectiveness of the agencies and the programmes to alleviate hunger and thus ensure food security over the years have been uneven.

The WFP Zimbabwe, a United Nations agency, has aligned its country strategy and programmatic work with the SDGs, especially SDGs 2 and 17, in its effort to reach zero hunger. Its programmes support food insecure rural house-

holds to achieve food security and resilience to seasonal shocks and stresses. The WFP provides cash or food to meet food insecure families' short term needs, while assets, such as water harvesting systems, are rehabilitated or created for long term food security. In order to improve food access and food stability, WFP (in line with SDG 17) has formed partnerships with Government and traders to provide a structured market for national commodity traders and smallholder farmers, with the aim of stimulating local markets and local food marketing and procurement mechanisms.

The FAO operates an early warning system for food security called the Global Information and Early Warning System (GIEWS). The FAO-GIEWS provides information on countries facing food insecurity, through monthly briefing reports on crop and food prospects, inclusive of drought information. The system works closely with the WFP Humanitarian Early Warning Service (HEWS), which provides information on natural hazards occurring across the globe. The HEWS is a global multi-hazard watch service for early warning information that can be used to facilitate and support national humanitarian preparedness.

Specific and notable responses by NGOs and donors that go beyond food aid include:

- The European Union's Developmental Strategy for Zimbabwe, which focuses on investments in small livestock, which are considered important agricultural assets for coping with and adapting to extreme weather related events like drought;
- The DfID funded harmonised cash transfers; and
- The Zimbabwe Resilience Building Fund, managed by UNDP and supported by the European Union, DfID and the Government of Sweden, which aims to create communities that are resilient and able to bounce back from human induced and natural shocks and stresses.

Early warning systems

These include the ZimVAC and meteorological early warning systems. The ZimVAC was set up

in 2001, and is a consortium of Government, UN agencies, NGOs and other International Organisations that coordinate food and nutrition security assessments. The mandate of ZimVAC is to generate information on the Zimbabwean population's livelihoods, in particular their vulnerability to food insecurity and other socioeconomic factors. The information is used in planning, programming and decision making by Government and its development partners, using a national integrated food and nutrition security information system that provides timely and reliable information on the food and nutrition situation in the country and the effectiveness of programmes. The ZimVAC household food security analysis uses food availability, access and utilisation as indicators of food security.

The assessments are carried out each year, to project harvests and determine whether the country will have food security and which parts of the country and how many people will be food insecure and require assistance. This exercise informs both Government and development partners in designing the humanitarian assistance required each year and particularly during drought and floods years.

Rapid assessments are sometimes carried out when droughts and floods are imminent, as was the case for the 2015/16 drought season. Results of such an assessment informed the government to declare a State of National Emergency which assisted in raising humanitarian aid before a nationwide food crisis.

Early warning systems and their operationalisation may reduce vulnerability to climate change. Zimbabwe participates in the SADC regional early warning systems and hosted the SADC Drought Monitoring Centre from 1991 to 2008. The Centre monitors real-time climatic trends and generates long range climate outlook products to monthly and seasonal time scales (Feresu, 2010). Each year at the beginning of the planting season, the projections for the season are disseminated to the SADC member states to afford a greater opportunity to decision makers to develop strategic plans for dealing with any adverse climatic conditions.

Zimbabwe is also a member of the Southern Africa Regional Climate Outlook Forum, a net-

Table 4.4 Budget allocations to government departments central to agriculture and food security

Source: Government of Zimbabwe National Budget Statements - Ministry of Finance (2014,2015,2016)

Sector	Budget (USD '000s)		
	2014	2015	2016
Meteorological Services	3 838	2 926	2 330
Water Resources Management and Development	79 227	40 439	28 564
Agricultural and Extension Services	36 183	35 110	19 599
Irrigation and Development	15 218	10 703	7 147
Livestock Production and Development Division	6 697	5 082	5 558
Veterinary Services Division	22 109	19 008	1 850
Agricultural Engineering and Mechanisation	4 760	5 285	3 531
Civil Protection Unit	550	350	360

work that meets regularly to interpret global and regional climate signals that also provide seasonal rainfall forecasts. In addition, the country participates in the activities of the SADC Regional Early Warning System and the Famine Early Warning System which provide advisory services on the food security situation in the region (Feresu, 2010).

At national level, the Meteorological Services Department, within the Ministry of Environment, Water and Climate is responsible for climate monitoring and provides the country with daily, monthly and seasonal forecasts. With greater resourcing, it would have the capacity to give early warning forecasts of the impacts that might accompany climate change (Government of Zimbabwe, 2015).

Effectiveness of Institutions in Responding to Climate Change Induced Food Insecurity

Zimbabwe is one of the few countries in the global south with a high literacy rate and this has the potential to be transformed into human and intellectual capital for advancing the country's development agenda (see Chapter 6). Unfortunately, Zimbabwe continues to lose its technical and skilled experts to other countries in the region and abroad, primarily because of the poor macroeconomic environment in the country. This brain drain has weakened both public and private sector institutions and compromised the country's capacity to respond effectively to climate change. Weak institutional capacity to implement policies and strategies is the gravest obstacle to curbing Zimbabwe's food security challenges and there is a need for en-

hanced human and institutional capacity (technology, skill set, financing) in the country.

Further barriers to Zimbabwe responding effectively to climate change are related to limited financial resources and obsolete equipment and infrastructure. For example, the Zimbabwe Meteorological Services Department is responsible for weather forecasting, climate research and hydrological early warning systems, which are imperative for providing information for planning, management and disaster preparedness by sector ministries, farmers and civil society. However, it receives a mere 0.005 percent of the national budget, which is 10 percent of the ideal level (UNDP, 2016). As a result, its services and monitoring activities across the country are severely constrained. Furthermore, the effectiveness of Zimbabwe's Meteorological Services Department and its satellite offices at the district level is limited by inadequate funding, failure to upgrade and maintain equipment especially at local stations, and staff turnover.

This situation further curtails the ability of the country and individuals to respond effectively to the impacts of climate change and extreme weather events, and places stress on already resource constrained households in rural areas, leading to declining wellbeing and increased poverty. Building resilience to climate change in Zimbabwe requires substantial investment in meteorological infrastructure at both national and local levels.

While the Government of Zimbabwe regards climate change as a threat to the country, it is inhibited by its limited human, institutional and

Table 4.5 Food Security targets for Sustainable Development Goal 2

Goal	Target number	Target
Goal 2 End hunger, achieve food security and improved nutrition and promote sustainable agriculture	2.1	By 2030, end hunger and ensure access by all people, in particular the poor and people in vulnerable situations, including infants, to safe, nutritious and sufficient food all year round
	2.2	By 2030, end all forms of malnutrition, including achieving, by 2025, the internationally agreed targets on stunting and wasting in children under 5 years of age, and address the nutritional needs of adolescent girls, pregnant and lactating women and older persons
	2.3	By 2030, double the agricultural productivity and incomes of small scale food producers, in particular women, indigenous peoples, family farmers, pastoralists and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment
	2.4	By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters, and that progressively improve land and soil quality
	2.5	By 2020, maintain the genetic diversity of seeds, cultivated plants and farmed and domesticated animals and their related wild species, including through soundly managed and diversified seed and plant banks at the national, regional and international levels, and promote access to and fair and equitable sharing of benefits arising from the utilisation of genetic resources and associated traditional knowledge, as internationally agreed

Table 4.6 Examples of targets in other goals linked to food security

Goal	Target number	Target
Goal 8 Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all	8.3	Promote development oriented policies that support productive activities, decent job creation, entrepreneurship, creativity and innovation, and encourage the formalisation and growth of micro small and medium sized enterprises, including through access to financial services
Goal 10 Reduce inequality within and among countries	10.2	By 2030, empower and promote the social, economic and political inclusion of all, irrespective of age, sex, disability, race, ethnicity, origin, religion or economic and other status
	10.4	Adopt policies, especially fiscal, wage and social protection policies, and progressively achieve greater equality
Goal 12 Ensure sustainable consumption and production patterns	12.3	By 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post harvest losses
Goal 13 Take urgent action to combat climate change and its impacts	13.2	Integrate climate change measures into national policies, strategies and planning.

financial resources. Domestic spending cuts put pressure on the ability of the government to cope with climate stresses and weather-related disasters. The budget for the Ministry of Environment, Water and Climate was drastically reduced from the USD 93 million set aside for 2014, to USD 52 million for 2015 (Ministry of Finance 2014, 2015; Thomson Reuters Foundation, 2015). There was a further reduction to USD 34 million in the 2016 budget for this sector. Table 4.4 summarises budgets for key government sectors that are important in developing climate resilience and food security in the country for the period 2014 to 2016.

The general trend highlights a reduction in government spending in these sectors. In recent years even these reduced amounts in the National Budget Statements may not be disbursed in full. The challenge for the country is to develop a resilience framework that will reduce the diverse and complex impacts of climate change within the limited financial support available from Government.

Food Security, Sustainable Development Goals and National Policies

Sustainable development can only be achieved by ending poverty and hunger but multidimensional poverty levels are high in Zimbabwe, especially in rural localities (see Chapter 2). Climate change, with its associated variations in precipitation patterns, extreme weather events and temperature extremes is likely to exacerbate these poverty levels, as well as cause food insecurity resulting in hunger. This will constrain progress made in the country's human development and increasingly affect the poor (OECD, 2014).

Food security in Zimbabwe and sustainable development

Food security is a human right and underlies life and all components of sustainable human development. The SDG 2 on food security is linked closely to the climate change, food security and human development nexus for Zimbabwe. One of the targets of SDG 2 is to double the agricultural productivity of small scale producers and this is particularly relevant to Zimbabwe since almost 89 percent of its agrarian landscape comprises smallholder farmers (Moyo, 2011)

who are reliant on climate sensitive crop and livestock production. As in the rest of the world, the SDGs will map Zimbabwe's mid-term future outlook for human development including SDG2 on food security, which is outlined with its targets in Table 4.6.

Most of the targets relating to Goal 1 presented in Chapter 3 on livelihoods, if implemented, will have an effect on food security. Examples of other SDGs relevant to food security are presented in Table 4.6.

Zimbabwe has become a net importer of maize, its staple food (see Chapter 3) because of frequent droughts, among other challenges. Implementing SDG 2 and the other supporting goals will ensure a move towards food security. This will need the global support envisaged in the directions about how to implement the targets that accompany the SDGs. Currently Zimbabwe receives very limited foreign direct investment and support from the global financial institutions. Measures will need to be taken by both the Government of Zimbabwe and the developed countries to drive the food security agenda.

Conclusions

This chapter has presented the state of food security in Zimbabwe whereby national agricultural production relies on rain-fed agriculture, which renders the sector vulnerable to climate change and variability. The outcomes of the interaction among environmental stresses, socioeconomic conditions and climate change impacts, over various time scales, have negative effects on the country's ability to achieve food security and to meet its human development goals. It is expected that the frequency of droughts, long dry periods and reduced rainfall will constrain agrarian production and exacerbate food poverty, resulting in a significant decline in human development, especially for those with very limited social safety nets. The food security responses (Government, donors, civil society) to the impacts of climate change have been outlined. Policy measures, therefore, require Zimbabwe to build rural and urban resilience to the shocks and stresses of climate change and variability and ensure food security.

CLIMATE CHANGE AND HEALTH

Climate change represents an inevitable, massive threat to global health that will likely eclipse the major known pandemics as the leading cause of death and disease in the 21st century... The health of the world population must be elevated in this discussion from an after-thought to a central theme around which decision-makers construct rational, well informed action-orientated climate change strategies.

Dr. Dana Hanson, President, World Medical Association

Introduction

Good health is central to human happiness and wellbeing. People in good health live longer and are much more likely to invest in education, making them potentially more productive and better contributors to national income. As noted in Chapter 2, living a long healthy life is one of the components of human development, which is measured through life expectancy. Many factors affect or determine life expectancy and most of these are related closely to the levels and performance of various health indicators, including health service provision. Hence issues such as child mortality, maternal mortality, nutrition, immunisation, water and sanitation provision, and access to quality healthcare services and facilities, among others, have an important bearing on life expectancy.

This chapter focuses on how climate change affects human development in Zimbabwe through its impact on the health of the population. Climate change affects peoples' abilities to lead long and healthy lives, to be knowledgeable, to have a decent standard of living, and to participate in community life with dignity and self respect (see Chapter 2). In line with the rest of the report, this chapter applies a modified version of the DPSIR framework to interrogate the health aspect of human development, considering climate change as the main driver of the status of health in the country.

The chapter starts by presenting the state of the health sector in Zimbabwe, which provides a

background for analysing and understanding how climate change is likely to affect the health of the people. It then goes on to present the linkages between health and climate change, identifies the groups in society that are most vulnerable, and discusses the impacts of climate change on their health and how this affects them. The chapter ends by discussing the responses by Government, households, and health related stakeholders from outside the communities (e.g. NGOs and other development partners) to the impacts of climate change on health. The perceptions of stakeholders of the effectiveness of the health service system in addressing climate change induced health problems are also discussed.

This chapter addresses the following questions:

- What is the state of health and the health sector in Zimbabwe?
- What are the major climate change risks and their impacts on community health and health service delivery, and on achieving the targets of SDG 3 and targets in other Goals linked to health?
- Which social groups are most vulnerable to these risks?
- What measures have been taken by the Government, society and other players to address the impacts of climate change on health and how effective have these mea-

sures been?

The Constitution of the WHO defines health as “a state of complete physical, social and mental wellbeing, and not merely the absence of disease or infirmity” (WHO, 1948). However, in a context of health promotion, the WHO has assumed a more purposeful notion of health, considering it as “a resource which permits people to lead an individually, socially and economically productive life”. From this perspective, health is seen as “a positive concept emphasising social and personal resources as well as physical capabilities” (WHO, 1998). In the economic literature, health is often measured by life expectancy at birth or at other ages.

Health is a human right enshrined in the United Nation’s Universal Declaration of Human Rights, the African Charter on Human and Peoples’ Rights and the International Covenant on Economic, Social and Cultural Rights. The Constitution of Zimbabwe explicitly provides for the right to healthcare for all its citizens and permanent residents in Chapter 4 Section 76 (Government of Zimbabwe, 2013). Health is an important component of the quality of life and every human being, without discrimination, has the right to the highest attainable standard of physical and mental health. This includes access to adequate healthcare (curative, preventive, rehabilitative and palliative), nutrition, sanitation, clean water and air, and occupational health. The right to health is very important to a person’s life and wellbeing, and is necessary to enable them to enjoy other rights.

Universal healthcare tops the global health policy agenda and demands national health systems in which everyone has access to the services they need and universal financial protection from the costs of using those services. It is included as target number 3.8 of the health targets of the SDG on health (SDG 3). Hence the need to understand and address the effects of climate change on human development through its impacts on health cannot be over emphasised.

The State of Health in Zimbabwe and its Vulnerability to Climate Change

This section presents the state of the health sector in Zimbabwe, with the objective of providing a broad indication of the extent to which the country’s health sector is exposed to climate

change risk, its vulnerabilities, and the extent to which the country is prepared to tackle the potential negative effects of climate change on health. In this regard, the section discusses the state and trends of the major health indicators, including those that have a bearing on human development indices.

Trends in Zimbabwe health indicators

The Zimbabwean health sector held the status of a leading performer in Sub-Saharan Africa during the first and into the second decade of Independence (beginning in 1980). The performance of the health sector started to decline during the mid to late 1990s, and suffered severely during the period 2000 to 2009, virtually collapsing before beginning to recover thereafter.

The trends in the performance of the health sector followed, and in some way reflect, Zimbabwe’s broader macroeconomic trajectory. Zimbabwe experienced severe and escalating economic challenges which peaked in 2008. The economic decline resulted in a sharp decrease in funding for social services in real terms. This contributed directly to an unprecedented deterioration of health infrastructure, loss of experienced health professionals, drug shortages and a drastic decline in the quality of health services available to the population.

The situation analysis for the National Health Strategy for Zimbabwe, 2009 to 2013 (Ministry of Health and Child Welfare, 2009) described the prevailing physical environment as being

...characterized by poor and inadequate water supplies, breakdown in the sewer systems, inadequate sanitation in both the urban and rural areas, poor waste management practices, inadequately supervised food preparation processes and inadequate control of vector borne diseases coupled with increased urban unplanned overcrowded settlements and poor enforcement of laws and regulations that protect health.

This situation increased the exposure of the population to vector-borne, water-borne and other diseases, which saw an increase in the rate of diseases such as cholera and other diarrhoeas, malaria, tetanus, asthma and other chest conditions.

Table 5.1 Estimated life expectancy at birth by province, 2015

Source: ZIMSTAT (2015c)

Background Characteristics	Life Expectancy at Birth		
	Male	Female	Both Sexes
Rural	55.0	62.3	57.4
Urban	60.9	65.4	64.0
Bulawayo	55.5	60.2	57.9
Manicaland	56.3	63.3	60.1
Mashonaland Central	54.9	58.9	57.1
Mashonaland East	54.7	59.7	57.3
Mashonaland West	56.2	58.9	57.6
Matabeleland North	55.2	61.7	58.6
Matabeleland South	49.8	56.8	53.5
Midlands	57.1	61.9	59.7
Masvingo	54.1	61.4	58.1
Harare	59.9	62.9	61.4
Total	57.4	64.0	60.7

The outcomes of these, compounded by the economic challenges facing the country, included the following:

- High infant, child and maternal mortality;
- High morbidity and mortality due to HIV, malaria, and vaccine preventable diseases;
- Poor access to safe water and sanitation with consequent increases in diarrhoeal diseases including cholera;
- Inadequate health information, education and communication;
- Limited access to healthcare, especially by vulnerable groups because of high user fees, high transport costs and uneven spatial distribution of health facilities;
- Poor quality of care in both the public and private health sectors;
- A weak health delivery system in terms of planning, budgeting and management;
- Poor intersectoral action and partnership in health service delivery; and
- Poor community participation and involvement in health issues (Ministry of Health

and Child Welfare, 2009).

Given the level to which the health sector had deteriorated, because of the economic decline that reached rock bottom in 2008, the country had to go through a transition towards building the foundation for a long term system for universal health coverage. Zimbabwe's health sector is still struggling to reclaim lost ground while coping with very tight fiscal constraints. This situation has made the health sector highly vulnerable in dealing with climate change induced shocks and stresses such as droughts and floods.

According to the World Bank (2016), while the health sector's expenditure efficiency has not yet returned to the performance levels observed in the 1990s, it has succeeded in adopting innovative strategies such as the Results Based Financing model, which have enabled it to exceed the average performance levels of comparable countries. This means Zimbabwe's health sector performance is moving in the right direction and has potential to build the required capacity to address the negative impacts of climate change on health.

Life expectancy at birth

Life expectancy at birth is one of components of the HDI (see Chapter 2). It reflects how long a new born infant is expected to live if the exist-

ing age specific mortality pattern in society remains unchanged throughout the infant's life. It summarises the mortality situation that prevails across all age groups – children, youth, adults and the elderly.

Life expectancy in Zimbabwe, which was estimated at 61 years in 1990, had dropped to 41.7 years by the year 2000. The decline was mainly due to the impacts of HIV, exacerbated by widespread poverty, which weakened national and individual responses to the pandemic. Concerted efforts were successful in combating and reversing the incidence of HIV and its impacts in Zimbabwe, and this saw life expectancy recovering to 60.7 years in 2015. Behavioural change, combined with increased access to antiretroviral therapy (ART) among adults aged 15 years and above (from 73.8 percent in 2011 to 83.6 percent in 2013) largely explains this success (Ministry of Macroeconomic Planning and Investment Promotion and UN Zimbabwe, 2016). Estimates of life expectancy at birth by sex and by province are presented in Table 5.1.

Life expectancy is lower in rural areas, at 57.4 years, than for the urban areas, at 64.0 years. It is higher for females (64.0 years) than for males (57.4 years). Harare has the highest life expectancy level (61.4 years), followed by Manicaland (60.1 years) and Midlands (59.7 years). Matabeleland South has the lowest life expectancy, at 53.5 years, followed by Mashonaland Central (57.1 years).

The improvements in life expectancy, which reflect improvements in the general health status of the population, and hence human development, need to be protected against threats from the negative impacts of climate change. Climate change and its potential impacts on poverty, food availability (see Chapter 4) and health, remain a potential threat to the positive developments in life expectancy.

Table 5.2 shows projections of life expectancy for males and females in Zimbabwe, both of which show an increasing trend. These are based on assumptions of a continued decline (non-reversal of trends) in HIV prevalence and reduced AIDS related deaths, improved public health systems, increasing educational levels, rising incomes and urbanisation. For these positive projections to materialise, it is important to ensure that the

negative effects of climate change on health are addressed.

Table 5.2 Life expectancy values - projected population, 2012 to 2032

Year	Male	Female
2012	57.4	64.0
2017	60.3	66.5
2022	63.2	69.0
2027	66.1	71.5
2032	69.0	74.0

Child mortality

The mortality of children can be defined for different age groups as outlined in the box below (ZIMSTAT, 2015d, 2015b).

Definitions used for assessing child mortality (ZIMSTAT, 2015d, 2015b)

Neonatal mortality: the probability of dying within the first month of life

Infant mortality: the probability of dying between birth and the first birthday

Post-neonatal mortality: the difference between infant and neonatal mortality

Under-5 mortality: the probability of dying between birth and the fifth birthday

Child mortality: the probability of dying between age one and the fifth birthday

The mortality rates for children in Zimbabwe for three successive five-year periods 2000-04; 2005-09 and 2010-14 are presented in Table 5.3.

Table 5.3 Mortality rates (per 1 000) for various periods between 2000 and 2014

Source: Ministry of Macroeconomic Planning and Investment Promotion and UN Zimbabwe, (2016)

Mortality Rate Age Group	Period		
	2000-04	2005-09	2010-14
Neonatal	29	25	20
Infant	50	58	55
Under-5	75	84	75

Table 5.4 Zimbabwe GDP at current prices (USD billion), 2000 to 2014

Source: Zimbabwe data portal (ZIMSTAT) of the World Development Indicators

<http://zimbabwe.opendataforafrica.org/WBWDIGDF2016Oct/world-development-indicators-wdi>

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
GDP	6.7	6.8	6.3	5.7	5.8	5.8	5.4	5.3	4.4	8.2	9.4	11.0	12.4	13.5	14.2

The leading causes of under-5 mortality in Zimbabwe are neonatal, mainly pre-term birth complications (accounting for 44 percent), birth asphyxia, neonatal sepsis and congenital anomalies (Ministry of Health and Child Care, 2017). Other major causes of under-5 mortality include pneumonia, diarrhoea and measles. HIV could also underlie deaths recorded as pneumonia and diarrhoea, while malnutrition is an underlying factor in many of the deaths. Malaria was the cause of 3 percent of under-5 mortality. Some of the leading causes of child mortality, such as diarrhoeal conditions, respiratory infections, malnutrition and malaria, are climate sensitive. Malnutrition is the outcome of chronic food insecurity and hunger (see Chapter 3), which are exacerbated by drought and variable precipitation the frequency of which is increasing because of climate change.

Trends in child mortality are also influenced by national economic outcomes. The progress that had been achieved in infant and under-5 mortality between 1999 and 2004 was reversed between 2004 and 2009 as the national economic situation deteriorated. Zimbabwe's GDP at current US Dollar prices fell by 34.3 percent, from 6.7 billion in year 2000 to 4.4 billion by 2008 (Table 5.4). Thereafter, as the economy improved, with GDP increasing to 14.2 billion by 2014, as did the performance in infant and under-5 mortality. This suggests that improvements in overall economic conditions had a positive impact on the health conditions of children and it could be extrapolated from this that such conditions would be necessary to build the country's resilience towards climate sensitive diseases that affect children.

Maternal mortality

Adult and maternal mortality indicators can be used to assess the health status of a population, especially in developing countries such as

Zimbabwe. Maternal deaths are a subset of all female deaths, and are defined as any deaths that occur during pregnancy or childbirth, or within two months after birth or the termination of a pregnancy. The maternal mortality ratio was estimated at 612 deaths per 100 000 live births for the seven years 1998 to 2006. It then increased (worsened) to 960 deaths per 100 000 live births during the seven years 2003 to 2011. Thereafter it improved to 651 deaths per 100 000 live births for the seven years 2008 to 2015 (ZIMSTAT and ICF International, 2016).

The amelioration in maternal mortality after 2009, as the economy was recovering, was a result of improvements in healthcare services reflected in an increased proportion of births being attended by skilled health personnel, reduction in home deliveries and improved antenatal care. These developments are pointers towards improving capacity for the healthcare system in Zimbabwe to deal with climate change induced upward pressure on maternal mortality, since climate change effects on maternal health outcomes, such as malnutrition, infectious diseases, environmental problems, and direct heat exposure, represent severe health risks for mothers and children (Rylander et al., 2013).

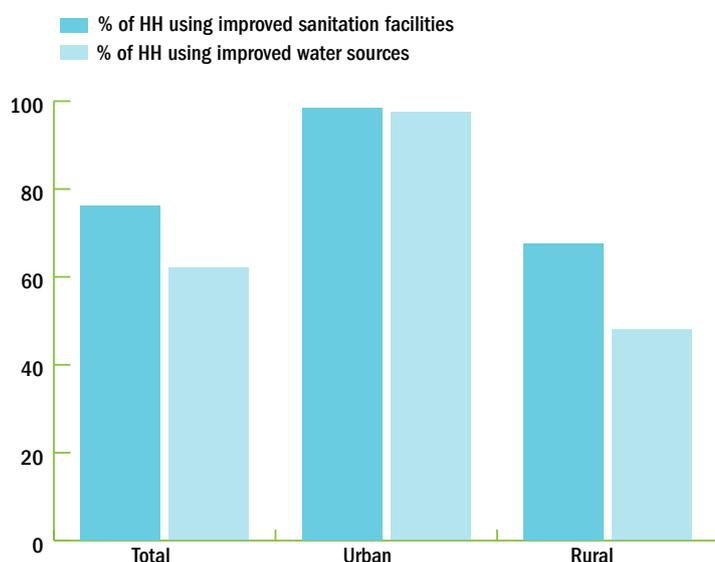
Prevalence of malnutrition

The major nutrition challenges in Zimbabwe are chronic malnutrition and micronutrient deficiencies (also see Chapter 4). Children's nutritional status is a reflection of their overall health. Food and nutrition insecurity leads to a vicious cycle of malnutrition, increased susceptibility to disease, and impaired mental and physical development.

In 2014, 27.6 percent of children in Zimbabwe aged 0 to 59 months were stunted (ZIMSTAT, 2015d). This was an improvement on the 35 percent reported in the 2009 Multiple Indica-

Figure 5.1 Percentage of households using improved water sources and improved sanitation facilities in Zimbabwe in 2014

Source: ZIMSTAT (2015d)



tor Monitoring Survey (ZIMSTAT, 2009). The stunting level in rural areas was 30.4 percent, compared to 20 percent in urban areas. Boys were more likely to be stunted (31.1 percent) than girls (24.1 percent). Despite the improvement, more still needs to be done if the country is to meet the global World Health Assembly target of 40 percent reduction by 2025.

The attainment of these malnutrition reduction targets will be made difficult by the challenges posed by climate change. The expected impacts of climate change on rainfall variability, rising temperatures and increasingly frequent of heat waves, droughts and floods will destabilise agricultural production. The situation is made worse by the country's excessive reliance on rain-fed agriculture (see Chapters 3 and 4). These are issues that need to be addressed for the country to make acceptable progress in reducing malnutrition.

Water and sanitation

Safe drinking water and sanitation are two of the essential elements that determine improvement of living standards, as they reduce morbidity from diseases such as diarrhoea, dysentery, cholera, typhoid and schistosomiasis. These diseases can sometimes be induced by climate related shocks and stresses such as floods and

droughts.

Safe drinking water is a basic necessity for good health. Easy access to it may be particularly important for women and children, who bear the primary responsibility for fetching water, especially in rural areas. Droughts tend to lengthen the distances that have to be walked as most water sources are no longer perennial because of reduced rainfall.

Of all households in Zimbabwe, 76 percent use improved sources of drinking water (piped water, tube well or borehole, protected well, protected spring). Nearly all households (98.4 percent) in urban areas and 67.5 percent in rural areas use an improved water source (Figure 5.1). However, some of the improved water sources may still be subject to contamination. For example, 36 water points out of a total of 68 sampled in Harare's high density suburbs were significantly contaminated by faecal coliforms (OXFAM Survey referred to in DailyNews Live, 24 March 2017). Such incidences have been observed especially when there are extreme climatic events such as floods which was the case when these tests were carried out.

Inadequate disposal of human excreta and lack of personal hygiene are associated with a range of diseases, including diarrhoeal diseases and polio, and are important determinants for stunting (UNICEF, 2016a). Improved sanitation can reduce diarrhoeal diseases by more than a third (Cairncross et al., 2010) and can lessen significantly the adverse health impacts of other disorders responsible for death and disease among millions of children in developing countries (ZIMSTAT, 2015d). About 62 percent of the population of Zimbabwe lived in households with improved sanitation facilities in 2014 (Figure 5.1). Use of improved sanitation facilities was almost universal in urban areas (97.5 percent), compared to 48.0 percent in rural areas.

Overall, 29.7 percent of households used improved water sources and sanitation. A higher proportion of the population in urban areas had access to both improved water sources and improved sanitation (46.9 percent) than in rural areas (23.1 per cent) (ZIMSTAT, 2015d).

With climate change, reduced precipitation levels will decrease the availability of both surface

Table 5.5 Distribution of health facilities by level and province, 2014

Source: ZIMSTAT, (2014)

Provinces	Primary Level	First Referral Level	Second Referral Level	Third Referral Level	Total
Harare	77	0	0	8	85
Manicaland	245	31	1	0	277
Mashonaland Central	142	12	1	0	155
Mashonaland East	194	21	1	0	216
Mashonaland West	170	18	1	0	189
Matabeleland North	140	17	0	0	157
Matabeleland South	115	17	1	0	133
Midlands	241	12	1	0	254
Masvingo	188	19	1	0	208
Bulawayo	37	0	0	8	45
Total	1 549	147	7	16	1 719

and ground water, while on the other hand, increased precipitation intensity can overwhelm existing drainage infrastructure and lead to flooding. Depending on location and sanitation conditions, flood water can contaminate drinking water (surface water, groundwater, and distribution systems) and may increase the incidence of water-borne and water related diseases. Such incidences may occur in both urban and rural settings. For example, water supply and sanitation infrastructure were flooded and contaminated in January 2015, including 70 boreholes in Mashonaland Central Province (Mbire district) alone, which increased the risk of water-borne diseases (Emergency Plan of Action Zimbabwe: Floods, International Federation of Red Cross and Red Crescent Societies, January 2015). Floods render individual septic systems dysfunctional in urban areas, with the ground becoming too saturated to percolate the sewage and greatly increased potential for disease outbreaks.

Access to healthcare facilities

The Health sector in Zimbabwe is made up of the public, local authorities, private, and mission health centres or institutions. The public health sector comprises government hospitals and clinics in major cities, towns, provinces and districts, as well as rural and urban council clinics and health centres. The private health sector consists of private hospitals, clinic and surgeries. Mission health centres or institutions include hospitals and clinics at schools and colleges. The country has four categories of health services

and facilities which are:

1. Primary level - clinics and rural health centres
2. First referral level - district, mission and rural hospitals
3. Second referral level - provincial hospitals
4. Third referral level - central hospitals and infectious diseases hospitals.

Table 5.5 shows the distribution of health facilities by province for the years 2013 and 2014.

The majority of health facilities in Zimbabwe are at primary care level and these refer complicated cases to the next levels of care. Mission hospitals are mostly at the first referral level and they provide considerable services mainly in rural areas, while private sector facilities provide services mostly in urban areas. A service availability and readiness assessment survey conducted in 2015 reviewing the organisation and readiness of the health system, found that urban locations had a higher availability of basic amenities than rural locations. Furthermore, hospitals were more likely to have all basic amenities than were primary care facilities (Ministry of Health and Child Care, 2017).

Most of the challenges to the health sector associated with climate change are addressed from a primary healthcare perspective and with strong

community participation. The National Health Strategy 2016-2020 advocates for strong community participation and identifies a need to establish strong community systems, including involvement of traditional and local leadership, to enable successful and effective implementation of the primary healthcare approach (Ministry of Health and Child Care, 2017).

However, the number of primary health facilities is lower than optimal in relation to the size of the population in all provinces – less than two health facilities per 10 000 people – except in Bulawayo (Ministry of Health and Child Care, 2017). In terms of staffing, only Bulawayo Province achieves the national target of 23 health workers per 10 000 people. The majority of primary healthcare centres in the country are understaffed, with most provinces having less than 10 health workers per 10 000 people.

Despite the threat of a near collapse of the health system in 2008, and the staffing challenges, the 2015 service availability and readiness assessment survey shows that the health system has largely remained resilient enough to provide basic services to the majority of the people (Ministry of Health and Child Care, 2017). However, challenges remain in terms of service gaps, and more importantly quality of service, to ensure effective coverage.

The other leading challenge affecting access to healthcare is the requirement for direct out-of-pocket payment for health services (formal or informal) which presents hardships especially for poor and vulnerable households. With no public health insurance scheme, most Zimbabweans, other than those exempted from user fees in the public sector, rely on having cash on hand to seek healthcare. Private health insurance schemes cover only about 10 percent of Zimbabwe's 14 million people. This prevailing situation needs to be addressed if the health sector is to be strengthened sufficiently to cope with the increasing health burden that is likely to occur with climate change.

Climate Change-Health Linkages

Climate change presents a global public health problem, with serious health impacts predicted to manifest in varying ways in different parts of the world. The prospect of having a long and healthy life and having access to the resources

needed for decent living standards could be threatened by climate change. This is because it threatens human health and wellbeing in many ways, including impacts from increased extreme weather events and wildfires, decreased air quality as well as illnesses transmitted by food, water and disease carriers such as mosquitoes and ticks. There are two broad categories of climate phenomena impacting on health, and these are changes in temperature and precipitation. The causal pathways through which climate change impacts on public health are shown in Figure 5.2.

The manner in which these phenomena affect health is discussed using information gathered during the community and other stakeholders' consultative workshops, from the U-Report Poll, as well as from literature (see Chapter 1 for details on methods of data collection).

Impacts of climate change on health

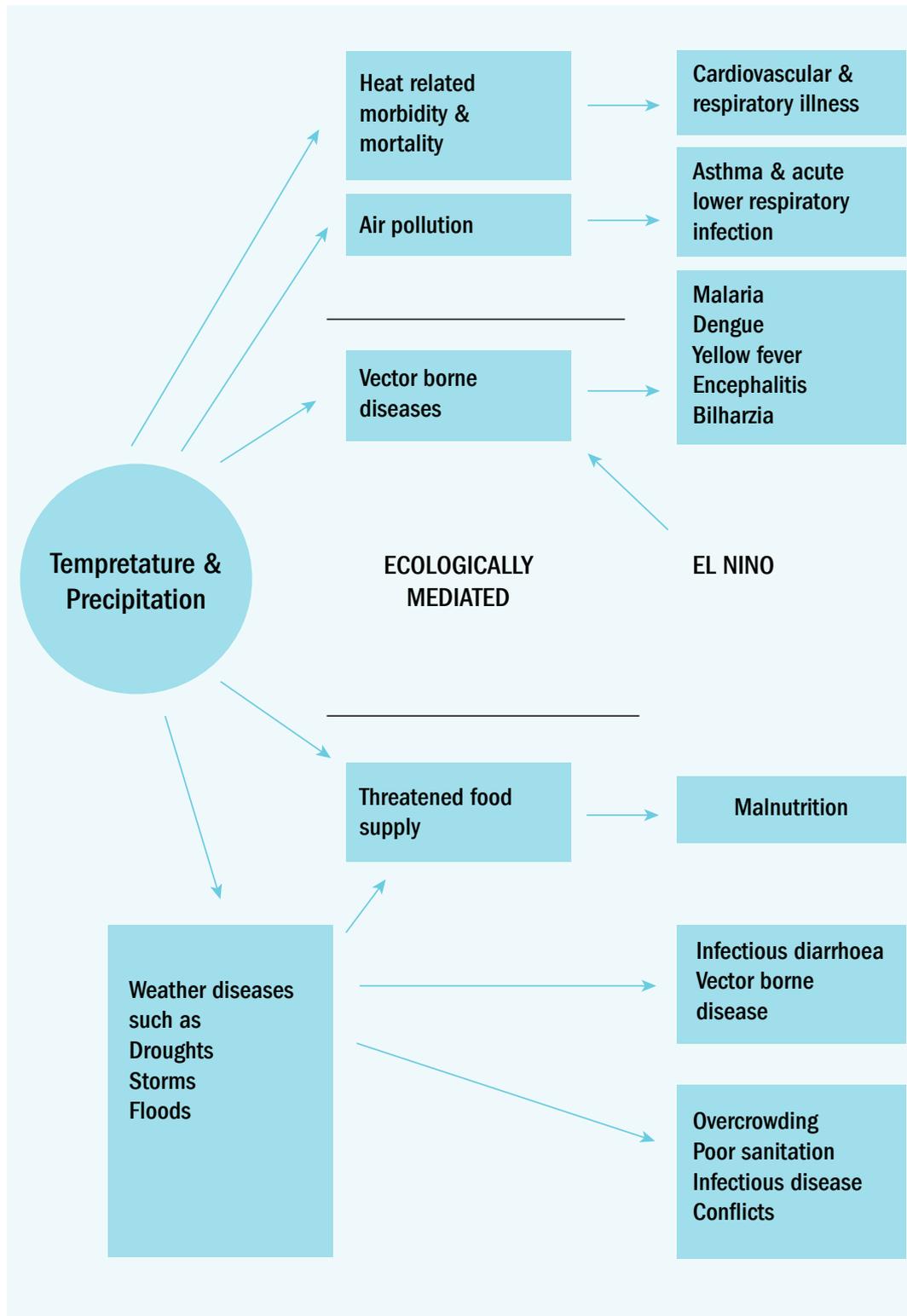
Climate change is predicted to have a wide range of impacts on human health including temperature related morbidity and mortality caused by extreme temperatures and those caused by extreme weather events such as malnutrition, water-borne, as well as food borne and vector-borne diseases (Markandya and Chiabai, 2009).

Precipitation changes

Community representatives who were consulted identified several ways in which the changing weather patterns bring about health problems. Heavy rains and flash floods were associated with direct threats to human life, particularly for those living in low lying areas such as in Muzarabani in the North of the country and Chikwalakwala in Chiredzi District. The most cited example was that of the Tokwe-Mukosi flood victims who were relocated to Chingwizi transit camp where around 12 000 affected people stayed for about two years. Other areas where increased floods have been observed are Lower Save, Lower Manyame and Tsholotsho (Government of Zimbabwe, 2015). Floods destroy homesteads and they create breeding grounds for mosquitoes which are associated with the spread of malaria. Excessive rains, in areas of poor drainage, such as urban areas, lead to occurrence of water-borne diseases such as cholera and typhoid.

Figure 5.2 Causal pathways of public health impacts from climate change

Source: Modified version of Patz and Balbus (1996)





Heat stress and loss of cattle in Chipinge in the El Nino induced drought of 2016
Source: Manica Post (2016)

Floods also result in damage to transport infrastructure, which makes it difficult for people, particularly in rural areas, to reach health institutions, or for deliveries of medicines to rural health centres and food aid to rural communities to take place. Heavy rains and flash floods have resulted in the destruction of homesteads, school buildings and clinics, in some cases exposing families, students and patients to hostile weather conditions.

People who experience loss of homes or loved ones, or exposure to life threatening conditions, face a higher risk of developing stress and anxiety related conditions such as post traumatic stress disorder and depression (OHCHR, 2016).

Floods and poor drainage cause water contamination that leads to the occurrence and spread of water-borne diseases. These are caused by pathogenic microorganisms that are most commonly transmitted in contaminated fresh water. Infection commonly occurs through drinking water, preparation and consumption of food, and washing or bathing with water that is infected by pathogens. Water-borne pathogens cause a wide range of conditions including, acute dehydration diarrhoea (cholera), prolonged febrile illness with abdominal symptoms (typhoid fever), acute bloody diarrhoea (dysentery), and chronic diarrhoea (brainerd diarrhoea).

From mid-January to 28 February 2017, about 1 380 typhoid cases were reported in Zimbabwe,

of which 39 were laboratory confirmed and two typhoid related deaths were reported (Zimbabwe Humanitarian Situation, Report No. 12-28, February 2017). During this period, the country was experiencing localised and widespread flooding caused by torrential rain, mainly in the southern provinces of Masvingo, Matabeleland South, Midlands and Manicaland.

Internal migration occurs as people are forced to move from areas that are flooded. As already noted, low lying areas such as Chiredzi District in the south of Zimbabwe and Muzarabani in the north, are prone to flooding; and when people are internally displaced because of weather related disasters, they are usually settled in camps. More often than not, these camps have poor sanitary facilities, promoting transmission of communicable diseases.

In 2014, UNICEF reported on the water supply situation at the main relocation campsite at Chigwizi after displacement of people as a result of floods from Tokwe-Mukosi dam. They noted that the situation was largely temporary and unsustainable, and the sanitation and hygiene promotion coverage was low. At one point, the proportion of the population with access to communal toilets in Chingwizi camp was 26 percent (UNICEF, 2014). At that time, diarrhoeal diseases were reported to be on the increase and 60 cases were recorded at the camp's health facility. Furthermore, the social conditions in such camps often force young women into sexual activities and prostitution, promoting the spread of sexually transmitted diseases, including HIV. The dormitory conditions that are standard in most such camps may also promote the spread of diseases such as tuberculosis.

UN Environment anticipates that climate change will affect migration flows in two ways that are relevant to inland countries such as Zimbabwe. The first relates to the effects of warming which, in some areas, will gradually reduce agricultural productivity and degrade ecosystem services such as clean water and fertile soil. The second is the increase in extreme weather events, especially heavy rainfall accompanied by flash or river floods in tropical regions. This will affect increasing numbers of people and result in mass displacement (Science for Environment Policy, 2015).

Decreasing rainfall and drought

Drought leads to poor harvests and deficits in food supply. It has adverse effects not only on humans, but also on livestock, which are a strategic investment to rural and farming communities (see Chapter 3 and 4). Drought and the associated inadequate grazing results in prolepses, death during birth and hunger deaths in livestock.

Lack of adequate food caused by drought results in malnutrition and stunting in humans. Malnutrition is associated with higher disease incidence and impedes mental development among children (UNICEF, 2013). The most affected and vulnerable people identified through stakeholder consultation workshops for the report were children, especially orphans, pregnant mothers, the elderly, people with disabilities, widows, diabetics and people living with HIV. People living with HIV and chronic diseases such as diabetes are special groups in terms of vulnerability to drought and the accompanying food insecurity and malnutrition, in that they need to have access to food and nutrients to adhere to treatment so that they can live healthy and productive lives.

Treatment for HIV most effective for those people who are properly nourished. There is a direct correlation between lack of food and non-adherence to treatment, which can lead to increased viral load because of the virus building resistance to the medication, opportunistic infections, progression of the disease, and a higher risk of transmitting HIV to others (UNICEF Zimbabwe, USAID PEPFAR, and WFP, 2016). Food insecurity can also pressure people into harmful coping strategies, such as transactional sex, which can make them more vulnerable to HIV infection.

Low rainfall results in water points becoming low or drying up altogether in many parts of Zimbabwe. Similarly, the water table for water points and sources, including boreholes, becomes low or completely dry, resulting in people using unprotected and even condemned water sources. This leads to the occurrence of water-borne diseases. As noted earlier people find themselves having to walk long distances to water sources. The most affected social groups were identified as children especially girls, ex-

pectant mothers, elderly people and people with HIV. The shortage of water also affects livestock.

Some people may decide to migrate to neighbouring countries, when communities fail to cope with the drought situation. According to the UNICEF/Institute of Environmental Studies (IES) (2014) study, in districts that border other countries, such as South Africa, Botswana and Mozambique, children reported that family members crossed the border to go and work to earn money to buy food, as a response to food shortages. Some children were also involved in these migration trends. This phenomenon has been most pronounced, in Matabeleland and Masvingo provinces, in districts bordering South Africa and Botswana. Families disintegrate and generally it is women and children who are left behind, although, in some cases, elderly people are left to care for grandchildren. In such cases, food production and availability tends to be low because older people may be less capable of engaging in productive farming. This leads to heightened incidence of malnutrition and related health challenges.

Secondary impacts of decreasing rainfall and drought

A secondary impact of climate change is that some parents marry off their daughters at an early age in return for dowry or bridal wealth as a coping mechanism. However, children born to teenage mothers face a 15 percent higher chance of under-5 mortality and 10 percent higher chance of low birth weight (UNICEF, 2016). Female teenage marriages (15 to 19 years) increased from 21 percent in 2009 to 24 percent in 2012 and to 25 percent by 2014 (ZIMSTAT, 2009, 2013, 2015d), which means that one in every four female teenagers was married. Thus, climate change leads to an increase in under-5 mortality and the incidence of low birth weight by contributing to the occurrence of child and teenage marriages through the drought, food shortage and poverty channels.

Early marriage also reduces the age of sexual debut. Early sexual debut is associated with higher risk of contracting HIV (Stockl et al., 2013). Furthermore, early marriages arising from poverty and food insecurity are frequently characterised by a couple with a large age gap between the young girl/woman and the husband. Marked

partner age differences have been identified as one factor that significantly increases the HIV risk among young women (Katz and Low-Ber, 2008).

Illegal mining is thought to be another secondary impact of consecutive droughts caused by climate change. Alluvial gold mining, in particular, is widespread in many parts of the country and is mostly carried out by young people. Participants in the consultative meetings identified this activity as one of the coping mechanisms used by rural communities. However, gold panners use mercury, a highly dangerous neurotoxin, to purify the gold, with significant impacts on human health. In addition, alluvial mining has destroyed river banks and beds, and flood plains and has promoted sedimentation of downstream dams coupled with siltation of water supply systems.

Temperature changes

Heat waves, which can be defined as unusually hot and dry or hot and humid weather that lasts for at least two and often several days, are a pervasive natural hazard that can exact a heavy toll on human systems, affecting health, livelihoods and infrastructure. The stakeholders consulted during the development of the ZHDR 2017, cited increasing temperatures and occurrences of heatwaves as being some of the outcomes of climate change.

Heat waves are among the most dangerous of natural hazards, but rarely receive adequate attention (McGregor et al., 2015). This is partly because they lack the eye catching and sudden violence of other hazards, such as tropical cyclones or flash floods. Furthermore, the related death toll associated with heat waves is not always immediately obvious. For example, the European heat waves in the northern hemisphere summer of 2003 were responsible for the deaths of tens of thousands of people (McGregor et al., 2015). Most of the deaths occurred, not as a direct result of heatstroke, but after the phenomenon and were related to the worsening of existing heat related and other conditions.

Because there is no absolute universal value, such as a given temperature that defines what is extreme heat, heat waves are relative to a location's climate; the same meteorological con-

ditions can constitute a heat wave in one place but not in another (Robinson, 2001; Perkins and Alexander, 2013).

Excessive heat can cause the development of heatstroke, heat exhaustion, heat cramps, heat syncope, heat oedema and heat rash. Heat can cause severe dehydration, acute cerebrovascular accidents and contribute to thrombogenesis. It can further aggravate chronic pulmonary conditions, cardiac conditions, kidney disorders and psychiatric illness. Only a few deaths and illnesses are directly caused by heat due to elevations in body core temperature for a prolonged period – deaths due to heatstroke – while many more are related to the worsening of existing health conditions mentioned above (McGregor et al., 2015).

Risk factors include the inability to balance heat gains by and heat losses from the body, being elderly or very young, and having pre-existing diseases such as diabetes, fluid/electrolyte disorders and some neurological disorders. According to the submissions by Zimbabwean stakeholders consulted during the development of the ZHDR 2017, the social groups most affected by heat waves are children, albinos, the elderly, those with disabilities, poor people, refugees, orphans and women.

Some studies have shown differences in mortality impacts of heat waves between women and men. The numbers of heat wave deaths are greater among women than among men in all age groups. Women have higher core body and skin temperatures and may be less tolerant to heat than men (Havenith, 2005). However, a study in which women and men were matched on physical characteristics found that the differences were minimal.

In some cases, the effects on gender are age specific. In certain countries in Europe, for example, the effects are greater on women in the elderly age groups (D'Ippoliti et al., 2010). In short, the role of gender as a risk factor remains unclear and has only been assessed for a limited number of developed country situations. In some countries where the division of labour is strong with women or men undertaking strenuous tasks in outdoor or indoor heat, or where cultural factors, as expressed through dress, lead to higher personal heat loads, there may well be

clear gender effects.

In Zimbabwe, women, particularly in rural areas, are responsible for fetching water and firewood. In 2014, women were responsible for fetching water in 80 percent of those households where the source was not on the premises (ZIMSTAT, 2015d). As droughts lengthen, the amount of time that women spend will increase because of their having to travel longer distances for these tasks, exposing them more to the health risks of high temperatures and heat waves.

Albinos are exposed to the risk of direct sunlight (harmful effects of ultraviolet light) because of their lack of melanocytes in the skin. Prolonged exposure to sunlight increases their risk of developing skin disorders such as skin cancer. Zimbabwe has a high incidence of albinism of 1 in 1 000 people (Kagore and Lund (1995) cited in Mabula et al., 2012).

Skin cancers are a major risk associated with albinism and are thought to be a major cause of death among albinos in Africa. Exposure to ultraviolet light appears to be the most important risk factor in the development of skin cancers among albinos. The outcome of treatment of skin cancers among albinos in most developing countries has been poor because most of these patients present when the cancer is at an advanced stage, and many are unable to complete the treatment because of financial difficulties (Mabula et al., 2012). Communities generally lack awareness of the importance of reporting early to the hospital for diagnosis and treatment of albinism related cancer. With climate change, the health risk exposure among albinos is likely to increase. Early introduction of preventive measures, as well as early presentation, treatment, and follow up, should be encouraged in the albino population to secure better outcomes.

Impacts of increasing temperatures and precipitation on frequency of vector-borne diseases

Small changes in temperature and precipitation have the potential to increase the frequency of vector-borne diseases, including malaria, dengue and yellow fever epidemics, as well as water-borne diseases, such as diarrhoea and typhoid fever (Brown et al., 2012). By 2100, changes in temperature and precipitation as a

result of climate change, are likely to alter the geographic distribution of malaria in Zimbabwe, with previously unsuitable areas becoming suitable for transmission (IPCC, 2007). Ebi et al. (2005) obtained similar results, using a model of future climate suitability for stable *Plasmodium falciparum* (malaria parasite) malaria transmission in Zimbabwe. Among all scenarios, the highlands became more suitable for transmission, while the lowveld and areas with low precipitation showed varying degrees of change depending on the climate sensitivity and greenhouse gas emission stabilisation scenario, and the general circulation model used (Ebi et al., 2005).

Lindsay and Martens (1998) developed a model that included three scenarios: an increase of 20C in percentage monthly temperature; an increase of 20C with a 20 percent increase in precipitation; and an increase of 20C with 20 percent decrease in precipitation. Their results indicated that the temperature increase would be greatest on malaria transmission potential at higher altitudes while a monthly temperature increase of 20C combined with 20 percent decrease in precipitation in the relatively drier lower altitudes would result in the areas becoming too dry for malaria transmission. However, an increase of 20C with a 20 percent increase in precipitation would increase the transmission potential in the drier lower altitude areas (Lindsay and Martens, 1998).

Climate change can cause health problems by increasing ground level ozone and/or particulate matter air pollution in some areas. Ground level ozone is associated with health problems, such as diminished lung function, increased incidence of asthma, and increases in premature deaths (Dennekamp and Carey, 2010).

Factors that affect ozone formation include heat, concentrations of precursor chemicals, and methane emissions, while particulate matter concentrations are affected by wildfire emissions and air stagnation episodes, among other factors. By increasing these different factors, climate change is projected to lead to increased concentrations of ozone and particulate matter in some regions (Ebi and McGregor, 2008). Modelled surface ozone concentrations over southern Africa for the period October 2000 to April 2001 showed a band of high surface

ozone values (over 40 parts per billion) extending across Botswana and Zimbabwe and down into the northeast of South Africa (Zunckel et al., 2006). This, however, is lower than the 0.070 (parts per million) ozone standard levels of the US Environmental Protection Agency.

As climate continues to change, increased respiratory allergies from pollen and spores in the air will accentuate respiratory and cardiovascular diseases. The combination of rising temperatures and extreme rainfall can also foster indoor air quality problems, including the growth of mold, which increases respiratory and asthma related conditions. In addition, extreme temperatures may increase pollution in urban areas with the potential to aggravate pre-existing respiratory and cardiovascular diseases (Markandya and Chiabai, 2009).

The rise in temperatures increases the vulnerability of many forests to wildfire. Long periods of high temperatures are associated with droughts that contribute to dry conditions and tend to drive wildfires. Wildfire smoke contains particulate matter, carbon monoxide, nitrogen oxides, and various volatile organic compounds (which are ozone precursors) and can reduce air quality significantly, both locally and in areas downwind of fires (Dennekamp and Abramson, 2011). Smoke exposure increases respiratory and cardiovascular diseases and the need for medication for asthma, bronchitis, chest pain, chronic obstructive pulmonary disease, respiratory infections, and lung illnesses (Elliot, et al., 2013).

Wild fires are now common in Zimbabwe and destroy over 1 million hectares per year of rangelands and forests. With the predicted drier conditions under climate change, fires are expected to increase in intensity (Government of Zimbabwe, 2015). Black carbon is a major component of soot and has significant human health and climate impacts (Government of Zimbabwe, 2015).

Responses to Health Related Challenges of Climate Change

The Government of Zimbabwe has made several health related commitments at international, regional and national levels that indicate the extent to which the country considers health as a national priority issue, including under weather

related shocks and stresses.

Zimbabwe's health commitments at international and regional levels

Zimbabwe signed and ratified (in 1986) the African Charter on Human and People's Rights, (also known as the Banjul Charter), which recognises health as a human right. In terms of Article 16 of the Charter, "Every individual shall have the right to enjoy the best attainable state of physical and mental health" and, "State parties to the present Charter shall take the necessary measures to protect the health of their people and to ensure that they receive medical attention when they are sick."

The country is also a signatory to the Abuja Declaration of 2001, in which Heads of State and Government of African countries met and pledged to set aside 15 percent of their annual budgets to the health sector. Zimbabwe is also a signatory to the SADC Protocol on Health of August 1999, the objective of which is to coordinate regional efforts on epidemic preparedness, mapping prevention, control and where possible the eradication of communicable and non-communicable diseases. Education and training, efficient laboratory services and common strategies to address the health needs of women, children and vulnerable groups, are all covered by the Protocol.

Other regional and international initiatives on health policies, strategies and protocols that Zimbabwe is involved in, include the Ouagadougou Declaration on Primary Health Care and Health Systems in Africa, the African Union Health Plan, and the East, Central and Southern Africa Health Community Agreements.

National policy commitments to health impacts in Zimbabwe

Zimbabwe has domesticated some of its international obligations into national policies and legislation, starting with its Constitution, medium term policies and sectoral strategies in the health sector and in relation to climate change.

Zimbabwe's Constitution Amendment (No 20) Act 2013

As noted earlier, the Constitution of Zimbabwe (Government of Zimbabwe, 2013) explicitly provides for the right to healthcare in Chapter 4

Section 76, Sub-sections 1 to 4, which state that:

1. Every citizen and permanent resident of Zimbabwe has the right to have access to basic health care services, including reproductive health care services.
2. Every person living with a chronic illness has the right to have access to basic health-care services for the illness.
3. No person may be refused emergency medical treatment in any health care institution.
4. The State 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 this section.

Section 77 provides for ancillary rights to food and clean water which are necessary for ensuring good health and the provision of adequate healthcare. It states that:

Every person has the right to:

(a) safe, clean and potable water; and

(b) sufficient food;

and the State must take reasonable legislative and other measures, within the limits of the resources available to it, to achieve the progressive realization of this right.

These rights align with the Universal Declaration of Human Rights.

The theme of the Zimbabwe National Health Strategy 2016-2020 – Equity and Quality of Health: Leaving No One Behind – also echoes these constitutional provisions relating to health as a human right. Table 5.6 shows key policy frameworks that provide an enabling environment for addressing the health challenges facing the country with special focus on those that address climate change related impacts on health.

[Responses to specific health effects of climate change through programmes](#)

During the provincial consultative workshops conducted in the process of developing this report, community representatives were asked to identify the type of activities, projects or programmes that were implemented in their areas by various stakeholders, to address the negative effects of climate change on health. The participants highlighted the National Malaria Control Programme.

The National Malaria Control Programme is spearheaded by a unit of the Department of Disease Prevention and Control in the Ministry of Health and Child Care. The programme implements many strategies, including vector control, case management, epidemic preparedness and response, intermittent preventive therapy, research, monitoring and evaluation, and information, education and advocacy for malaria treatment and prevention. Indoor residual spraying is the main strategy used to reduce malaria transmission through reduction of mosquito density. The main approaches of the malaria control strategic plan are:

Table 5.6 Key policy and legislative frameworks on health in Zimbabwe

Policies and Strategies	Key Provisions
Zimbabwe Agenda for Sustainable Socio-Economic Transformation (ZimAsset) 2013 to 2018	Addresses health issues in three of its four main Clusters. It aims to reduce morbidity and mortality rates, HIV infections among children and adults, tuberculosis prevalence, maternal mortality, child mortality, and the incidence of other communicable diseases such as malaria and diarrhoea, and to remove financial barriers to health services. The incidence of some of the above diseases is exacerbated by extreme weather events. ZimAsset also addresses health related issues of improved service delivery by local authorities that will help in disaster risk management by ensuring that the infrastructure is climate resilient. These include rehabilitation of water supplies, sewerage systems, roads, health facilities, waste management facilities, schools and social amenities in all local authorities.
National Health Strategies: 1997-2007 2009-2013 2016-2020	These aim to attain the vision of the Ministry of Health and Child Care which is, to have the highest possible level of health and quality of life for all Zimbabweans. The 2016-2020 National Health Strategy makes explicit reference to the need to improve climate change awareness and the need to develop a Public Health Adaptation to Climate Change Plan. The 2016-2020 Strategy has identified public health surveillance, early detection of disease outbreaks, and disaster preparedness and response programmes as strategic priorities.
Climate Change Policy and Strategies	Key Provisions
National Climate Policy	Commits Government to: <ul style="list-style-type: none"> Strengthening surveillance programmes for monitoring human health under a changing climate, particularly operational knowledge on climate-disease relationships. Understanding the impacts of climate change on women, children, youth and people living with disabilities in Zimbabwe and creating an enabling environment that prevents harm to these vulnerable groups emanating from the pressures of these impacts. Enhancing provision of Geographic Information Science and Earth Observation based early warning systems on droughts, floods and disease outbreaks to vulnerable groups and ensuring coordinated approaches in providing emergency services.
Zimbabwe's National Climate Change Response Strategy	The health related strategic goal of this Strategy is to promote and protect health under a changing climate. The strategies are (a) strengthening surveillance programmes for monitoring human health under a changing climate and (b) building resilience against diseases that occur because of the impacts of climate change. Health related strategic objectives are to: <ul style="list-style-type: none"> promote and protect health under a changing climate; promote sustainable development, management and utilisation of water resources under changing climatic conditions; and mainstream gender, children and youth, people living with HIV and other vulnerable groups into all climate change interventions.
Policy and Strategies for Social Protection	Key Provisions
Social Transfer and Policy Framework	Provides a suite of assistance (education, health, nutrition etc) together with cash transfers to identified vulnerable households. The assistance is usually given during weather related shocks such as droughts and floods. Vulnerable groups and individuals receive free medical treatment. The Assisted Medical Treatment Order (AMTO) is a fee waiver or voucher that covers the treatment in hospital and caters for persons over 60 years of age, people living with disabilities, orphans and vulnerable children as well as persons who suffer from continuous illness. The institutions involved include the Government of Zimbabwe, Ministry of Public Service, Labour and Social Welfare and selected Mission hospitals

Draft National Housing Policy	Emphasises that many poor Zimbabweans lack access to decent and secure housing while others live in settlements that lack basic infrastructure and sustainable services. It acknowledges that some neighbourhoods are overcrowded, which puts pressure on the infrastructure, leading to, for example, sewer bursts, water outages, bad road networks and inadequate health and education facilities. Such situations are worsened by extreme weather events. Much more needs to be done in the area of housing provision.
National Nutrition Strategy 2014-2018	Has the objective of ensuring nutrition security for all through the implementation of evidence based nutrition interventions that are integrated within a broad public health framework, including health services, water and sanitation. This is linked to food security, which is turn, is linked to rain-fed agriculture. At the end of the lifetime of this strategy, it will be necessary to incorporate the issue of making provision of adequate nutrition climate resilient.

- Universal access to malaria prevention and personal protection, with 90 percent of the population at risk being covered by indoor residual spraying and insecticide treated nets, and 85 percent coverage of the monthly recommended dose of intermittent preventive treatment for pregnant women attending antenatal care in medium to high transmission areas.
- Improving diagnosis and treatment of both uncomplicated and severe malaria.
- Improving timely control of malaria epidemics, by detecting 100 percent of malaria epidemics within two weeks of onset.
- Expanding the number of districts implementing pre-elimination activities.
- Increasing the use of correct malaria prevention and control measures to at least 80 percent of the population at risk.
- Strengthening, monitoring and improving evaluation of malaria activities at all levels.

Zimbabwe's malaria programme receives support from two major donors, the Global Fund to Fight AIDS, Tuberculosis and Malaria and the President's Malaria Initiative. Prior to 2011, other malaria donors included UNICEF, the DFID, and the European Commission but these have shifted their financial support to the Health Transition Fund (2011-2015).

Mechanisms for coping with health related climate change challenges

The stakeholders consulted expressed different ways in which communities have responded to the health challenges brought about by climate

change. These are:

- Adapting to the effects of climate change induced droughts on harvests by shifting from growing maize only, as a cereal, to cultivating small grains, a practice that is being promoted by the Ministry of Agriculture, Mechanisation and Irrigation Development. However, the shift to small grain cereals has faced resistance from some communal farmers, because of the more demanding processing procedures required for small grains compared to maize.
- Cultivating on wetlands and stream banks because of higher moisture content, although these practices have their own serious negative environmental effects.
- Using their social capital in the form of extended families and community relationships and networks to help each other out in times of difficulty.
- Using indigenous knowledge systems, religious leaders, including prophets as well as traditional healers (n'angas/innyanga) to address the health effects of climate change.

The Zunde raMambo/Isiphala Senkosi programmes are being promoted among communities, but they face their own challenges and need to be researched to improve their effectiveness. Zunde raMambo/ Isiphala Senkosi, a local phrase in Shona/Ndebele which loosely translated means 'the chief's granary' is a traditional social security arrangement designed to address the contingency of food supplies during drought or famine which existed before the colonisation of Zimbabwe.

Financial commitments and resource mobilisation for health programmes

The ongoing decline in economic growth rates from an average of 8 percent during the period 2009 to 2012, to estimates of about 0.4 percent for 2016 (World Bank, 2016), has diminished budgets available for healthcare. The low 2016 growth rate resulted from the impacts of El Niño, devaluation of neighboring currencies, and severe cash shortages in the country.

Budgetary allocations to the Ministry of Health and Child Care have declined, from USD381.00 million (10 percent of total budget) in 2013 to USD330.79 (8.3 percent) in 2016. The amount allocated in 2015 was the lowest USD311.93 million and was 7.3 percent of the total budget (Table 5.7).

Table 5.7 Budgetary allocations to Ministry of Health and Child Care, 2013 to 2016

	2013	2015	2016
Allocation (USD million)	381.00	311.93	330.79
Percentage of total budget	10.0	7.3	8.3

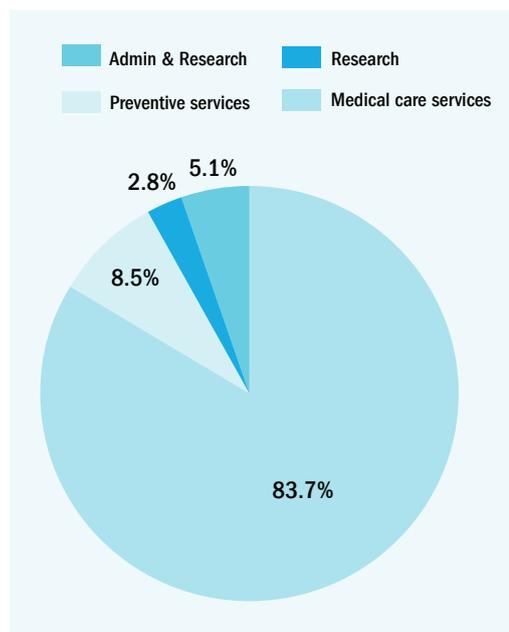
Total Health and Child Care allocation has remained below the 15 percent Abuja target and the Sub-Saharan Africa average of 11.3 percent of total budget. As a share of GDP, at 2.3 percent, the Health and Child Care budget is still far from the level of total health expenditure of 4 to 5 percent of GDP recommended by the UN High Level Commission on Macroeconomics and Health. It is also 0.7 percentage points lower than the Sub-Saharan Africa average of 3 percent. The 2016 per capita budget allocation of USD 24.34 is lower than the WHO target of USD 34 and much lower than the SADC average of USD 146.29 (UNICEF 2016).

Zimbabwe's budgetary allocations on preventive services (Figure 5.3) are also low than those of other African countries. Countries such as Kenya, Tanzania and Uganda spend more than double what Zimbabwe spends on preventive services, averaging 20 percent of total health expenditure (World Bank 2014, cited in UNICEF 2016c). In the short term, prioritising health expenditure towards prevention and promo-

tion could achieve greater efficiency in overall resource utilisation. The current composition of healthcare financing is not very 'healthy', particularly in the face of increasing climate change related health challenges.

Figure 5.3 Composition of healthcare allocation (USD 330.79) for Zimbabwe for the year 2016

Source: UNICEF (2016c)



Zimbabwe depends heavily on off-budget development partner support, projected at USD 411.67 million for the year 2016, for its health sector. This is higher than the national budgetary allocation of USD 330.79. With 60.5 percent of government funding going towards employment costs, much programme spending and cost of infrastructure has been borne by development partners and out-of-pocket payments by individuals. The country's level of dependency on development partner support in healthcare services delivery is high and not sustainable.

In 2013, the sources of revenue for district, rural and mission hospitals were made up of user fees (out-of-pocket) at 54.1 percent, development partner contributions at 22.1 percent, and central government input at 22.1 percent. The contribution of Central Government to rural health centres was hardly visible, at 0.1 percent, compared to that of development partners at 75.6 percent, followed by out-of-pocket user fees at

14.5 percent (UNICEF, 2016c).

The bulk (over 90 percent) of the drugs in the public health system are funded by external partners. These include antiretroviral treatment medications, tuberculosis and antimalarial drugs, and primary kits for maternal, neonatal and child health services. Most rural and urban area primary services are provided by local governments and church related institutions, but inadequate grant support has had a negative effect on the provision of these services.

Although donor funding for healthcare in Zimbabwe exceeds Government funding in all categories except wages, it is lower than in other countries in the region. Zimbabwe currently receives about USD12 per capita in annual donor support for health expenditures, less than half of the allocation for Zambia and lower than the allocations for Tanzania, Mozambique and Malawi (World Bank, 2015). Given the above scenario, Zimbabwe will need to increase its allocation to health, especially during those years with extreme climatic events, and throughout for investment in preventive actions including financing climate resilient infrastructure.

Mobilising donor support - health transition and health development funds

The Health Transition Fund (2011-2015) was a multi-donor pooled fund, managed by UNICEF to support the Ministry of Health and Child Care to strengthen health systems in Zimbabwe. The fund aimed to attain planned progress towards “achieving the highest possible level of health and quality of life for all Zimbabweans” and to harmonise donor support, practices, and requirements. The initial donors to the fund were the governments of Ireland, Sweden, Norway and the United Kingdom, as well as the European Commission delegation to Zimbabwe.

Funds from the development partners in the Health Transition Fund were used, among other things, to educate midwives, and top up salaries of medical personnel to reduce brain drain and to aid their retention. This assisted in improving the maternal and child mortality rates in the health sector.

The Health Transition Fund was succeeded by the Health Development Fund (2016-2020), a

multi-donor fund to the health sector, with a focus on reproductive, maternal, newborn, child and adolescent health, which was launched by the Government of Zimbabwe, in partnership with the United Nations and Development Partners in October 2015.

The Health Development Fund aims to ensure equitable access to quality health services for women and children within the context of the National Health Sector Strategy (2016-2020). It is expected to result in the reduction of maternal and child mortality by 50 percent, increased access to family planning, halving of the prevalence of stunting in under-5 children, and elimination of mother-to-child transmission of HIV. All this is sought by 2020, at the same time as combating HIV, malaria and other preventable diseases.

This situation in which the health sector is highly dependent on donor funding and out-of-pocket payments is unsustainable and perpetuates inequality in access to health. There is evidence to suggest that higher out-of-pocket payments discourage the poor from seeking healthcare. According to the World Bank (2015), the most commonly cited reason for not seeking healthcare when ill is the cost.

What is clear from this is the need to increase resources for the health sector as well as to re-configure the financing structure of the sector to make it sufficiently robust to tackle the anticipated increasing negative effects of climate change.

Effectiveness of the Health Service Delivery System in Addressing Climate Change Induced Health Problems

This section presents the perceptions expressed by stakeholders regarding the effectiveness of Zimbabwe’s health service system in addressing climate change induced health problems.

Strengths

The stakeholders consulted, including community representatives and administrators, believe that the health delivery system in Zimbabwe has the following points of strength:

- A fairly strong surveillance system,
- Awareness campaigns are conducted

Table 5.8 Health targets in Sustainable Development Goal 3

Goal	Target number	Target
Goal 3 Ensure healthy lives and promote wellbeing for all at all ages	3.1	By 2030, reduce the global maternal mortality ratio to less than 70 per 100 000 live births
	3.2	By 2030, end preventable deaths of newborns and children under 5 years of age, with all countries aiming to reduce neonatal mortality to at least as low as 12 per 1 000 live births and under-5 mortality to at least as low as 25 per 1 000 live births
	3.3	By 2030, end the epidemics of AIDS, tuberculosis, malaria and neglected tropical diseases, and combat hepatitis, waterborne diseases and other communicable diseases
	3.4	By 2030, reduce by one third premature mortality from non-communicable diseases through prevention and treatment and promote mental health and wellbeing
	3.5	Strengthen the prevention and treatment of substance abuse, including narcotic drug abuse and harmful use of alcohol
	3.6	By 2020, halve the number of global deaths and injuries from road traffic accidents
	3.7	By 2030, ensure universal access to sexual and reproductive healthcare services, including for family planning, information and education, and the integration of reproductive health into national strategies and programmes.
	3.8	Achieve universal health coverage, including financial risk protection, access to quality essential healthcare services and access to safe, effective, quality and affordable essential medicines and vaccines for all
	3.9	By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination

throughout the country and emergency preparedness response teams at the ready;

- Availability of rural health facilities;
- Community voluntary health workers and community based distributors who are available and trained; and
- Donor financial support in the face of constrained fiscal space.

According to the Zimbabwe Third National Communication to the United Nations Framework Convention on Climate Change, disease surveillance is carried out daily at all health facilities and data on epidemic diseases and deaths is transmitted through the Frontline SMS system. The District Health Information Software, DHIS2 System, an active computer based system uses the Internet to compile and transmit weekly and monthly reports between district, province and national levels, providing a status update on diseases countrywide.

Weaknesses identified

The stakeholders consulted identified the following weaknesses:

- The health sector needs to mobilise more resources as the available financial resources are inadequate;
- There are human resource shortages;
- Services are expensive and the most vulnerable groups cannot afford them;
- The supply of medicines is inadequate;
- There are no specialists in rural areas;
- Some non-progressive cultural beliefs slow down the reaction of communities to climate induced health problems;
- Communities are more focused on and pre-occupied with agriculture than with health; and
- Overall the communication strategy is weak

Communities' perceptions of external interventions

Communities, on the whole, were of the opinion that external interventions aimed at assisting them to cope with or adapt to the effects of climate change on health were quite effective. They felt that:

- Donors have helped to increase access to essential medicines and to strengthen health systems initiatives;
- Community malaria control programmes have helped to reduce the incidence of malaria;
- The immunisation programme has resulted in the reduction of child mortality; and
- Food-for-work programmes, food handouts, schools feeding programmes and community nutrition gardens have been used effectively to reduce malnutrition.

Health, Climate Change and the Sustainable Development Goals in Zimbabwe

Climate change is recognised and given prominence in the post 2015 development agenda. According to the 2030 Agenda for Sustainable Development document (United Nations, 2015), climate change is one of the greatest challenges “of our times” and its adverse impacts undermine the ability of all countries to achieve sustainable development. The Sustainable Development Agenda provides all nations of the UN with a mid-term outlook to work towards and has targets for all facets of human development, including health.

Health is inherently important as a human right, but is also critical to achieving the pillars of sustainable development. Zimbabwe's vision of inclusive growth that leads to the empowerment of its citizens to reduce the levels of poverty cannot be achieved without a healthy and productive population. The WHO Commission on Macroeconomics and Health (1999) emphasised the need for greater investment in health through increased public financing and highlighted the positive multiplier effects of investment in health and the ‘cost of neglect’ from preventable death and disability.

The Government of Zimbabwe has included

health as one of the ten priority SDGs that it will focus on because of its importance in improving labour productivity and economic growth, and hence in the attainment of other SDGs. Zimbabwe's Government is also committed to completing the unfinished health related Millennium Development Goals' agenda by implementing the SDGs. As noted earlier, Goal 3 of the 17 SDGs (Ensure healthy lives and promote wellbeing for all at all ages) is devoted specifically to health and is framed in broad terms that are relevant to all countries and all populations. Table 5.8 presents the nine targets that underpin the broad health goal.

These targets are accompanied by directions on the provisions that would be needed to meet them. The overall thrust or spirit of the health goal and targets is reflected in the initial remarks in paragraph 26 of the 2030 Agenda for Sustainable Development which reads as follows:

To promote physical and mental health and wellbeing, and to extend life expectancy for all, we must achieve universal health coverage and access to quality health care. No one must be left behind.

The SDG agenda emphasises the close links between health and sustainable development. Health policies can contribute to sustainable development and poverty reduction if people have access to the information and services they need to promote and protect their health and are protected from high expenditure when they fall ill. Policies made in all sectors can have a profound effect on population health and health equity. The agenda encompasses adaptation to climate change in all sectors including the health sector.

Conclusion

This chapter has reviewed the state of health in Zimbabwe and has highlighted the major climate change risks and their impacts on health and human development in the country. The impacts of climate change on health are transmitted mainly through temperature and precipitation. Heavy rainfall and floods lead to increased incidence of water-borne diseases, result in damage to health supporting infrastructure, and lead to internal and external migration which bring about their own challenges to the delivery of health services. Drought results in food shortages and malnutrition which render the popu-

lation more vulnerable to disease. Drought also has secondary impacts with negative impacts on health and human development, such as early marriages and illegal mining. Increases in temperatures are likely to lead to an increase in the transmission of malaria.

The chapter has also presented the responses

of Government, communities, households and development partners to the impacts of climate change on health. The private sector is involved but currently this is at a fee which most vulnerable groups cannot afford. Some companies however, have contributed by building facilities and providing drugs as part of their social responsibility programmes.

CLIMATE CHANGE AND EDUCATION

We have to do more than just educate our children. We have to give them an environment free of all debt, dealing with climate change, always placing the future first, in what we try to achieve

Phil Mitchell, American artist, composer and author

Introduction

Education is recognised as a universal human right and an important predictor of economic growth, human development, and poverty reduction (United Nations and Government of Zimbabwe, 2012). It is key to the socio-economic, technological and political development of a country. It enriches people's understanding of themselves and the world, improves the quality of their lives and leads to broad economic and social benefits to individuals and to society at large, as well as improving income distribution. Education raises people's productivity and creativity and promotes entrepreneurship and technological advances (Ozturk, 2001). As the 2007 World Development Report and World Bank (2006) acknowledge, increased availability of skilled and educated workers induces faster skill intensive technological change.

It has been established that, in many poor countries, people with just one additional year of schooling earn 10 percent higher wages. With education, people are far better able to prevent disease and to use health services effectively. For example, young people between the ages of 15 and 24 years who have completed primary education are less than half as likely to contract HIV as those who have little or no schooling (Lucas and Timmer, 2005).

Educating girls and women is probably the single most effective investment a developing country can make, whether or not women work outside the home. Studies have shown that educating girls and women creates a multitude of positive returns for families, including better family health and nutrition, improved birth

spacing, lower infant and child mortality, and enhanced educational attainment of children (Ozturk, 2001; Lucas and Timmer, 2005).

The Government of Zimbabwe recognises education as a basic human right which plays a pivotal role in combating ignorance, disease and poverty and is the key to socioeconomic and political transformation (Government of Zimbabwe, 2005). Zimbabwe is among the nations of the world, that adopted the set of seventeen SDGs to reduce poverty, protect the planet and ensure prosperity for all by 2030. The fourth SDG aims to ensure inclusive and quality education for all and promote lifelong learning by guaranteeing that all girls and boys complete free, equitable, and quality primary and secondary education.

Article 26 (1) of the Universal Declaration of Human Rights (1948) states that:

Everyone has a right to education. Education shall be free, at least in the elementary and fundamental stages. Elementary education shall be compulsory. Technical and professional education shall be made generally available and higher education shall be equally accessible to all on the basis of merit.

This chapter focuses on how climate change affects human development in Zimbabwe through its impacts on education. In line with the other sections of the report, a modified version of the DPSIR framework is used to interrogate the education aspect of human development with the main driver being climate change. It seeks to answer the following questions:

- What is the state and status of education in Zimbabwe?
- What are the major climate change risks and what are their impacts on the delivery of quality education in Zimbabwe and on achieving the fourth SDG of ensuring inclusive and equitable quality education and promoting lifelong learning opportunities for all?
- Which social groups are most vulnerable to these risks?
- What measures have been taken by Government and other players, to address the impacts of climate change on education and how effective have these measures been?

The study undertook provincial consultations through workshops to facilitate dialogue and gathering of information from and experiences of various stakeholders; the UNICEF U-Report Poll, and an intensive review of literature (see Chapter 1 for details) to address these questions.

The State of Education and Sectoral Performance in Zimbabwe

This section presents the state of education in Zimbabwe with special focus on educational indicators that are relevant to the human development paradigm and which are being affected by climate change. These form the backdrop of the discussion that follows, on how climate change affects education in the country.

Since the attainment of Independence in 1980, the Government of Zimbabwe has prioritised the provision of education and widened access to education for all Zimbabweans by expanding the existing schools and establishing many new ones. The number of primary schools increased by 89 percent from 2 401 in 1979 to 4 530 in 1990 and, during the same period, enrolments in primary schools increased by 242 percent, from 619 586 to 2 119 881 (Kanyenze et al., 2011). An important outcome in primary education during this period was the improvement in the gender parity ratio in enrolments, from 90.8 in 1980 to 97.5 by 1990.

The expansion was even greater at the secondary school level. The number of secondary schools increased by 754 percent, from 177 in 1979 to 1

Excerpt from the Education Act, 1987

4. Children's fundamental right to education in Zimbabwe

(1) Notwithstanding anything to the contrary contained in any other enactment, but subject to this Act, every child in Zimbabwe shall have the right to school education.

(2) Subject to Subsection (5), no child in Zimbabwe shall –

(a) be refused admission to any school; or

(b) be discriminated against by the imposition of onerous terms and conditions in regard to his admission to any school; on any grounds of his race, tribe, place of origin, national or ethnic origin, political opinions, colour, creed or gender.

5. Compulsory education

It is the objective in Zimbabwe that primary education for every child of school-going age shall be compulsory and to this end it shall be the duty of the parents of any such child to ensure that such child attends primary school.

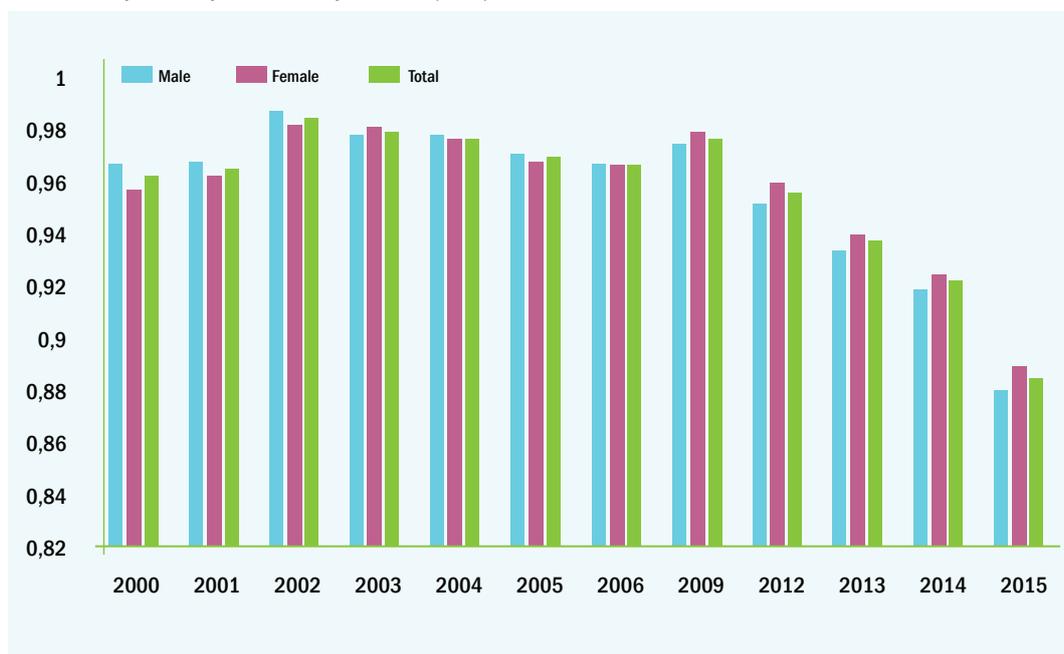
512 in 1990, with the enrolments rising by 916 percent from 66 215 to 672 656 during the same period. Gender parity ratio increased marginally, from a ratio of 76.4 in 1980 to 76.5 in 1990 (Kanyenze et al., 2011).

Government adopted rights based education legislation and policies. The Education Act made education a human right and the intention was to make primary education free and compulsory (Government of Zimbabwe, 1987). An excerpt from the Education Act, 1987 is given below.

By the late 1980s, Zimbabwe's education system had earned a reputation as one of the best and most progressive in Africa (Riddell, 2012). The Government made all these improvements in education with the active support and participation of many stakeholders and cooperating partners.

Figure 6.1 Primary school net enrolment ratio (percent) in Zimbabwe, 2000 to 2015

Source: Ministry of Primary and Secondary Education (2015)



However, after 1990, with the introduction of the Economic Structural Adjustment Programme (ESAP), which was followed by the economic crisis of 2000 to 2008, this momentum was not maintained. With ESAP, tuition fees were reintroduced in urban primary schools as a cost recovery measure. Many children dropped out of school before completion, and others did not go to school. This resulted in a cohort of youth who had little education and few employable skills.

The economic situation has since improved, but children are still dropping out of school (ZIM-STAT, 2013; Ministry of Primary and Secondary Education/UNICEF, 2015). Between 2013 and 2014, 23 percent of children did not transition from primary (Grade seven) to secondary (Form 1) school. Climate change was one of the confounding factors and its impacts on the various educational performance/attainment indicators needs to be examined systematically (Ministry of Primary and Secondary Education/UNICEF, 2015). This includes its impacts on enrolment ratios, school dropouts and completion rates, as well as the infrastructure necessary for the provision of educational services.

The government is the primary sponsor of ba-

sic education in Zimbabwe. In all state run educational institutions, students pay tuition fees while the duty of building infrastructure and salaries for teaching staff lies with the government. However, because of the current macroeconomic challenges, parents are playing a very significant role in building infrastructure and in contributing to acquiring some of the facilities required by the schools, by paying levies, which are approved by Government. Many parents, particularly from rural communities that rely heavily on rain-fed agriculture as a source of livelihood and school fees (see Chapter 3) will find it difficult to raise both school fees and such levies, as climate change continues to cause more frequent extreme events such as drought and floods. Without remediation, this will result in an increase in school dropouts.

Performance of the education sector

Figure 6.1 presents the primary school net enrolment ratio (NER) for Zimbabwe from 2000 up to 2015.

The primary school NER has been generally high since 2000, but started to exhibit a declining trend from 2012 to 2015. On the whole, between the years 2000 and 2015, the primary school NER declined from 96.20 percent to

88.46 percent. Gender parity in primary school NER was retained throughout the period 2000 to 2015, that is, there was no significant difference in access to education between males and females reflected in net enrolment ratios.

Table 6.1 presents the secondary school NER for the years 2000 to 2015.

Secondary school enrolment rates have fluctuated by 2 to 4 percentage points below and above 50 percent but, in 2009, peaked at 58.3 percent. From 2012 to 2015, the secondary school net enrolment rate increased by roughly 1 percentage point each year. Gender parity tilted towards girls from 2003, with the exception of the year 2009, and was stable at 1.12 from 2012 to 2015.

Table 6.2 presents the expected and mean years of schooling used to compute the educational attainment index component of the HDI (also see Chapter 2).

The expected years of schooling increased by 3.8 years, from 6.5 years in 1980 to 10.3 years by 2015. Similarly, the mean years of schooling increased by 4.5 years, from 3.2 years to 7.7 years over the same period. These positive aggregate achievements contributed to an improvement in the country's HDI from 0.437 in 1980 to 0.522 in 2015 (ZIMSTAT, 2015e; UNDP, 2016b). However, the noted improvements fail to reveal some dynamics that were occurring in the performance of the education sector of Zimbabwe, particularly those relating to completion and dropout rates.

Table 6.3 presents secondary school dropouts and the reason they dropped out for the year 2015. The main reason for dropping out of secondary school was school fees, followed by absconding.

A major component of absconding could be related to relocation of both parents, possibly in search of alternative livelihoods, in response to food insecurity in times of drought (see Chapter 4). The problems of school fees are worsened by the impacts of climate change which undermine the earning capacity of many Zimbabweans who rely on rain-fed agriculture for their livelihoods (see Chapter 3).

While school enrolment rates have remained

Table 6.1 Secondary school net enrolment rate, 2000 to 2015

Source: Ministry of Primary and Secondary Education (2015)

Year	Form 1 to 4 Net Enrolment Rate			Gender Parity Index (GPI)
	Male	Female	Total	
2000	49.1	48.9	49.0	1.00
2001	50.1	50.4	50.2	1.01
2002	49.3	49.3	49.3	1.00
2003	48.4	49.6	49.0	1.02
2004	47.4	48.9	48.2	1.03
2005	46.5	49.1	47.8	1.06
2006	45.2	47.3	46.3	1.05
2009	58.5	58.2	58.3	0.99
2012	49.1	54.8	51.9	1.12
2013	49.8	55.9	52.8	1.12
2014	50.8	56.7	53.7	1.12
2015	51.1	57.3	54.1	1.12

Table 6.2 Zimbabwe educational attainment indices, 1980 to 2015

Source: UNDP (2016b)

Year	Expected years of schooling	Mean years of schooling	HDI Value
1980	6.5	3.2	0.437
1985	9.7	4.0	0.498
1990	9.8	4.5	0.499
1995	9.8	5.5	0.465
2000	9.8	6.5	0.427
2005	9.5	6.8	0.408
2010	10.1	7.3	0.452
2011	9.8	7.3	0.464
2012	10.4	7.7	0.488
2013	10.3	7.7	0.498
2014	10.3	7.7	0.507
2015	10.3	7.7	0.522

relatively high in the country, the same cannot be said of completion rates. In 2014, 22 percent of all children who entered primary school dropped out before they reached Grade 7. A major barrier to completion of the cycle from Grade 1 to Grade 7 is poverty and hunger among the generality of Zimbabweans. According to Munjanganja and Machawira (2014):

Table 6.3 Secondary school dropouts by reason, 2015

Source: Ministry of Primary and Secondary Education (2015)

Reason for dropping out	Male	Percentage	Female	Percentage	Total	Percentage
School fees	10 675	55.3	9 071	38.5	19 746	46.1
Absconded	6 143	31.8	4 494	19.1	10 637	24.8
Expulsion	133	0.7	63	0.3	196	0.5
Illness	257	1.3	319	1.4	576	1.3
Marriage	464	2.4	4 838	20.5	5 302	12.4
Pregnancy	122	0.6	3 439	14.6	3 561	8.3
Other	1 500	7.8	1 345	5.7	2 845	6.6
Total	19 294	100	23 569	100	42 863	100

For the peasants who rely on farming, the climatic changes resulting in prolonged drought means food insecurity and lack of resources to generate funds for daily upkeep. Children from such families fail to attend school regularly and this may contribute to their failure to complete primary education.

However, Government has taken steps, in the face of these challenges, to institute safety nets to arrest this failure by disadvantaged children to go through the full primary school cycle. These measures are discussed in Section 6.4.

Teacher to student ratio

Education is not only about the NER, but also has to be of a good quality. One of the elements of quality education is the Learner-Teacher Ratio and whether the teachers are adequately trained. According to the Ministry of Primary and Secondary School's Learner Teacher Ratio policy, the Early Childhood Development (ECD) learner to teacher ratio should be 1:20, ideal primary school learner to teacher ratio is 1:40, lower secondary Forms 1 and 2 learner to teacher ratio should be 1:33, while Forms 3 and 4 should be 1:30; and upper secondary school learner to teacher ratio should be 1:20 (Ministry of Primary and Secondary Education, 2014).

The ECD level has the highest proportion of untrained teachers (67 percent) and this has a negative effect on the readiness of children for primary school level. The distribution of trained and untrained ECD teachers is heavily biased against the rural areas. About 74 percent of ECD teachers in rural areas, are untrained, while 26 percent of teachers at this level in urban areas

are untrained. Furthermore, the ECD trained teacher to learner ratio is very high in rural areas, 1:140 as compared to 1:41 in urban areas, although the latter is also still above the recommended learner to teacher Ratio of 1:20.

At primary school level, 11 percent of teachers are not trained. The figure is 12 percent for rural areas compared to 6 percent for urban areas. The learner to trained teacher ratio has reached the benchmark of 1:40 in both government and non-government schools. It is slightly higher in rural areas, at 1:41 than in urban areas, with 1:39.

At secondary school level, 26 percent of teachers are untrained, broken down as 27.5 percent for rural areas and 21 percent for urban areas. The qualified teacher to pupil ratio is slightly higher in rural areas (1:31) than in urban areas (1:29).

The supply of qualified teachers needs to be improved. There are disparities between schools in rural and urban areas, as well as by province. Schools in urban areas and those with better resourcing tend to attract most of the trained teachers. Climate change will exacerbate the rural to urban disparities as teachers are known to shy away from those remote rural areas with high frequencies of drought and floods where these extreme weather events have higher impacts on education and other sectors.

Water, sanitation and hygiene facilities

Water is available at most schools, with only 1.16 percent of primary schools throughout the country reporting no access to any water in 2014 (Ministry of Primary and Secondary Education,

2014). The main sources of water supply are boreholes, with 68 percent of the schools getting water from this source. Piped water is available in 23 percent of schools and 10 percent use protected wells. The remaining 6 percent and 2 percent use stream/ rivers and dams, respectively. This may expose children and staff to risk of infection from contaminated water. Some schools have more than one water source (Ministry of Primary and Secondary Education, 2014). All these water sources will be affected by the frequency of extreme weather events, for example by drying up as a result of climate change or being contaminated when there are floods.

With regard to sanitation, the target pupil to toilet ratio for girls is 1:20 and for boys is 1:25 (Ministry of Education, Sports, Arts and Culture, 2013a). The primary school learner-toilet ratio for girls improved steadily from 1:26 in 2000 to 1:22 in 2014, which is slightly above the target level. That of boys improved from 1:29 to 1:22 over the same period, to beat the target. The situation is even better for the secondary school level, with the learner-toilet ratios for both boys

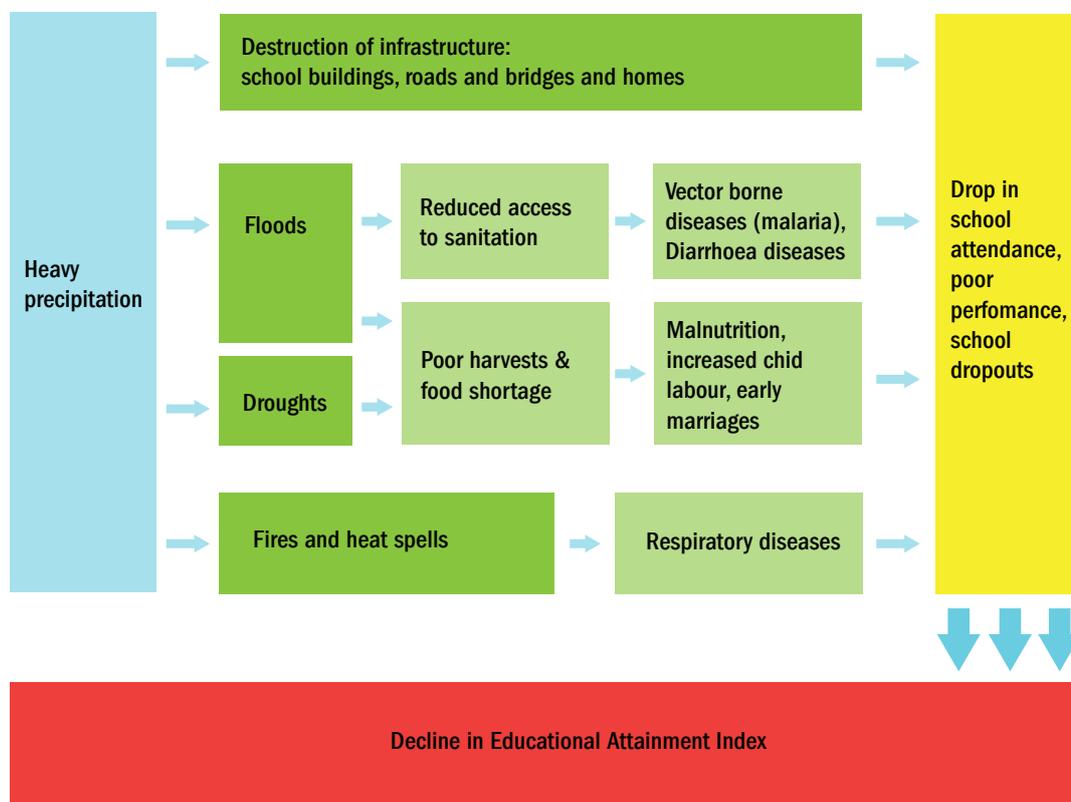
and girls being better than the respective targets. The ratio for girls improved from 1:19 in 2000 to 1:18 in 2014, while that for boys improved from 1:22 to 1:18 over the same period. Provision of the target pupil to toilet ratios makes schools' sanitation climate resilient especially in seasons where there are floods as they are likely to still have a reasonable number of toilets in the event that some are destroyed.

Impacts of Climate Change on Education

Climate change directly affects the delivery of educational services by increasing the occurrence of extreme weather events that disrupt the delivery of educational services. It also has negative impacts upon educational outcomes indirectly through the effects of these extreme weather events on variables that affect the capacity of school children to learn. Thus, climate change has both primary and secondary impacts on education. Figure 6.2 provides an overview of the pathways through which climate change affects education and human development, as well as the linkages among the three issues.

Figure 6.2 Pathways of climate change impact on education

Source: Adapted from UNICEF (2011)



Primary, direct impacts

Climate change affects the education sector directly through the increased frequency and severity of extreme weather events, in particular heavy rains accompanied by flash floods, strong winds and hailstorms. However, there is a dearth of studies focusing on the impacts of climate change on education in Zimbabwe. Similarly, there is no systematically compiled and published database on the destruction of education related infrastructure caused by natural disasters in the country. The Department of Civil Protection periodically produces situation reports that contain numbers of homesteads, schools, shops and other buildings destroyed in extreme weather disasters such as heavy rains, hail storms and strong winds, and related loss of property and deaths. These are not compiled into a coherent database. The Ministry of Primary and Secondary Education has recently started to compile information on damage to educational infrastructure caused by extreme weather conditions throughout the country and the related costs of rehabilitation or reconstruction.

As noted in Section 6.2, since Independence in 1981, Zimbabwe has made tremendous strides in providing infrastructure for the education system, including at primary, secondary and tertiary levels. Extreme weather events have the potential to destroy this infrastructure as they often cause damage to school buildings, as well as the roads and bridges necessary for access to and provision of educational services. The extreme weather events also result in disruption of electricity supply, interrupting the operations of educational institutions and contributing to the displacement and migration of families, thus disrupting and limiting education opportunities.

All these impacts can be classified as primary since they occur as direct results of the extreme weather events (UNICEF 2011). The outcome of these impacts is that children who cannot cross the flooded rivers fail to attend classes. Classrooms destroyed by the extreme weather events become unusable during the rainy season, forcing classes to be abandoned. The overall result is disruption of the learning process which leads to poor educational outcomes, including higher incidences of repeats and school dropouts. The incidence of dropouts increases in cases where



Floods wreak havoc in Mberengwa

Posted by ZBC News Online | February 27, 2017



Tokwana Primary, one of the schools destroyed by Cyclone Dineo-induced storms

Source: Chronicle, 9 March 2017

dwelling are destroyed and people are moved to safer areas, leading to withdrawal of children from schools. Students are often regarded as having absconded from school because of these disruptions.

Stakeholders at the provincial consultative workshops conducted in the process of developing this report, when asked to indicate their observations on changes that are occurring in climate and weather patterns in their respective geographical areas and how these were affecting the education of children, made the following observations:

- Floods are destroying infrastructure such as roads and bridges, and as a result, schools become inaccessible during the rainy season.
- Some school buildings are destroyed by flash floods and storms, and roofs of classroom blocks are blown away.
- Energy sources are destroyed, affecting science and computer lessons.
- Relocation because of floods leads to children dropping out of school.

A study conducted in Muzarabani (Mudavanhu, 2014), found that students failed to attend school when rivers were flooded, since some of the bridges were destroyed by Cyclone Eline in 2000, resulting in some communities being cut off. Floods, therefore, result in loss of learning hours, with negative impacts on the quality of education. The study found that, because of this disruption in lessons most teachers failed to cover the school syllabus either in primary or secondary schools and this affected the performance of the children.

The highest rate of school absenteeism was recorded during the rainy season (January to March). According to the study, attendance during the rainy season averaged 50 percent, thus about half of children do not attend school between January and March. Rivers and streams are barriers to children who have to cross them to get to their schools (Mudavanhu, 2014).

The UNICEF/Institute of Environmental Studies (IES) (2014) study also finds that children's education is affected by the impacts of floods. Almost one quarter of the school buildings in one of the study areas (Mbire), were damaged during storms and heavy rains. Over 13 percent of children covered in the study said they could not travel to school during times of floods and heavy rains. Five percent dropped out of school for a short time, while about 13 percent dropped out for a longer period.

When rivers in this area flood, they may take long to subside, forcing children to skip school for many weeks. Girl aged 16 from Mbire.

It is difficult to attract qualified teachers to flood prone areas like Muzarabani and the shortage of qualified teachers has meant that schools receive new relief teachers every term and there is no continuity in the learning process. Apart from this, schools run without a full teacher complement most of the time as teachers avoid taking up posts in the flood prone areas. Those already in post leave for greener pastures as observed by participants at the consultative workshops. This compromises the quality of education in flood prone areas such as Muzarabani as they nearly always have above the recommended learner-teacher ratio at all levels of education.

The fairly well documented effects of a natural disaster in Zimbabwe are those associated with Cyclone Eline which struck the country in November 2000 and destroyed 89 513 homesteads either completely or partially. The cyclone caused damage to the road network and damaged or swept away bridges, cutting off people's lifeline of supplies, including access to food supplies, clinics, schools, fuel and services in general. The cyclone affected directly or indirectly an estimated 2.7 million people residing in the southern and south-eastern parts of the country.

The cyclone caused damage to 221 schools distributed as follows: 46 in Manicaland Province, 75 in Masvingo, 14 in Midlands and 86 in Matabeleland South. Damage included roofs being blown away by wind, classrooms and teachers' houses being damaged, toilets collapsing, and school furniture and stationery being destroyed (Civil Protection Unit, undated). Such events have the effect of undermining progress achieved in the construction of educational infrastructure, including school buildings, and sanitation facility targets such as pupil to toilet ratios, which the Ministry of Primary and Secondary Education had so far achieved.

The 2016/17 agricultural season saw heavy downpours throughout the country, destroying approximately 18 percent of the country's schools, and affecting the education of approximately 500 000 children. The estimated cost of rehabilitation was USD 4.7 million, as estimated by the Ministry of Primary and Secondary Education in early February 2017.

Primary, indirect impacts

Impacts of food shortage on education

Drought and increasing temperatures lead to poor harvests and food scarcity. This causes malnutrition among school going children, which impairs their retention and learning performance. Lack of food also increases absenteeism from school. Furthermore, children may be removed from school to support the household. These impacts are often highly gendered as, in most cases, boys are prioritised over girls to remain in school, particularly at the secondary school levels. Girls are pulled out of school more promptly than boys, either to provide additional productive work or for subjection to early marriage.

These observations were mentioned by participants of the consultative workshops held as part of the process of developing this report:

- There is malnutrition and hunger as a result of drought, and hungry children fail to concentrate in class.
- Successive droughts have caused food shortages; hence communities are prioritising the purchase of food instead of education.

A good summary of the multiple negative ways in which drought affects children's access to education and diminishes their learning opportunities is presented in the box below.

Observations made at the consultative workshops on these issues are:

- Poor school attendance is caused by financial challenges which have led to some children dropping out of school and looking for jobs in South Africa. This is common in Matabeleland South.
- When parents fail to pay school fees, children are withdrawn from school.
- Child labour to supplement family income leads to a high rate of school drop outs.
- The overall results of this include school dropouts, child labour and delayed school enrolment, malnutrition resulting in stunt-

Excerpt from the Humanitarian Needs Overview UNDP (2016d)

Drought often leads to increased student absenteeism, poor concentration in class, and hunger related fainting at school. This is often exacerbated by the shortage of drinking water at school. In such cases, children are forced to walk long distances to fetch water. Because of the actual or perceived higher opportunity cost of participating in education, some children are forced to drop out of school in order to engage in casual labour activities in exchange for food. Livelihood pressures on families often result in parents not being able to meet the cost of education, leading to drop out of children and involvement in other social activities in order to earn a living. If children remain in school, their performance may decline due to hunger, sickness and inability to concentrate. Learning achievement will diminish and children may not be able to pass their exams thereby eroding the gains made with regards to learning achievement in the country. Anecdotal evidence indicates that some children are skipping classes while others are failing to concentrate in class in the hardest hit areas.

ing and low educational performance, as well as early marriages. Examples of areas affected are Buhera, Chirumanzu and Katerere area in Chipinge.

The UNICEF/IES study (2014) establishes that children's education is adversely affected in times of drought and floods. Non-availability of food, caused by low crop yields in times of drought or unreliable rainfall, was reported to be the main reason that a number of children had dropped out of school, because of non-payment of fees.

One girl in Gweru Rural reported,

My brother is at home because his money for school and examination fees was used to buy food.

Although government keeps school fees at a minimum, including at zero for certain disad-

vantaged students, poor families cannot afford all the direct costs of education such as school fees and levies, and indirect costs such as uniforms, transportation and food, particularly during years of drought. (Ministry of Primary and Secondary Education/UNICEF 2015).

Children reported that when they were hungry they sometimes could not go to school and, even if they went, they were unable to concentrate (UNICEF/IES, 2014). One boy in Chiredzi reported,

When I am hungry I feel weak and sleepy even when the teacher is talking.

The study also finds that children are involved in some of the food shortage coping responses of the family as they assisted adults in various economic activities, particularly vending, working in someone else's fields or herding someone else's cattle. These observations were also raised at the provincial consultative workshops held for this report. The study observes that the impacts of climate change on education are more serious for rural children than for children living in urban areas.

The National Assessment on Out of School Children study also finds that food shortages are a barrier to education. In this study, children cite hunger as a key reason for dropping out of school. Recurrent droughts made it difficult for parents, since they have to make trade offs between paying school fees and buying food for the survival of their families. Money earmarked for school fees is often diverted to buying food in times of household food insecurity (Ministry of Primary and Secondary Education/UNICEF 2015).

Water and sanitation

The occurrence of drought and low rainfall results in reduced availability of safe drinking water. Children, particularly girls, become involved in collecting water from longer distances. This affects their capacity to do other activities, such as going to school or doing homework (UNICEF/IES, 2014). Inadequate water and sanitation can affect children negatively, especially teenage girls, who often remain at home when they are menstruating.

The consultative workshops also noted that more frequent droughts reduced availability of water and as a result, sanitation in schools was compromised. This was observed, despite the achievements by the government in managing to provide water at most schools, with only 1.16 percent of primary schools in the country having no access to water in 2014 (see Section 6.2). These outcomes reduce educational achievements and the overall performance of the education system and may hinder the achievement of the SDG 4 (ensuring inclusive and equitable quality education and promoting lifelong learning opportunities for all).

Disease incidence

The increased incidence of weather related diseases such as malaria and diarrhoea caused by climate change can render children too weak to attend school (see Chapter 5 for details). Children miss classes because of ill health and, worse still, can be withdrawn from school altogether. The worst affected are those of primary school age. In 2014, 4.5 percent of all primary school children who dropped out of school did so, on grounds of illness. The equivalent figure for secondary school children was 1.4 percent (Ministry of Primary and Secondary Education, 2014). The year 2015 saw a slight improvement, with the percentage of primary school children dropping out of school because of illness dropping to 3.8 percent, and that for secondary school children being 1.3 percent (Ministry of Primary and Secondary Education, 2015).

A higher incidence of weather related diseases within the family can also reduce the time available for education when the household division of labour is restructured to cope with illness. In any case, ill or malnourished children lack the energy to be active learners (Bartlett, 2008).

What becomes clear from the above is that there is an interrelationship between climate change, education, food security and health, and that these issues require an integrated, rather than a compartmentalized, approach. Save the Children UK (2007) makes similar observations:

Education and child protection are closely linked to food security and the economy of the household. It is often the case that children are pulled out of school if there is no money for school fees,

or if the child is needed to work in place of a sick parent or to care for younger siblings (Save the Children UK, 2007).

Long term effects

The long-term effects of the primary, indirect impacts of climate change on education of children, via the health and nutrition linkage are considerable and should be viewed seriously. Although no such research has been conducted in Zimbabwe, useful insights and lessons can be drawn from studies undertaken elsewhere. There is a statistically significant relationship between the health and nutritional status of children of school-going age and their educational performance, as highlighted by the Consortium for Research on Education Access, Transitions and Equity (CREATE) (2008) in the following quote,

...there is strong evidence to suggest that school-aged children who suffer from protein-energy malnutrition, hunger, or who lack certain micronutrients in their diet (particularly iron, iodine or vitamin A) or who carry a burden of diseases such as malaria, diarrhoea or worms do not have the same potential for learning as healthy and well-nourished children, and they are more likely to repeat grades, drop out early and fail to learn adequately due to poor attention, low motivation and poor cognitive function.

Grantham-McGregor et al., (2007) point out that these disadvantaged children are likely to enroll late for education, do poorly in school and subsequently have low incomes, high fertility, and provide poor care for their children, leading to the intergenerational transmission of poverty. This loss of human potential has been estimated to lead to a 20 percent deficit in adult income and to have negative implications for national development.

There is convincing evidence that socially progressive, school based health and nutrition programmes specifically targeted towards the poor and the most disadvantaged children can provide a low cost and cost effective and solution to loss of education and learning. Many countries and development partners throughout the world now recognise the need for school health and nutrition programmes as part of Education for All actions. Education International, the World

Bank, UNESCO, WHO and, UNICEF jointly developed a framework to 'Focus Resources on Effective School Health' (FRESH) which they launched at the World Education Forum in Dakar in 2000. The clear message of FRESH is that good school health, especially water, sanitation and nutrition, is a key component of efforts to achieve education for all (CREATE, 2008). Zimbabwe will need to adopt such schemes to support and keep in school vulnerable children, whose households will suffer from food insecurity which occurs frequently in some parts of Zimbabwe because of the high frequency of droughts and poor agricultural seasons.

Secondary impacts

The secondary impacts of climate change on education arise from the way in which households respond or choose to cope with and adapt to climate change. The primary impacts of climate change in this regard may be on other factors that are not necessarily education. However, the secondary impacts may actually be greater than the direct primary impacts.

Supplementing income

During the provincial consultations conducted in the course of this study, stakeholders mentioned the use of child labour to supplement family incomes as one of the outcomes of drought that affects children's education negatively.

A common strategy for reducing vulnerability to the challenges brought about by climate change by families depending on rain-fed agriculture is to supplement income generation by engaging in new or additional non-farm labour activities and reducing reliance on farming. When women engage in such activities, children, particularly girls, might need to increase the time they spend on household work and caring for siblings to compensate for the mother's changing roles. As a result, they may miss school and/or have less time to study. In some cases, the strategy of the household might require children to actually participate in income generating activities, either on the family land or outside the household in commercial activities. This interrupts children's education to a greater or lesser extent, depending on the time allocated to paid work. In the worst case, children are withdrawn from school altogether.

The National Assessment on Out of School Children found that some children end up dropping out of school in order to help supplement family income by engaging in activities such as farming, fishing, gold panning, vending and working as herders or domestic workers (Ministry of Primary and Secondary Education/UNICEF, 2015).

In most cases they sell various commodities, such as airtime, freezits (frozen juices), and fruits to raise money for their households. Primary school teacher, Nyanga.

Migration

One of the more transformational responses to the negative impacts of climate change is seeking alternative livelihoods (see Chapter 3). In many cases this switch is accompanied by migration from rural to urban areas, and in some cases emigration out of the country.

The Ministry of Primary and Secondary Education/UNICEF (2015) study finds that many economically active members of the household migrate to neighbouring countries to work as migrant labourers, in order to cope with frequent droughts and poverty. This is the case particularly in border districts such as Chiredzi, Bulilima, Binga and Mbire. The study finds that migration of families into and out of the country is usually problematic for children as children of migrants tend to have lower levels of educational achievement.

Migration has mixed impacts on school children. When one or both parents leave the household, children can face increased levels of emotional distress and instability (UNICEF, 2011) and this can have negative impact upon their educational performance. However, remittances from parents can contribute to a better quality of life for children, if they are adequately cared for (usually by members of the extended family). However, most often, migration is associated with dropping out of school.

Gender based differences in the impacts of climate change

Stakeholders at the provincial consultations undertaken during the course of writing this report pointed out situations in which parents, in years of drought and faced by conditions of food

shortages and hunger, married off girls of school going age as a survival strategy. Several studies in Zimbabwe have confirmed these developments which are worsened by the impacts of climate change. In the UNICEF/IES (2014) study, marrying girls off at a young age was cited as a coping strategy for food shortages by about 10 percent of children in the Harare district sample. The same study makes reference to cases in which children said that parents actually forced children into marriages. Children in Mbire cited members of the Johane Masowe Apostolic Sect who married their children to old church members as a way of getting food and relieving themselves of paying school fees. The study finds that the situation of forced marriages is regarded by the children as distressing and painful. One girl in Chiredzi (rural) commented:

You are actually sold cheap for them to get a few bags of maize.

The other side of the story is that boys are discouraged from marrying as this would bring an extra mouth to feed into the household.

These research findings are corroborated by the study on the effects of floods in Muzarabani (Mudavanhu, 2014) which mentions early child marriages as one of the coping strategies commonly adopted in the area during times of food shortage. During climate crises, child marriage is used as a coping mechanism because (a) the bride price/dowry is welcome income, (b) it is one less person for the family to feed, clothe, and educate, and (c) the family perceives the girl will be better off and have greater food security in the marriage (Chigwanda, 2016).

The major effect of child marriages is that, in the majority of cases, the married child is withdrawn from school. In 2015, 4.4 percent of the female students who withdrew from primary school gave the reasons of marriage or pregnancy – 3 percent because of marriage and 1.4 percent because of pregnancy. Only 0.1 percent of the boys who withdrew from school did so for purposes of getting married. At the secondary school level, the situation was worse. About 20.5 percent of girls who dropped out of school did so because of marriage and an additional 14.6 percent of the girls that dropped out of school did so because they were pregnant. In contrast, only 2.4 percent of boys who dropped out of

school did so because of marriage, while only 0.6 percent dropped out because of pregnancy (of the partner) (Ministry of Primary and Secondary Education, 2015).

Responses to Climate Change Related Challenges to Education

Since Independence in 1980, Zimbabwe has created an environment for the attainment of education by all through introducing progressive policies, strategies, programmes and activities. However, there are no policies within the education sector that specifically address the challenges posed by climate change. Certain aspects of current policies have measures that, to an extent, address adaptation to climate change but that may need to be strengthened.

The Constitution of Zimbabwe (Government of Zimbabwe, 2013) explicitly provides for the right to education in Chapter 4 Section 75, Sub-section 1, which states that,

(1) Every citizen and permanent resident of Zimbabwe has a right to –

(a) A basic State-funded education, including adult basic education; and

(b) Further education, which the State, through reasonable legislative and other measures, must make progressively available and accessible.

Education related international commitments

The Government of Zimbabwe has made international commitments in the area of educational and other national infrastructure that is affected by the extreme weather events which are occurring more frequently because of climate change. Zimbabwe is party to the Sendai Framework, a 15-year, voluntary, non-binding agreement which recognises that the State has the primary role in reducing disaster risk and that the responsibility should also be shared with other stakeholders, including local government, the private sector and other stakeholders.

Priority number 4 of the Framework is about enhancing disaster preparedness for effective response and to 'build back better' in recovery and reconstruction. At the national level, the framework encourages the promotion of "the resilience of new and existing critical infrastructure, including water, transportation and telecommu-

nications infrastructure, educational facilities, hospitals and other health facilities, to ensure that they remain safe, effective and operational during and after disasters, in order to provide live-saving and essential services".

National education policy responses

The Government of Zimbabwe has put in place a number of measures aimed at making education accessible for all including the vulnerable members of society. The two ministries of education (the Ministry of Primary and Secondary Education and the Ministry of Higher and Tertiary Education) have policies to achieve education for all which address major issues in the following areas:

- Improving access to primary, secondary and tertiary education.
- Improving the quality of education services, including sports and culture.
- Improving the relevance of the curricula at the various levels of the system to cater for the contemporary and future needs of young people.
- Ensuring equity in the provision and delivery of education services with a special focus on marginalised and disadvantaged groups, including girl children.
- Ensuring an adequate and well trained teaching force.
- Strengthening partnerships between Government, parents, the community and the private sector in meeting the costs of education and training.
- Intensifying efforts to improve early childhood education and care.
- Paying greater attention to the education of children with special needs, with particular focus on the practice of inclusiveness and teacher education.
- Providing programmes for adults to create opportunities for lifelong and continuing education.
- Increasing access to information and com-

Table 6.4 Key policy frameworks on education in Zimbabwe

Policy and Strategies for Education	Key Provisions
The Education Amendment Act 2006	Enacted to regulate the national school fees system. The Act requires non-government schools to seek the approval of the Secretary for Education to charge any fees or levies and thereafter to increase these. The Act makes provisions for the involvement of parents in the adjustment of the levels of fees and levies. This Act provides a framework for Government to address problems of access to education which are likely to be worsened by climate change.
The National Strategic Plan for the Education of Girls, Orphans and other Vulnerable Children (2005–2010)	<p>Launched in 2006 and formulated to address gender disparity in education, including gender based violence in schools. Its goals are to achieve universal primary education of quality for all Zimbabwean children, especially girls, orphans and other vulnerable children, and to eliminate gender disparity in primary and secondary education. Its objective is to create a favourable policy and partnership environment to make basic education affordable for these special groups.</p> <p>It seeks to fulfill the right to education for every child in Zimbabwe and its vision is:</p> <ul style="list-style-type: none"> • A society in which girls and women are empowered to take charge of their lives and participate fully in national development. • Reach all orphans and other vulnerable children in Zimbabwe with basic education services that will have positive impacts on their lives. Such policies that equally empower boys and girls help in building climate resilient communities.
Policy and Strategies for Social Protection	Key Provisions
National Action Plan for Orphans and Other Vulnerable Children (2004)	Provides a framework for coordinated action to ensure that orphans, vulnerable children and their families in Zimbabwe, have incomes and access to basic services, and that all children are protected from abuse and exploitation. It provides for increased access to basic health and other social services by all orphans and vulnerable children and their families through cash transfers to the poorest families and education assistance. These safety nets are particularly relevant during years when there are extreme climatic events.
Policy and Strategies for Climate Change Adaptation	Key Provisions
National Climate Change Policy	<p>One of the primary goals of the Climate Policy is to strengthen education and awareness on climate variability and change.</p> <p>The Government commits itself to:</p> <ul style="list-style-type: none"> • Strengthen the teaching and learning of weather and climate, and mainstream it in all education curricula. • Provide relevant training on weather and climate research and modelling to educators. • Establish mechanisms for training officials, including legislators and the judiciary on climate science. • Provide relevant training on weather and climate research and modelling to practitioners working with communities. • Develop capacity to strengthen modelling and impact studies among technical staff, including in the planning and design of development programmes and projects.

<p>Zimbabwe's Climate Change Response Strategy</p>	<p>Identifies, as one of the strategic objectives, the need to strengthen and mainstream climate change in all education curricula, from ECE and primary, through to secondary and tertiary levels, and for both formal and informal education. It also highlights the need to monitor, evaluate and upgrade the curricula continuously to keep up with global trends and good practice. The Strategy advocates for the production of climate change literature in all relevant languages.</p> <p>It identifies the need for:</p> <ul style="list-style-type: none"> • Conducting in-service training of current educators and extension workers until saturation levels are reached or a critical mass of teachers with climate change skills is produced. • Providing relevant training on climate change issues for practitioners working with communities. • Enhancing the climate change knowledge of media and other professionals through the use of various platforms in order to achieve change in perceptions, attitudes and behaviour towards climate change mitigation and adaptation. • Training traditional leaders on their roles and responsibilities and on using the traditional institutions as a vehicle for educating communities on climate change issues. • Actively engaging the youth and their representative organisations in climate change education and training (Government of Zimbabwe, 2015).
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munication technology at all levels of the education system.

- Intensifying the development of science and technology at school level.
- Strengthening the teaching and learning of vocational and technical subjects at school level.

Table 6.4 outlines the policies and measures that Government has put in place to pursue the objective of making education accessible to all Zimbabweans, and these can also be used to address the impacts of climate change on education.

Climate change awareness and education needs to be incorporated across all sectors, so that Zimbabwe is prepared to mitigate and adapt to climate change through an informed community.

Programmes implemented in the education sector

The progressive policy framework has enabled the government to implement programmes to cushion the poor and other vulnerable children in the area of education. The major ones, post 2000 are the Basic Education Assistance Module (BEAM), the school feeding programme, the Education Transition Fund 1 and 2, and the Second Chance Educational Programme. While these programmes were not necessarily designed with the conscious objective of address-

ing the impacts of climate change on education, they nevertheless are relevant to addressing the challenges brought about by climate change.

The Basic Education Assistance Module

The BEAM was established in 2001 for the assistance of orphans, the poor and other vulnerable children in education. It is a demand side response to the cost barriers affecting the ability of orphans and vulnerable children to obtain education. At its peak in 2006, the programme helped to send more than 900 000 children to school. Until the end of 2008, BEAM was wholly funded by Government. From 2009, donors came in to complement Government efforts and BEAM is providing financial grants to cover tuition fees and levies in primary schools and examination fees in secondary schools (Ministry of Primary and Secondary Education, 2016).

The BEAM is a key component of the Enhanced Social Protection Programme in Zimbabwe, based on a policy and legal framework to provide quality education for children in the country. It is one of the largest social safety nets aimed at reducing the number of orphans and vulnerable children dropping out of school. This initiative upholds the policy of access to eleven years of school education for all children.

According to the 2012 school census, there were 1.14 million children out of 3.95 million in total enrolments throughout Zimbabwe classified as

orphans and vulnerable children and participating in the formal education system. Of these, 46.5 percent were covered by BEAM, while the remaining 53.5 percent, at that time, received no direct support from the government (Ministry of Education, Sports, Arts and Culture, 2013). In 2014, 26.0 percent of primary school children were considered as orphans and vulnerable children and BEAM covered slightly more than half of them (51.5 percent), representing 13.4 percent of all children enrolled in primary schools.

At the secondary school level, a higher percentage of children was classified as orphans and vulnerable children (32.0 percent) and BEAM provided support to just less than half of these (47.07 percent), representing 15.09 percent of the total number of secondary school children (Ministry of Primary and Secondary Education, 2014). As of 2015, 62 percent of children who qualified for BEAM assistance were not covered (UNDP, 2015b).

Although BEAM has greatly increased access to education for many learners who would otherwise have dropped out of school because of destitution, it still falls far short of meeting the needs of the many families living below the poverty datum line. Climate change is likely to increase the number of vulnerable children. Therefore, more needs to be done to increase the level of funding in BEAM.

Other assistance programmes available from Government and meant to reduce the vulnerability of children for education are the:

- Income Transfer and Public Works; and
- Children in Specially Difficult Circumstances.

The School Feeding Programme

School feeding programmes can help to get children into school and keep them there, thus enhancing enrolment and reducing absenteeism. Such programmes help improve micronutrient and macronutrient intake, which leads to enhanced nutrition and child health (see Chapter 5), increased learning and attendance, and reduced morbidity for students. The Ministry of Education, Sports, Arts and Culture's (2013) Education Medium Term Plan, under the op-

erational objective of improving conditions of learning in schools, mentions school feeding, deworming and other health related programmes as activities to support this objective.

As of 2014, only 9 percent of primary and 5 percent of secondary schools had support feeding programmes. The school feeding programme is mainly supported by development partners and NGOs and operates largely in rural schools. In 2016, Zimbabwe adopted and launched the Home-Grown School Feeding Programme for Harare, spearheaded by the Ministry of Primary and Secondary Education, which is aimed at providing at least one balanced meal for pupils at primary school level.

The Second Chance Educational Programme

The Zimbabwe Accelerated Learning Programme was piloted as a two year programme by the World Education's Bantwana Initiative, in partnership with the Ministry of Primary and Secondary Education and with support from UNICEF. The programme aims to identify out-of-school learners and prepare them to 'catch up' with their peers through accelerated learning approaches, in order to reintegrate them into the formal school system. In 2015, Zimbabwe launched its first non-formal education policy, one focus of which is to afford a second chance to those who have dropped out of school to complete their studies. Such programmes, if sustained, should help those children who drop out of school because of extreme climatic events to reintegrate in schools.

Education Transition and Education Development Funds

The Education Transition Fund programme was a multi-donor funding mechanism designed to mobilise resources for the education sector to ensure equitable access to quality education. The fund was set up to provide teaching and learning materials, textbooks and supplies in schools, starting with primary schools.

The Education Development Fund, a successor to the Education Transition Fund, went further to provide science kits for all secondary schools, including satellite schools. It also supported a health and nutrition programme in schools, including mass treatment for bilharzia and in-

Table 6.5 Sustainable Development Goal 4 and its targets

Goal	Target number	Target
Goal 4 Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all	4.1	By 2030, ensure that all girls and boys complete free, equitable and quality primary and secondary education leading to relevant and Goal 4 effective learning outcomes
	4.2	By 2030, ensure that all girls and boys have access to quality early childhood development, care and pre-primary education so that they are ready for primary education
	4.3	By 2030, ensure equal access for all women and men to affordable and quality technical, vocational and tertiary education, including university
	4.4	By 2030, substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship
	4.5	By 2030, eliminate gender disparities in education and ensure equal access to all levels of education and vocational training for the vulnerable, including persons with disabilities, indigenous peoples and children in vulnerable situations
	4.6	By 2030, ensure that all youth and a substantial proportion of adults, both men and women, achieve literacy and numeracy
	4.7	By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development.

testinal worms. In addition, the Education Development Fund supported the construction of classrooms through the School Improvement Grant initiative.

These measures, however, need to be increased as they are currently not reaching the majority of the affected children. Acceleration of such programmes would ensure an improvement from the current completion rates (Munjanganja and Machawira, 2014) and help make the education sector resilient to the effects of climate change.

Education and the Sustainable Development Goals

Education is central to achieving the SDGs and SDG4 is devoted specifically to education and framed as follows: “Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.”

The objective of Goal 4 is to transform lives through education, recognising the important role that education plays as a main driver of development and in achieving the other SDGs. Attainment of education is not restricted to SDG 4 and is mentioned in goals on health, growth and employment, sustainable consumption and production, as well as on climate change. The targets for SDG4 are enumerated in Table 6.3,

which gives the medium term goals for attainment of universal education, taking into consideration the impacts of climate change.

In addition to the SDGs, the UNFCCC addresses the role of education in mitigation of and adaptation to climate change through its Article 6. This article on education, training and public awareness commits parties to.

a) Promote and facilitate at the national and as appropriate, sub-regional and regional levels, and in accordance with national laws and regulations, and within their respective capacities.

i) The development and implementation of educational and public awareness programmes on climate change and its effects.

ii) Public access to information on climate change and its effects.

iii) Public participation in addressing climate change and its effects and developing adequate responses; and

iv) Training of scientific, technical and managerial personnel.

b) Cooperate in and promote, at the interna-

tional level, and where appropriate, using existing bodies:

i) The development and exchange of educational and public awareness material on climate change and its effects; and

ii) The development and implementation of education and training programmes, including the strengthening of national institutions and the exchange or secondment of personnel to train experts in this field, in particular for developing countries.

Zimbabwe is a signatory to both the UNFCCC and the 2030 Agenda on Sustainable Development. Involvement in these global multilateral agreements opens opportunities for further access to resources to maintain Zimbabwe's high level of education and literacy and for its education sector to adapt to the impacts of climate change.

Conclusion

This chapter has presented the state of education in Zimbabwe and trends in the major educational performance indicators. It has gone on to discuss how human development is affected by climate change through its impacts on education. Currently there is limited knowledge on the extent of the impacts of climate change on education. Hence, there is a need for systematic studies to quantify these impacts.

The chapter has discussed policies that government has formulated and measures or programmes that it has implemented together with other stakeholders (including development partners, private sector and civil society) that could cushion vulnerable members of society from the negative impacts of climate change on education. The national policy frameworks that are already in place address the impacts of climate change to some extent. However, some of them might need to be revised to mainstream climate change issues more extensively. Suggestions for further policy actions on education are presented in Chapter 7.

Section C

Responses To Climate Change Impacts On Human Development



CONCLUSIONS AND RECOMMENDATIONS

While governments are expected to take the lead, other stakeholders are just as important to ensure success in achieving human and sustainable development. The need couldn't be more urgent and the time couldn't be more opportune, with our enhanced understanding of the challenges we face that come with climate change, to act now to safeguard our own survival and that of future generations.

Adapted from the Global Environment Outlook

Introduction

This chapter concludes the Zimbabwe Human Development Report 2017 and puts forward recommendations for policies that could be implemented to address the impacts of climate change on human development as we move into the future. Chapter 2 of this report presented the trends in human development in Zimbabwe as reflected by the HDI and other related indices that take into account inequalities across populations and gender, poverty and the environment. Chapters 3 to 6, discussed in detail the linkages between climate change and the critical human development aspects of livelihoods, food security, health and education, and the country's performance in these areas.

The report notes that the HDI for Zimbabwe improved from 0.437 in 1980 to 0.522 in 2015 (representing a 19 percent value increment). This is mainly explained by the massive post-Independence investment, particularly in education and health, that the Government of Zimbabwe undertook with the objective of correcting the colonial imbalances in social expenditure. The expected years of schooling increased by 3.8 years and the mean years of schooling increased by 4.5 years. Life expectancy at birth also increased from 59.2 years in 1980 to 60.7 years by 2015, although in between it fell to as low as 42.7 years in 2000 because of the HIV pandemic.

Climate change poses a huge challenge to human development in Zimbabwe, as in all countries of the world. The negative impacts of cli-

mate change are compounded by other factors, such as the overall economic performance and the high incidence of poverty in the country. As noted in Chapter 2, Zimbabwe is deemed to be in the 'extreme risk' category with regard to the impacts of climate change based on the Climate Change Vulnerability Index (see Chapter 2). The index assesses national vulnerabilities relating to exposure to climate related natural disasters, and human sensitivities in terms of population patterns, development, natural resources, agricultural dependency and conflicts, as well as future vulnerability. Zimbabwe is in the extreme risk category because of its high levels of poverty, exposure to climate related events such as frequent droughts, and its reliance on flood and drought prone agricultural land.

The Government of Zimbabwe is committed to addressing the impacts of climate change on sustainable human development in the country. It is party to the UNFCCC and many other international conventions and agreements, such as the SDGs framework, covering different aspects of human development. It has committed itself to implementing or domesticating international policy agreements that strengthen the country's adaptive capacity and resilience to climate change. The Government has also put in place a number of nationally initiated policies and programmes that strengthen ability to deal with challenges originating from the impacts of climate change. Some of the policies are not new but already cover aspects of adaptation. The recommendations presented in this chapter are

meant to complement these initiatives so as to bolster the country's capacity to address the negative impacts of climate change on the various components of human development.

Disaster Preparedness, Early Warning Systems and Disaster Risk Management

Climate change affects human development through changes in temperatures and precipitation resulting in extreme events. It causes increased frequency and severity of droughts, changes in rainfall and weather patterns, and increased occurrence of extreme weather events such as heavy rains accompanied by flash floods, strong winds and hail storms.

Disaster preparedness

Extreme weather events bring about disasters through destruction of crops in the fields, damage to infrastructure such as roads, bridges, school buildings and houses, as well as disruption of electricity supplies. All these outcomes have negative impacts upon human development because they disrupt livelihoods and the provision of health and educational services, destroy crops, and threaten human and livestock lives. Extreme weather events also result in displacement and migration of families, which have adverse social outcomes. Thus, disaster preparedness cuts across all the four themes (livelihoods, food security, health and education) presented in this Human Development Report.

Early warning system

Zimbabwe's rural population is dependent on agriculture as a livelihood and changes in weather patterns require farmers to have accurate rainfall forecasts for them to determine the most appropriate planting times as well as to choose appropriate plant breeds in advance of the agricultural season. The Meteorological Services Department is mandated to provide up-to-date information on climate change issues and information to determine the interventions required to react to the adverse impacts of climate change. Therefore, it has a very important role to play in disaster risk management and climate change response. However, most of the equipment at the Meteorological Services Department and at its satellite offices at the district level is old and has become very costly to maintain. The shortage of spare parts to repair faulty equipment, and financial resources for upgrad-

ing the equipment, undermines the operational efficiency of the Department and it has also suffered a major brain drain. Therefore:

- It is recommended that the capacity of the Department to monitor, detect, forecast and give early warnings about disasters such as floods, droughts and emerging threats be strengthened so that it becomes a more effective and reliable institution.
- Related to this and along the thrust of the Zimbabwe's Climate Change Response Strategy, it is recommended that the capacity of the National Meteorological and Hydrological Services to carry out research on climate change through improved data collection and management, and climate modelling be strengthened.
- It is further recommended that the National Meteorological and Hydrological Services broaden their documentation activities and tap into indigenous knowledge systems to complement scientific knowledge for climate change forecasting and early warning systems.

Disaster risk management

The Department of Civil Protection is another important institution in the response to the more frequent disasters that are occurring due to extreme weather related events. The mandate of local authorities and the Department of Civil Protection is to provide early warning and responses to floods, with the main goal of limiting the danger to human lives and property. Although the Department has implemented decentralised arrangements for the coordination of national, provincial, district and community level disaster risk management initiatives, it is not well resourced and staffed to respond timely. Therefore:

- It is necessary to capacitate and strengthen the Department of Civil Protection and to mainstream disaster risk management in such a way that it is central to climate change adaptation.
- It is recommended that the Civil Protection Department be strengthened to deal with flood related and other disasters efficiently to limit the danger to human life.

- *The Civil Protection Department should use information systems, including cellular phones to warn the Zimbabwean population of impending danger, and undertake ongoing education and information dissemination as well as training on crisis services.*
- *The Civil Protection Department should increase its use of media of high relevance and accessibility to stakeholders, such as the existing programme of broadcasting flood warning information via cellular phones.*

Strengthening National Capacity to Adapt to the Effects of Climate Change on Livelihoods, Food Security, Health and Education

Climate change is expected to have both direct and indirect impacts on rural and urban livelihoods. Agriculture, which is the main source of livelihood activities for rural households, is climate sensitive and has a strong interface with urban areas through backward and forward linkages. The negative impacts of climate change are compounded by other factors, such as a poorly performing macroeconomic environment, unemployment, ecosystem service degradation and poverty.

Stakeholders consulted during the development of this report came up with several recommendations for strengthening national capacity to address the challenges of climate change for rural and urban livelihoods. Policy measures require Zimbabwe to build resilience to climate related shocks and stresses for both rural and urban areas.

The effects of climate change on the four dimensions of food security – food availability, food accessibility, food utilisation and food system stability – are already being felt in Zimbabwe’s rural and urban areas. The effects are particularly significant in specific rural areas in the country where crops fail and yields decline because of the frequency of droughts and long dry spells. As noted in Chapter 4 extreme weather events such as floods disrupt supply and market chains, resulting in spikes in food prices, and loss of productive assets and livelihood opportunities, which affect human wellbeing and developmental progress negatively.

Responses to strengthen the national capacity to address the effects of climate change on food security will require local adaptation planning and a greater focus on building the adaptive capacity of individuals and communities (IIED, 2013). The recommendations for strengthening national capacity to address the effects of climate change on food security are made based on the knowledge that communities in Zimbabwe already have a strong reservoir of skills and knowledge that can be tapped to build resilience to climate related stresses and shocks.

Climate change is projected to have wide ranging health related effects, mainly through changes in temperatures and precipitation (Chapter 2) and the frequency of extreme events such as droughts and floods. Any responses to climate change are centred around responding to these phenomena. Stakeholders consulted while developing this report suggested several actions they felt are needed to strengthen the country’s capacity to address the health challenges associated with climate change.

Zimbabwe’s educational system experiences serious disruptions from weather related hazards, including floods, storms and droughts, that are increasing in frequency as a result of climate change. As noted in Chapter 6, floods and storms have resulted in the destruction of infrastructure, including roads and bridges, classrooms, teachers’ houses and school toilets, all necessary for the efficient delivery of educational services and learning.

Any assessment of the impacts of climate change on education reveals the interlocking relationship between climate change, education, food security and health, as well as other sectors especially those related to infrastructure construction. As a result, many of the impacts of climate change on education have to be addressed through actions in other sectors, such as health, water, agriculture and public infrastructure, in addition to those actions within the education sector itself. This means that integrating climate change aspects in education involves providing inputs for other sectors’ adaptation strategies.

Adaptation to drought

Capacity to deal with water supply and demand management

Access to and efficient management and use of water are the foundations for building climate resilient livelihoods. Since drought and dry spells were identified as leading hazards at national consultations held in the process of developing this report, efforts need to be made to rehabilitate and improve water related infrastructure. Zimbabwe has the highest number of inland surface dams in Southern Africa, after South Africa, However, the utilisation of these dams for irrigation has been limited for a variety of reasons, such as lack of investment in irrigation infrastructure and perceived insecure land tenure arrangements.

Irrigation is vital to countering the negative effects of drought, especially in the drier regions of the country where most of the rural population resides and is reliant on rain-fed agro-systems and climate sensitive livelihoods. Therefore:

- *It is necessary to promote irrigation schemes as this presents an opportunity for communities to produce commodities for year-round markets and local consumption.*
- *Existing irrigation schemes need to be resuscitated and rehabilitated.*
- *Business models that can sustain the operation and maintenance of irrigation schemes should be promoted.*

Past development interventions have not been sustained, primarily because of a focus on the functionality of hardware while neglecting the business model and institutional arrangements which underpin viability and sustainability of such schemes (Spooner, 2014).

It is estimated that agriculture use currently accounts for about 80 percent of the surface water resources used in economic activities. The amount of water stored as groundwater in Zimbabwe is still unknown so it is important to improve on knowledge on groundwater storage to ascertain whether there is enough groundwater to cushion the country to the impacts of climate change, ensure agricultural productivity and improve food security. Improvement in water

use efficiency is one form of adaptation that has minimal costs. Therefore:

- *Water, Sanitation and Hygiene (WASH) interventions need to be strengthened through a focus on water recharge, retention and efficient use, including investment in rehabilitation of dams and weirs, water harvesting, drip irrigation and solar powered water schemes for irrigation, as well as management of institutional and domestic consumption and demand.*
- *Investments should be centred on drip irrigation infrastructure, as opposed to overhead sprinklers or pivot irrigation where much water is lost to evapotranspiration.*
- *Dam rehabilitation and training communities, especially young people, on catchment management are central to reducing siltation of dams and improving irrigation facilities.*
- *It is necessary to review water resource infrastructure and to design dams, bridges and levees that accommodate droughts, flooding, and extreme events.*
- *Investments should be made in piped water schemes for domestic use as these lessen women's burden in fetching water, and enable them to use their time in productive activities.*

Investments in water harvesting techniques

The quantity and peak of storm water runoff is responsible for much of the flooding the country experiences, particularly in urban areas. Stakeholders recognised the importance of capturing or harvesting flood waters and the potential this action has for recharging groundwater supplies. Rainwater harvesting can also supplement water sources when their volume decreases. Therefore:

- *Therefore, public-private partnerships are required for the design of cost effective rain harvesting techniques and context specific infrastructure.*

Boreholes

Stakeholders pointed to the need to exploit underground water resources further. In this

respect, the need to drill more boreholes was emphasised, as boreholes normally provide safe drinking water. This would help to increase community access to clean and safe drinking water and reduce the health risks associated with using condemned water sources, while reducing the distances that people, in most cases women, travel to fetch water. Stakeholders felt that this needs to be done for both rural areas and the high density urban residential areas that face piped water shortages and the associated health threats. Local authorities should take the initiative, with support from development partner initiatives such as UNICEF's WASH programme. Therefore:

- *It is recommended that borehole drilling programmes be scaled up in both rural and urban areas, in partnership with development partners.*
- *Related to these programmes, is recommended that Government equip the District Development Fund with appropriate and adequate machinery and equipment for undertaking borehole drilling and dam scooping exercises.*

Climate smart agriculture and investments

Appropriate agro-ecology and climate resilient agricultural practices ensure improved production that does not undermine the environmental base. Some of the proposed solutions to ensure food security under a changing climate are improving agriculture technologies and irrigation facilities as well as providing affordable inputs and improved seed varieties. Seed multiplication and banks will help improve crop quality and yields. Conservation agriculture has the potential to improve in-situ water conservation. Although conservation agriculture has been promoted actively in Zimbabwe, there has been little uptake because of the perception of increased drudgery associated with it.

Agricultural productivity could be enhanced via knowledge and skills transfer, through extension services and investment in agricultural infrastructure across the country. While investments were made in rural infrastructure in the 1980s, these are not frequently maintained, contributing to poor infrastructure (roads and communication). This hinders access to markets and services as well as climate information and

consequently constrains agro-based livelihoods and food security. Therefore:

- *It is necessary to continue building capacity and investing in climate smart technologies, as well as to invest in rain-fed and irrigation agriculture.*
- *Efforts should be made to address the bottlenecks faced by communities in adopting climate smart agriculture.*

Land and crop suitability mapping

Land and crop suitability mapping needs to be carried out for the country. Brown et al. (2012) point to changes in land suitability for production of certain crops across the country. These authors argue that land suitable for sorghum and maize will decrease particularly in the south-western parts of the country, while cotton production is more likely to thrive. Therefore:

- *There is a need for land suitability mapping and awareness raising amongst communities on appropriate crop production systems under a changing climate.*

Diversifying production systems

Reduced social and ecological resilience has arisen from the marginalisation of locally adapted crop varieties and livestock breeds. For example, hybrid maize seed is used widely in all regions of Zimbabwe despite the fact that it is not adapted to semi-arid conditions. This is informed by a mentality of productivity per crop variety and not per unit area and leads to the non-utilisation of the comparative advantages of the semi-arid areas. It is worsened by the scarcity of improved small grains seeds – sorghum, millet, groundnuts and bambara nuts – that are adapted to drier conditions.

The Ministry of Agriculture, Mechanisation and Irrigation Development and civil society organisations have been promoting small grains that are more drought resistant in response to frequent droughts. However, there has been low uptake because of the processing requirements of the small grains which are labour intensive. Therefore:

- *It is recommended that the promotion of*

small grains be continued, but supplemented by the promotion of technologies that reduce the labour requirements in their processing. Vulnerable segments of society, such as children (especially orphans), elderly, people with disabilities, widows and the poor, need to be supported through food provision programmes. School feeding schemes should be continued and expanded.

- *Efforts to convince farmers to adopt local varieties of both crops and livestock should be continued and strengthened. Research on the bottlenecks that farmers face in switching to these crops and livestock should be supported and strengthened. Public awareness programmes should be instituted using all forms of media.*

Changing dietary preferences

Changing of dietary preferences (from maize to small grains) could be achieved through behavioural change options. Women at the national consultations complained that small grains required a lot of labour time especially in de-husking and processing the grains, hence they did not favour this diet alternative. Therefore:

- *It is imperative to invest in agriculture technology in order to find ways to improve on the preparation and processing of small grains.*

Exploration of biofortified crop production

Extensive research has been done in other African countries, such as Malawi and Zambia, on harnessing biofortified drought tolerant crops such as beans that are rich in iron, zinc and selenium (Ajilore, 2014). Biofortified varieties of maize and sweet potato are also available. Therefore:

- *Consideration needs to be given to carrying out research trials on the growth, development and production of biofortified crops in Zimbabwe, as these could improve smallholder farmers' resistance to climate change and variability and increase food security.*

Adaptive livestock carrying policies

Planned de-stocking and encouraging rearing of indigenous breeds are some of the adaptive interventions for livestock production systems. Livestock, particularly heat tolerant indigenous cattle, are an important asset in the farming system and can do well in a dry climate. In this case, promoting livestock production as a substitute or addition to crop production in dry areas is an important safety net in the face of the changing climate in the country. Therefore:

- *The policy message is that livestock improvement programmes instituted by the Government's departments of Livestock Development and Veterinary Services and private companies are vital for sustaining farming households in the face of a changing climate.*
- *Promotion of rapid de-stocking in anticipation of natural hazards such as drought is also an adaptive measure, which entails ensuring that there are functional markets that can allow for this to take place.*

Improving livestock feed during droughts

There is a need to improve livestock survival during droughts by encouraging and increasing the use of feedlots to carry livestock through these periods. Therefore:

- *The production and processing of fodder crops to increase livestock feed availability should be supported to improve the survival of livestock. Strategies should include hay-making, hay warehousing, production of fodder grasses and legumes with high crude protein content and production of climate smart raw materials for stock feeds.*

Responding to drought induced malnutrition and impacts on education and health of children

Poor harvests caused by drought lead to malnutrition, hunger, sickness and inability to concentrate, which reduces performance and diminishes learning achievement among children. Lack of food and intestinal worm infection, which weaken children, increase absenteeism from school. The increased incidence of weather related diseases such as malaria and diarrhoea have

the same effect of rendering children too weak to attend school. Children miss classes because of ill health and, in the worst case scenario, drop out of school altogether. An additional outcome is that many girls end up being married early as a family coping strategy (see Chapter 6).

Furthermore, there is strong evidence to suggest that school-aged children who suffer from protein energy malnutrition, or hunger, or who lack certain micronutrients in their diet or who carry a burden of diseases such as malaria, diarrhoea or worms, do not have the same potential for learning as healthy and well-nourished children (see Chapter 6).

It is necessary to ensure that the active participation of children in school is maintained and children from vulnerable households continue to have access to education. School based health and nutrition programmes improve the nutritional intake of children, which improves their health, reduces morbidity, increases school attendance, and improves concentration and learning performance. Feeding needs for children in primary schools need to be met in order to encourage school attendance and to maintain regular hours of learning. Therefore:

- *It is recommended that school based health and nutrition programmes be introduced in all schools. A good entry point is the school feeding programme, and in particular, the Home Grown School Feeding Programme version. This which could be scaled up and broadened in coverage to include all schools and incorporate water and sanitation along with the FRESH initiative (that covers school health, especially water, sanitation and nutrition) as well as access to insecticide treated bed nets in malaria infested areas.*

Responses to floods

Heavy rainfall, hailstorms and floods result in displacement, loss of livelihood assets, loss of human life and livestock, and destruction of infrastructure. Flash floods, which occur particularly in urban areas, are mainly a result of blocked or poor drainage systems, in addition to the increasing occurrence of heavy rains.

Stakeholders noted that wetlands played an important role in providing a buffer against flood waters and that they remove contaminants from overland flow and river waters. They also act as

ground water recharge zones and provide habitats for ecologically beneficial organisms. Therefore:

- *It is recommended that local authorities ensure that drains are thoroughly cleared before the rainy season begins because of the likely increased frequency of downpours.*
- *Stakeholders recommended that local authorities enforce existing regulations and not allow development of residential or commercial buildings on wetlands. They also noted the need for strict adherence to required building standards, particularly in urban areas, as part of structural measures for protection against floods.*

'Climate proofing' of educational infrastructure

This is desirable in order to minimise the risks and associated costs of weather related damage, and should include small dams, access roads, bridges and electricity. This is clearly an important starting point which calls for adequate risk assessment when making decisions about, for example, school location. It also involves improving building design and maintenance to ensure infrastructure, including buildings, withstands severe weather events (Bangay, and Blum, 2010).

A focus on school design and upgrading existing infrastructure offers opportunities to reduce environmental impact in terms of the materials used and also to incorporate design elements that create improved learning environments (e.g. levels of natural lighting, sanitation facilities, reduced noise from rainfall and spaces conducive for learning). Therefore:

- *It is recommended that a strategy for 'climate proofing' of infrastructure, including of institutions, be developed together with implementation modalities. This should facilitate the gradual conversion of infrastructure to become as climate resilient as possible, including through choice of location and design of new infrastructure.*
- *It is recommended that maintenance and upgrading of infrastructure, roads and bridges, buildings be undertaken.*

- Where electricity is essential to operations, but power disruptions or shortages are expected to be more frequent, it is recommended that the possibilities of reducing dependence on externally supplied energy be investigated (e.g. of installation of local power generation equipment based on renewable sources).
- Initiatives are needed around the empirical evidence that communities with a range of livelihoods options and improved and diversified production are more resilient to climate related shocks than those that depend on one or two options.

Displacement

The impacts of climate change are widely predicted to result in significant population movements, as happened in the case of Chingwizi transit camp in the southern part of Zimbabwe. There is a need to improve the disaster preparedness of the education sector, so that there is capacity to respond to the plight of internally displaced children by minimising the disruption of their learning. The development of innovative approaches to reducing the problems of the disruption of the education of children for extended periods as a result of relocation in response to extreme weather events is crucial. The concepts of 'portable school' and schools in buffer zones' capable of accommodating an expanded number of students at short notice are worth exploring. Therefore:

- It is recommended that a task force be put in place or a study be conducted to explore possible models that could be adopted to minimise disruption of education among children living in areas prone to weather related disasters.
- Related to this, the education sector's capacity to deliver basic schooling services in temporary shelters or camps set up for populations displaced by climate events be strengthened.

Enhancing safety nets

Diversifying livelihood systems in communities

Diversification of income sources reduces the risks of dependence on and failure in one enterprise. Livelihood diversification enables households to carry out different activities that are complementary through internal and external exchange. This, in turn, creates stronger communities that, when well organised, can penetrate external markets, thereby bringing money into that community (Matondi, 2011). Therefore:

Improving financial instruments

Access to instruments such as bank accounts and insurance contracts helps households and firms to adapt to climate change, prepare for natural shocks, and recover when affected. Protected savings and borrowing makes it possible for households to cope with income losses while maintaining consumption and avoiding detrimental coping measures (like reducing food intake or taking children out of school). Therefore:

- It is recommended that financial and non-financial channels for remittances be improved and made easier, as remittances help people manage temporary or permanent shocks and to escape climate induced poverty.

A comprehensive social protection system

Results from the U-Report Poll and nationwide consultations pointed to a weak social protection system in the country. Stakeholders recommended a comprehensive social protection system that combines social cash transfers (conditional and non-conditional) and establishes social networks, which can build on social capital. This would enable communities to become resilient to present and future climate related impacts.

It is necessary to strengthen social capital and to promote savings and loan schemes among community members in order to strengthen agrarian production and reduce food insecurity within communities. Therefore:

- Social insurance and social safety nets need to be established as efficient tools to support poor people when they are affected by natural disasters or environmental and economic shocks. This would prevent communities from selling productive assets and enable them to bounce back from climate related shocks and stresses.

Communal granaries and social welfare

The concept of Zunde raMambo/Isiphala seNkosi was recommended in national consultations by some provinces as a possible solution for dealing with erratic food supplies and viewed as a possible strategy in building social capital through collective work. Presently, and as indicated in the U-Report Poll conducted by UNICEF, food-for-work programmes sponsored by both Government and civil society have allowed poorer households to absorb the stress of food insecurity. Figure 8.1 shows the types of safety nets that exist in communities. It can be seen that illegal gold panning has become a safety net rather than the 'get rich quick' story that is common in the discourse, yet this safety net is one of the drivers of ecological degradation in the country, and is in competition with agriculture.

Sentiments were expressed that there is a need for research into how the Zunde raMambo/Isiphala seNkosi concept could work in a modern world where most people are individualistic. Therefore:

- *There is need to improve on external sources of aid such as social cash transfer. The idea of cash transfers is that they allow households to use money for food rather than sell productive assets. This will ensure that households continue with their farm production.*

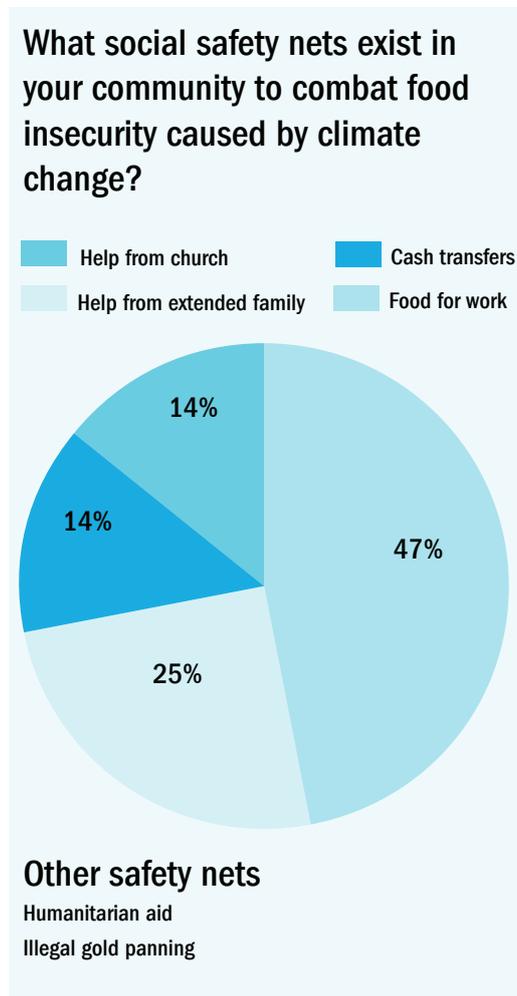
School dropouts and low completion rates

The BEAM programme was established to provide education assistance to orphans, the poor and other vulnerable children. However, because of limited fiscal space as a result of the difficult economic situation that the country is facing, as well as inadequate support from development partners, BEAM is able to support less than half of the deserving children classified as orphaned or vulnerable. This has contributed to the increase in the school dropout rate and reduction in completion rates. Therefore:

- *It is recommended that greater effort be made to mobilise resources for the expansion of the BEAM programme.*

Figure 7.1 Safety nets that exist in communities to combat food insecurity

Source: UNICEF UPoll (2016b)



Insurance against climate and weather related shocks

There is a need to create an insurance system that is based on fair compensation for farmers who are affected by climate related and environmental challenges such as droughts, floods and invasive pests such as army worms and locusts. Weather-based Index Insurance is designed to minimise the risk of loss of investment to smallholder farmers and is a valuable tool for unlocking rural credit in countries, as has happened in Malawi where institutions such as the Opportunity International Bank of Malawi and Malawi Rural Finance Corporation offer this product. Weather-based Index Insurance also assists smallholder farmers to endure climate change impacts and market shocks (Lewis,

2015). Therefore:

- *Zimbabwe should introduce a Weather-based Index Insurance as a matter of urgency. Focus could shift from insuring individual farmers to insuring so called aggregators, such as farmer associations or pre-groups, to minimise basis risk problems, and to microfinance institutions.*

Governance, institutions, strategies and plans

Improved governance structures that are gender sensitive

According to the National Climate Change Response Strategy, there is limited coordination among government ministries and departments, local authorities, UN agencies, development partners, civil society and the private sector with regard to climate change issues. Often there is duplication of effort, hence there is a need to introduce a coordinated approach for all major climate change initiatives.

In addition, it has been observed that, when external institutions get involved in adaptation practices, their relationships are more with local non-governmental institutions rather than local government and community institutions (Mubaya and Mafongoya, 2017). The limited direct interaction of these institutions with communities has implications for the success in building adaptive capacities in communities. Therefore:

- *It is recommended that Government, development partners and the private sector build a centralised database to house government and development partner initiatives, as well as an open source repository of social, economic and climate data that can be accessed easily to allow for evidence based programming or interventions.*
- *Grassroots structures should form the core building blocks for climate governance as this will allow for context specific local climate action and effective and timely responses to climate related disasters.*

Zimbabwe's progressive Constitution lays a foundation for gender equality and promotion of gender responsive governance, attitudes and practices. The National Gender Policy (2017), promotes the mainstreaming of gender in en-

vironmental and climate change policies and strategies. The key strategies proposed on which to build improved governance structures are anchored on equal decision making platforms, inclusion of women in national environmental action plans and

The participation of women in climate change negotiations so that their needs and perspectives are taken into account. Therefore:

- *It is important to identify constraints to female participation in value chain growth and to find opportunities for women's entrance, as this will enhance women's livelihood options and incomes.*

Strengthening formal and informal institutions

Institutional arrangements are key to climate change adaptation. This involves capacitating local authorities, traditional authorities, community based organisations and communities in disaster risk management, as well as developing climate action and resilience plans that strengthen community level resilience to extreme climate related events. Therefore:

- *Interventions involving building the capacity of all institutions at all levels in disaster risk management, developing climate resilience and action plans that strengthen community level resilience to extreme climate related events should be implemented in Zimbabwe.*

Strengthening disease surveillance systems

The Zimbabwe disease surveillance system was rated as fairly strong by the stakeholders. Therefore:

- *This should be strengthened, especially in the face of changing circumstances, namely expected increases in disease outbreaks as a result of climate change. The relevant institutions need to be in a strong position to detect diseases outbreaks early.*

Public health adaptation to climate change plan

Zimbabwe has already developed a National Climate Change Response Strategy and a Climate

Policy which seek to address climate change issues and contribute to climate resilience in the country. The WHO developed a National Adaptation Plan process guidance document which explains how to plan for building climate resilient health systems at country level. The Zimbabwe National Health Strategy 2016-2020 points to the need to develop a Public Health Adaptation to Climate Change Plan. Therefore:

- *It is recommended that Zimbabwe solicit the support of UNFCCC and other relevant partners (e.g. UNDP, UN Environment, WHO, development agencies and NGOs), to utilise the WHO National Adaptation Process Guidelines to start planning for the country's mid and long term priorities for building resilience to climate change in the health sector. The initial steps are to develop a Zimbabwe National Health Adaptation to Climate Change Plan and Strategy, building on Zimbabwe's National Climate Change Response Strategy.*

Research and development; education and awareness and access to ICT

Research and development

Universities and agricultural institutions play an important role in meeting the demand for climate change and agricultural research, education and training. Therefore:

- *Financial support should be provided for research in areas that inform adaptive strategies to produce knowledge products on which climate resilience and food security can be anchored.*

Further studies on climate change health linkages

Current knowledge on climate change health issues is still limited in many areas. For example: the contribution of short term climate variability to disease incidence needs further research; early warning systems for prediction of disease outbreaks, heatwaves and other extreme events need to be developed further and validated; and there is a need for more research into the adaptive capacity of the country, taking into consideration that frequent extreme events may lead over time, to weakened adaptive capacity. Therefore:

- *It is recommended that areas for further studies to understand and predict the impacts of climate change on health, be identified systematically and research commissioned. Further studies related to water management and climate change should be undertaken also.*

Technical issues that need to be addressed

These are to help improve Government's ability to understand and adapt to climate change impacts on the water sector. Therefore:

- *Improved monitoring of climate, rivers flows and groundwater levels is needed, to provide the factual basis for understanding the growing impacts of climate change on Zimbabwe's water resources.*
- *Scientific studies should be undertaken into groundwater characteristics (such as recharge rates and water dependent ecosystems) and models of surface water and groundwater flows that would help predict climate change impacts on water resources and explore adaptation options need to be developed.*
- *There is a need to undertake a more thorough analysis of climate change impacts on water resources.*

Climate change education

Education is a powerful vehicle for imparting new ideas especially to young people (Government of Zimbabwe, 2015). It can be used to carry climate messages to create a new generation of youth whose behaviour is climate change compliant. As noted in Chapter 6 of this report, the network of schools in Zimbabwe is so extensive that most young people can be reached through the formal education system. Thus, all school going children could receive climate change education at primary level and, in that way, create the sustainable behavioural change needed to adapt to and to mitigate climate change (Government of Zimbabwe, 2015).

There has been a general view that the content of the curricula used in both primary and secondary schools does not adequately cover climate change. The same sentiments have been expressed with regard to teacher training insti-

tutions. This is because climate change has been taught as a small component of the curriculum in such subjects as Social Studies, Environmental Studies and Agriculture at primary level, and Geography, Agriculture and Civic Education at secondary level.

In its efforts to address this deficiency the Ministry of Environment, Water and Climate has engaged the Ministry of Primary and Secondary Education to develop new curricula and materials for primary and secondary schools that strengthen existing teaching materials on climate change. It is expected that, when fully developed, the materials in the new curricula will be able to be used from the early childhood development level up to 'A' Level and tertiary education. Therefore:

- *It is recommended that in-service training for teachers already in the system be undertaken to strengthen their climate change knowledge. This also applies to national extension officers (e.g. Agricultural Extension, Environmental Management Agency, Forestry Commission), agro-service providers, and personnel of civil society organisations, to enable them to implement action plans for climate change adaptation with communities.*
- *It is also recommended that the communication strategy for raising awareness on climate change be implemented.*

Use of integrated approaches

At the national consultations, both community members and policy makers reiterated the importance of using responses for adaptation that include scientific and indigenous technical knowledge systems to anticipate climate related patterns and adaptive measures. The Paris Agreement recognises the value of indigenous knowledge, stating that action to adapt to climate change “should be based on the best available science and, as appropriate, traditional knowledge, knowledge of indigenous peoples and local knowledge systems” (IIED, 2017).

Evidence from the Smallholder for Resilience multi-country project shows that new innovations based on traditional knowledge and crops of indigenous communities in Peru, China, In-

dia and Kenya, are not only helping to maintain yields but actually increasing production (IIED, 2017). Therefore:

- *It is recommended that, as a national day be set aside for indigenous knowledge appreciation and sharing of ideas. Alternatively, a programme could be introduced for indigenous knowledge on climate change appreciation. This would demystify traditional knowledge and encourage the co-production of modern and traditional scientific knowledge in building climate resilient measures that could help individuals and communities to adapt to the impacts of climate change.*

Access to information, communication and technology

Noting the masculine bias toward access to information, employment opportunities, decision making processes and institution building, it is necessary to establish formal and informal dialogue platforms and structures, and to encourage women and young people to be the drivers of these platforms. Zimbabwe should take advantage of the growing role of ICT platforms as a means of gender and age sensitive information sharing, particularly among the 15 to 34 years age group.

Platforms such as U-Report Poll should be used as a means of information sharing and dissemination of climate data, particularly amongst those up to 35 years. Information about weather, advice on seeds or pesticides and herbicides, updates on crop and livestock diseases, or soil and water analysis could potentially be relayed by leveraging ICT. For example, Econet mobile wireless network offers a product called Eco Farmer that is geared towards providing weather related information to farmers. In 2015 this platform served close to 300 000 farmers across Zimbabwe (Chirauro, 2015). Therefore:

- Similar ICT platforms should be created for spreading weather and climate forecasts especially to rural people to inform their farming activities and for early warning of pending weather related risks.

Other adaptation enablers

Value addition

Value addition should be given top priority as an adaptation measure, especially for agricultural projects. This entails the processing and drying of horticultural products such as vegetables, pureeing of fruits for export, and branding and packing of agricultural produce such as small grains (millet, sorghum, rapoko), which have gained a niche market. Value addition generally provides for increased income streams and counters the loss of income caused by post-harvest losses. Therefore:

- *Employment opportunities and economic growth, particularly in rural areas, are some of the positive trickle down effects associated with value addition of agricultural and timber and non-timber forest commodities.*

Establishing market linkages and creating business partnerships

There is a need to strengthen existing markets in rural economies, develop service markets, and facilitate public-private-community partnerships with local, regional and international companies. Therefore:

- *Farmers need to be linked to markets, as this will diversify their income earning portfolios, which will then increase their resilience to climate related shocks and stresses.*

Conclusions

Climate change poses serious threats to human development in Zimbabwe, as it does to all other countries throughout the world. However, developing countries such as Zimbabwe, are much less well equipped to address the impacts of climate change on human development. This report has highlighted the threats of climate change to human development, focusing on food security, livelihoods, health and education in Zimbabwe. It has also highlighted the measures that Government has put in place nationally, that address these impacts of climate change on human development. Some of the measures, such as conventions and agreements on climate change and those on sustainable development cascade from international platforms addressing these issues to national and local levels.

This chapter has presented recommendations which complement policies and programmes that Government has already put in place and/or is implementing that reduce the negative impacts of climate change on human development. These recommendations arise from the consultations that were conducted in the production of this report as well as from the analysis conducted, taking into consideration experiences of other countries and best practice from the literature reviewed. Implementation of these recommendations will go a long way towards strengthening the country's resilience and its capacity to adapt to the impacts of climate change on human development.

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ANNEXES

Annex 1

Zimbabwe Human Development Index (HDI) Computation

$$\text{Dimension Index} = (\text{Actual Value} - \text{Minimum Value}) / (\text{Maximum Value} - \text{Minimum Value})$$

$$\text{HDI} = (\text{Health Index} \times \text{Education Index} \times \text{Income Index})^{1/3}$$

$$\text{Life Expectancy at Birth} = 60.7 \text{ years}$$

$$\text{Mean Years of Schooling} = 7.7 \text{ years}$$

$$\text{Expected Years of Schooling} = 10.3 \text{ years}$$

$$\text{GNI per capita (PPP)} = \$1\,588 \text{ (2015 est.)}$$

$$\text{(i) HEALTH Index} = 60.7 - 20 / (85 - 20) = 0.627$$

$$\text{(ii) Mean Years of Schooling Index} = 7.7 - 0 / (15 - 0) = 0.513$$

$$\text{(iii) Expected Years of Schooling} = 10.3 / 18 = 0.572$$

$$\text{(iv) EDUCATION Index} = (0.513 + 0.572) / 2 = 0.543$$

$$\begin{aligned} \text{(v) INCOME Index} &= (\ln 1588 - \ln 100) / (\ln 750000 - \ln 100) \\ &= (7.6497 - 4.6052) / (11.2252 - 4.6052) \\ &= 0.4177 \end{aligned}$$

$$\begin{aligned} \text{(vii) HDI} &= (0.627 \times 0.543 \times 0.4177)^{1/3} \\ &= 0.522 \end{aligned}$$

(this figure is slightly higher than the HDRO figure of 0.516 due to different life expectancies used; 59.2 years (HDRO) and 60.7 years (ZIMSTAT) respectively).

Source: UNDP Country Note (2016)

Annex 2
Average Annual Income by Province, 2012 (US\$)

Bulawayo	2 359
Harare	2 379
Matabeleland South	1 435
Matabeleland North	1 049
Midlands	1 065
Mashonaland East	967
Mashonaland West	1 531
Manicaland	779
Masvingo	881
Mashonaland Central	895

Source: ZIMSTAT (2013) Poverty, Income, Consumption and Expenditure Survey 2011/2012 Report

Annex 3 Zimbabwe Gender Development Index (GDI) Computation

	FEMALE	MALE	BOTH
Life Expectancy	64.0	57.4	60.7
Mean Years of Schooling	7.3	8.2	
Expected Years of Schooling	10.2	10.5	
GNP per Capita (PPP\$)	1360	1822	

Life Expectancy Female Index	$= (64.0 - 22.5) / (87.5 - 22.5)$ $= 0.6385$
Life Expectancy Male Index	$= (57.4 - 17.7) / (82.5 - 17.5)$ $= 0.6139$
Female Education Index	$= (7.3/15 + 10.2/18) / 2$ $= 0.5267$
Male Education Index	$= (8.2/15 + 10.5/18) / 2$ $= 0.5650$
Female Income Index	$= (\ln 1360 - \ln 100) / (\ln 75000 - \ln 100)$ $= \ln 13.6 / \ln 750$ $= 0.3943$
Male Income Index	$= \ln 18.22 / \ln 750$ $= 0.4821$
Female HDI	$= (0.6385 \times 0.5267 \times 0.3943)^{1/3}$ $= 0.5099$
Male HDI	$= (0.6139 \times 0.5650 \times 0.4821)^{1/3}$ $= 0.5510$
GDI	$= 0.5099 / 0.5510$ $= 0.925$

Source: UNDP Country Note (2016)

Annex 4

Zimbabwe's GDI for 2015 relative to Selected Countries and Groups

	Life expectancy at birth		Expected years of schooling		Mean years of schooling		GNI per capita		HDI values		F-M ratio
	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	GDI Value
Zimbabwe	60.7	57.7	10.2	10.5	7.3	8.2	1.360	1.822	0.510	0.551	0.925
Kenya	64.1	60.3	10.8	11.4	5.7	7.0	2.357	3.405	0.531	0.577	0.919
Lesotho	50.0	49.9	11.2	10.3	7.0	5.3	2.631	4.020	0.485	0.505	0.962
Sub-Saharan Africa	60.2	57.6	9.1	10.3	4.5	6.3	2.637	4.165	0.488	0.557	0.877
Low HDI	60.7	58.0	8.5	10.0	3.6	5.6	1.950	3.365	0.455	0.536	0.849

Source: UNDP Country Report (2016)

Annex 5

Zimbabwe's GII for 2015 relative to Selected Countries and Groups

	GII value	GII rank	Maternal mortality ratio	Adolescent birth rate	Female seats in parliament (%)	Population with at least some secondary education (%)		Labour force participation rate (%)	
						Female	Male	Female	Male
Zimbabwe	0.540	126	443	109.7	35.1	51.9	64.7	77.8	87.3
Kenya	0.565	135	510	90.9	20.8	27.8	34.1	62.1	72.1
Lesotho	0.549	132	487	92.7	24.8	23.6	22.5	59.2	73.9
Sub-Saharan Africa	0.572	-	551	103.0	23.3	25.3	33.9	64.9	76.1
Low HDI	0.590	-	553	101.8	22.0	14.8	25.9	60.3	77.1

Maternal Mortality Ratio is expressed in number of deaths per 100 000 live births and Adolescent Birth Rate is expressed in number of births per 1 000 women aged 15-19 years.

Source: UNDP Human Development Report (2016)

Annex 6

Multidimensional Poverty across Sub-National Regions

Region	MPI (H*A)	H Incidence k≥33.3 (%)	A Intensity	Percentage of Population				
				Vulnerable to Poverty K= 20-33%	In severe Poverty k≥50%	Destitute	Inequality among the MPI Poor	Population Share
Zimbabwe	0.127	29.7	42.7	29.0	7.9	7.4	0.092	100.0
Urban	0.019	4.8	39.9	12.0	0.7	-	-	27.6
Rural	0.168	39.2	42.8	35.5	10.7	-	-	72.4
Bulawayo	0.012	2.7	43.8	10.5	0.8	0.1	0.149	6.8
Harare	0.024	6.1	39.5	15.0	0.8	0.6	0.036	8.9
Mashonaland East	0.090	22.2	40.8	30.6	4.5	4.8	0.074	11.1
Manicaland	0.128	29.5	43.3	31.4	7.7	6.1	0.103	12.3
Mashonaland West	0.133	31.7	42.1	32.0	7.4	7.9	0.084	13.1
Midlands	0.145	33.1	43.7	27.8	10.2	10.9	0.113	12.7
Matabeleland South	0.151	34.8	43.2	33.0	10.1	7.9	0.089	8.3
Masvingo	0.175	40.4	43.4	36.0	12.1	10.9	0.084	11.7
Mashonaland Central	0.181	41.2	43.8	31.4	12.9	8.8	0.106	5.4
Matabeleland North	0.202	48.5	41.6	34.3	12.0	12.8	0.083	9.7

Source: OHPI Country Briefing, December 2016

Annex 7

Environmental Performance Index (EPI) For Selected SADC Countries, 2016

Country	Score	10-year change (%)
Angola	28.69	9.09
Botswana	47.60	7.18
DRC	39.44	18.33
Lesotho	20.81	4.36
Malawi	40.06	7.72
Mozambique	29.87	1.49
South Africa	53.51	6.04
Swaziland	37.35	6.96
Tanzania	36.19	1.15
Zimbabwe	49.55	4.05

EPI is constructed through the calculation and aggregation of 20 indicators reflecting national-level environmental data based on Environmental Health Ecosystem Vitality.

Source: International Earth Science Information Network (CIESIN, Columbia University/ World Economic Forum (2016)



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