Mapping of Selected Hazards Affecting Rural Livelihoods in Zimbabwe

A District and Ward Analysis

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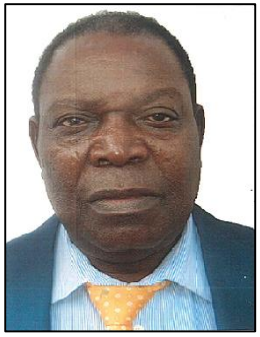
To obtain copies of this publication, please contact:

UNDP Zimbabwe,
Zimbabwe Resilience Building Fund (ZRBF) Management Unit;
Arundel Office Park, Block 7,
Norfolk Rd, Mt. Pleasant,
Harare, Zimbabwe
+263 4 338836-44

Foreword



In 2015, the Government of Zimbabwe, led by the Ministry of Agriculture, Mechanisation and Irrigation Development (MAMID) with technical and financial support from United Nations Development Programme (UNDP), European Union (EU) and UK's Department for International Development (DfID), embarked on laying the groundwork for a resilience-building initiative. This initiative seeks to ensure that development programmes are designed and based on evidence concerning the shocks and stresses that affect the well-being of communities in Zimbabwe, as well as their capacities to withstand and recover from these shocks. This initiative follows a series of conversations, meetings and workshops with the active participation from Government colleagues, UN agencies, NGOs and academia to define a strategic framework for resilience in Zimbabwe.

The building of an evidence base seeks to deepen the understanding of the most important hazards affecting rural livelihoods in Zimbabwe, as well as potential pathways to strengthen the resilience capacities of our communities. The mapping of key hazards has been developed to form a basis for decision-making and the targeting of programmes, as well as mainstreaming disaster risk reduction in planning processes.

I would like to take this opportunity to thank all Ministries and agencies for their helpful participation in the mapping, and particularly UNDP for their continuous support and technical assistance in identifying and supporting rural communities in Zimbabwe. I urge all Ministries, public institutions and other development partner agencies to consider and apply the Mapping of Selected Hazards Affecting Rural Livelihoods in Zimbabwe to their future plans and programmes. We trust that these efforts will help the Government of Zimbabwe and its development partners in their joint efforts to support the development of resilient communities in rural Zimbabwe.

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R.J. Chitsiko
Permanent Secretary in the Ministry of Agriculture, Mechanisation and Irrigation Development

List of Acronyms

AGRITEX	Agricultural Technical and Extension Services
DLVS	Department of Livestock and Veterinary Services
DRR	Disaster Risk Reduction
EU	European Union
FAO	Food and Agriculture Organization
FMD	Foot & Mouth Disease
GDP	Gross Domestic Product
GIS	Geographical Information Systems
LGB	Larger Grain Borer
NAC	National AIDS Council
NEWU	National Early Warning Unit
NGO	Non-Governmental Organisation
NPA	Norwegian People's Aid
SPI	Standardised Precipitation Index
UNAIDS	Joint United Nations Programme on HIV/AIDS
UNDP	United Nations Development Programme
WFP	World Food Programme
WRSI	Water Requirement Satisfaction Index
ZIMVAC	Zimbabwe Vulnerability Assessment Committee
ZINWA	Zimbabwe National Water Authority

Table of Contents

Table of Figures

I. Introduction

1.1 Background of the Hazard Mapping

The Government of Zimbabwe, led by the Ministry of Agriculture, Mechanisation and Irrigation Development (MAMID) with technical and financial support from United Nations Development Programme (UNDP), European Union (EU) and UK's Department for International Development (DfID), have embarked on 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. Zimbabwe has experienced a number of these hazards, especially in the past three decades. These include but are not limited to, droughts, mid-season dry spells, floods and cyclones, crop pests and diseases and a number of health-related shocks.

As a first step toward designing resilience programming for Zimbabwe a joint analysis was conducted to establish the multi-sectoral factors affecting resilience of at-risk communities, including characterizing and mapping of key hazards.

The mapping of hazards was undertaken as a way of forming a knowledge base for building resilience among rural communities. A thorough understanding of these shocks will assist in the design of appropriate context specific resilience-building strategies.

1.2 Objectives and scope

The aim of the Mapping of Hazards is to deepen and broaden an understanding of shocks in Zimbabwe and how they impact upon the resilience of affected populations.

The work on mapping hazards is intended to:

- elaborate on the existing national hazard profile,
- estimate the number of people at risk to different shocks, and
- identify areas experiencing frequent and multiple risks.

1.3 Beneficiaries and users

The Hazard Mapping is intended for wide range of stakeholders and potential users. For key decision and policymakers the mapping will enable them to ensure that both policies and decisions are based on robust hazard information. The mapping may benefit donors and development partners by providing important and evidence-based information which can support their respective project formulation and designs as well as the targeting of development interventions. It can also contribute to ensuring that informed planning processes take place within government institutions, non-government organizations and the private sector. In addition, the academia is one of the expected beneficiaries and users of the mapping, specifically as it provides a basis and reference for further research.

1.4 What are Hazards?

Hazards are defined as anything that poses danger or threat to humans. They can be divided into natural and anthropogenic hazards. Understanding the severity of hazards is usually essential for risk analysis and planning for resilience-building as there is evidence of the linkages between hazards and the resilience of rural communities[1]. Additionally, understanding the spatial distribution of the effect of hazards unravels part of the reasons why communities and households need to build resilience.

1.5 Methodology

The hazards which mostly affect rural livelihoods in Zimbabwe were identified through a series of meetings with stakeholders in government, non-governmental and private sectors. The consultation process identified nine hazards as the ones mainly affecting rural livelihoods in Zimbabwe. These are: 1) drought, 2) mid-season dry spells, 3) floods,4) landmines, 5) cereal and livestock price changes, 6) crop pests and diseases, 7) animal diseases, 8) HIV & AIDS and 9) diarrhoeal diseases. The analysis of the spatial distribution and convergence of the selected hazards was completed in order to gain increased insight into their potential combined effect on livelihoods in rural wards of Zimbabwe.

All the analytical steps of the mapping of hazards were made using a Geographical Information System (GIS), a tool widely used for hazard mapping and risk modelling[2].

1.6 Limitations

Although the hazard mapping was successfully completed, the following limitations were observed:

- Access to data was challenging due to department specific data access policies.
- Different reporting periods among the different sector data providers.
- Different spatial units of reporting among the different sector data provider.

1.7 Data sources

This study made use of secondary data from the mandated government departments as well as from other organisations which collect primary data for various programmes.

Every hazard amongst those nine selected falls under the mandate of at least one government department. Table 1 below shows the relevant departments that were consulted.

n

Table 1: Data Sources

Hazard	Parameters used	Source	Duration
Drought	Standardised Precipitation Index (SPI) & Water Requirement Satisfaction Index (WRSI)	The Meteorological Services Department, WFP	1971-2014
Mid-season dry spells	Number of dry days within a season	AGRITEX	2010-2015
Flooding	Flood prone wards	Zimbabwe National Water Authority (ZINWA)	10 year return period
Landmines	Wards affected by landmines	Halo Trust, NPA	Current state
HIV & AIDS	HIV prevalence as %	National AIDS Council (NAC), UNAIDS	2013 estimates
Cereal and Livestock prices	Inter-seasonal prices changes (June and October prices) Prices per kg and beast respectively	AGRITEX- National Early Warning Unit (NEWU)	2010-2014
Crop pests and diseases	Areas affected by Armyworm, Large grain borer and Quelea birds	AGRITEX	2010-2015
Animal diseases	Reported cases of Newcastle, Heart water, Foot and Mouth and Anthrax	Department of Livestock and Veterinary Services	2014-2015
Diarrhoeal diseases	Reported cases of cholera, dysentery, typhoid and common diarrheal	Ministry of Health and Child Care	2008-2015

1.8 Data analysis and visualisation

The data from the various sources underwent a standard data cleaning processes followed by mapping of each individual hazard based on the SMUG (Seriousness, Manageability, Urgency and Growth) hazard priority system[3]. The method was adapted to allow classification of hazards based on quantitative and qualitative data obtained from the government departments and development partners. The four SMUG concepts were considered in classifying the hazards into low, medium, medium high and high classes represented by values 0-3 or 1-4 in some cases. Experts from the data source departments were consulted during the pre-processing and mapping stages to avoid any loss of crucial information and misclassification. Some hazards such as flooding and drought had fewer classes than others hence normalisation was conducted to fit all hazards into a single scale. The following equation was used for normalisation resulting in all hazards having values ranging between 0 and 1:

$$H_n = \sum^{n} \frac{H_i - H_o}{H_h - H_o}$$

Where H_n – normalised hazard value

H_i – raw hazard value

H_h – highest hazard value

H_o – lowest hazard value

The nine hazards were then weighted using the livelihood zones developed by ZIMVAC in 2010[4] (see Figure 1).

Hazards were ranked based on their impact on the population in each one of the 25 rural livelihood zones. Ranking was done from 1-9 with 9 allocated to the shock affecting each zone most. The allocated values in ranking were converted into percentage weights using the following formula (adapted from Markovic and Urosevic (2011).

$$w_i = \frac{R_i}{\sum_i^n R_i}$$

Where w_i represent the weight of the i^{th} shock

R_i is the rank for the i^{th} shock and

$\sum_i^n R_i$ is the sum of all ranks.

The weights were then multiplied by the normalised values of each shock in the respective livelihood zones resulting in the weighted values for drought, mid-season dry spells, floods, HIV & AIDS, landmines, cereal and livestock prices, crops pests and diseases, livestock and diarrhoeal diseases.

Convergence of shocks was explored by calculating the sum of weighted values of the nine hazards. The values ranged between 0 and 1 just the same as the normalised values. The final hazard map was classified into four classes of Low, Medium, Medium high and High (Figure 11). The diagram below (Figure 2) summarises the entire methodology used in this exercise.

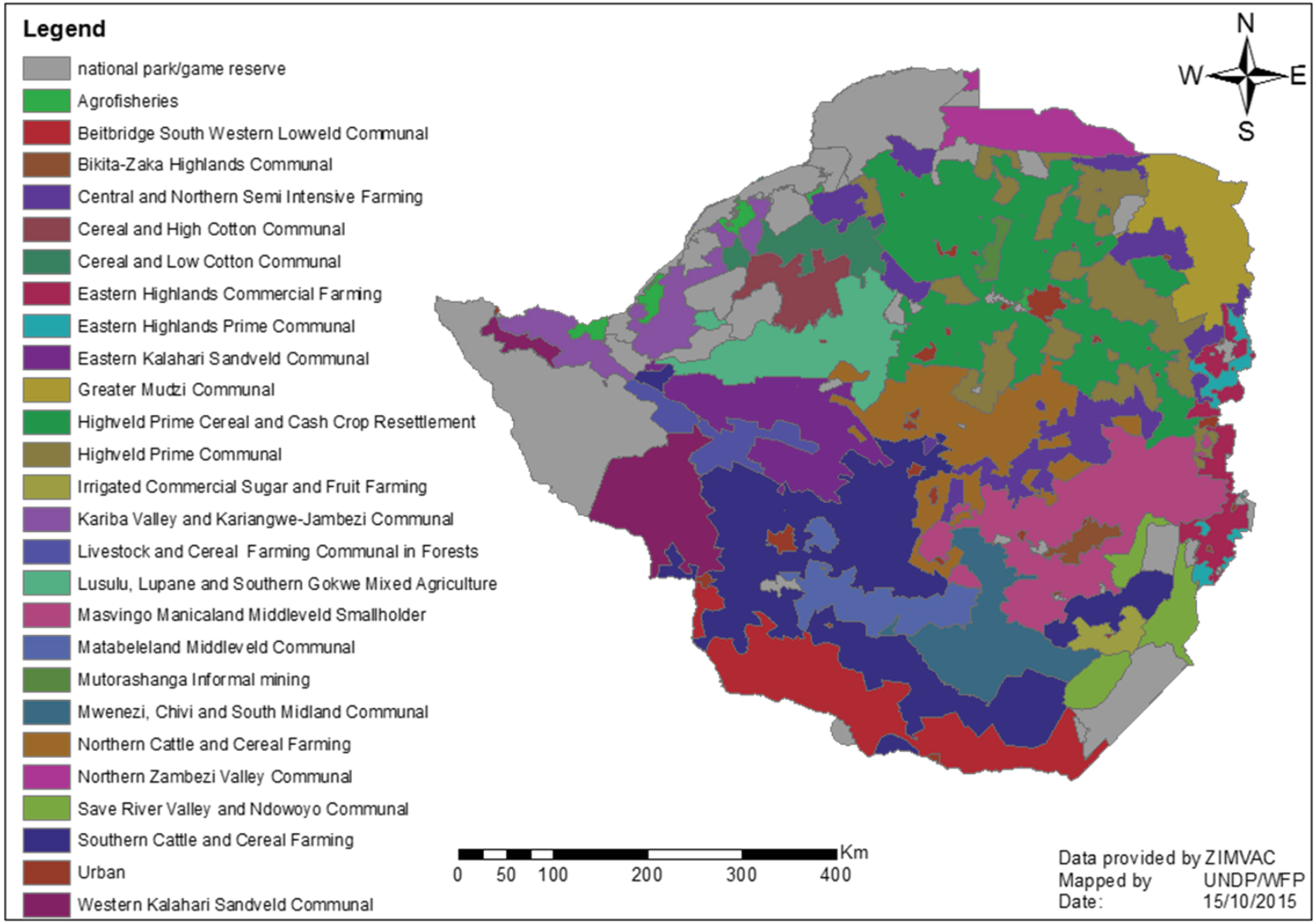


Figure 1: The Zimbabwe Livelihood Zones

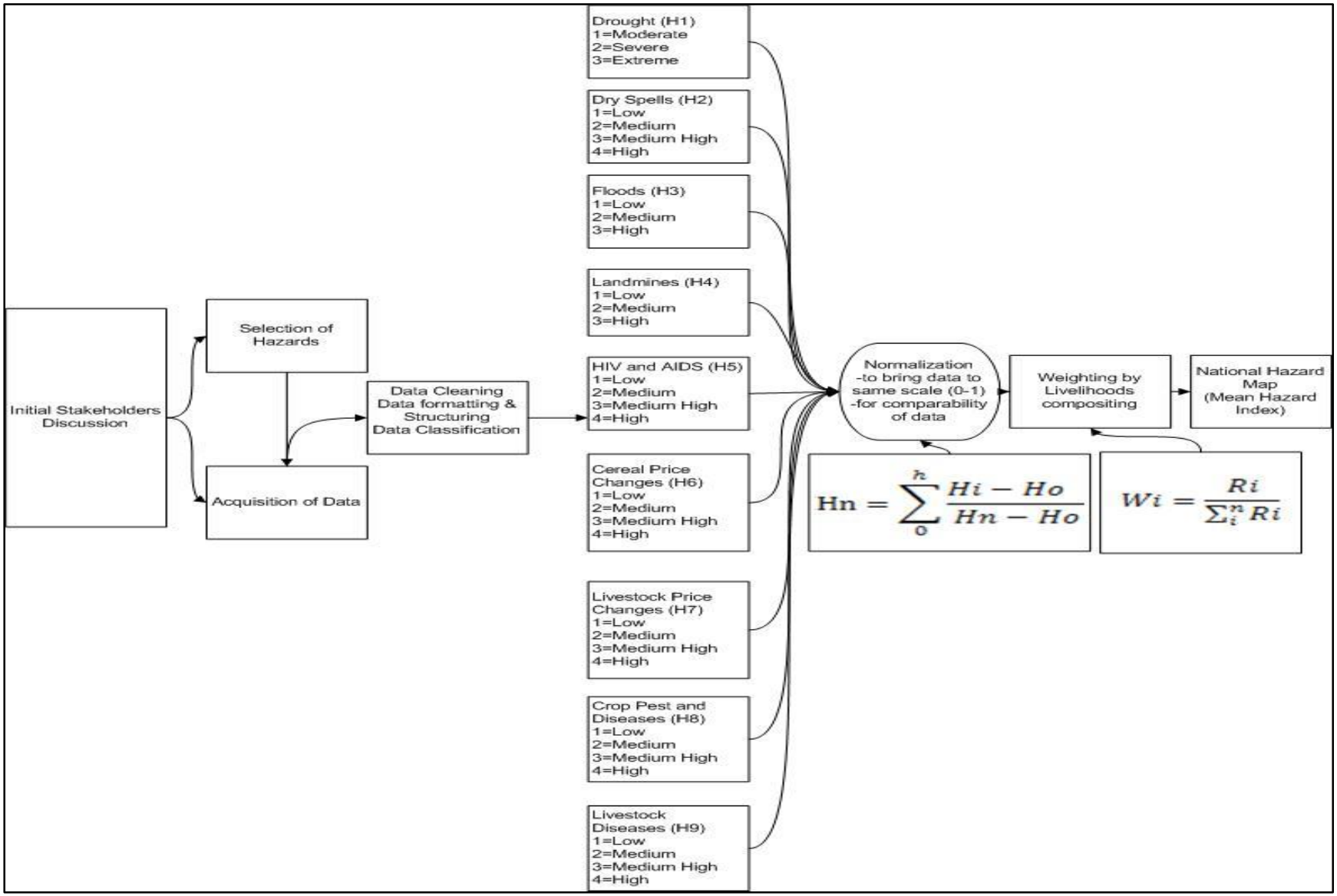


Figure 2: Methodology framework for mapping of selected hazard affecting rural livelihoods in Zimbabwe

1.9 Validation


Validation of all the mapping products and the methodology in this document was undertaken through

- bilateral meetings with the data providers,
- a workshop with technical staff from all the data provider departments,
- Presentations and discussions with
    - UN partners in the UN Resilience and DRM task force,
    - Various stakeholders at the National Civil Protection Committee Meeting, and
- A full-day multi stakeholder validation workshop on the 3rd of September 2015.

II. Major Shocks and Hazards in Zimbabwe

Agriculture is the most important economic sector in Zimbabwe, contributing to about 70% of the employment and 13% of the annual GDP.[5] However, recent productivity has been decreasing, particularly for small grains and maize crops. Previously controlled prices of maize and other commodities led commercial farmers to switch to non-price controlled cash crops, such as tobacco and cotton[6]. There are also a number of factors causing low agricultural productivity in rural areas which include lack of both support services and credit as well as limited access to inputs such as seeds and fertilizer.[7] Agriculture in Zimbabwe is particularly vulnerable to natural disasters and drought which occur regularly and are expected to increase in coming years due to climate change.

Over the last few decades, Zimbabwe has experienced hotter days and an increasingly variable rainfall, with little change in annual rainfall but with more extreme events (i.e., longer, more frequent dry spells and fewer, more intense rain days). Studies have found that climate change has caused some regional shifts to drier agro-ecological zones[8] which could impact livelihoods, especially where people have limited resources and information with which to adapt to new conditions. Small-scale farmers have already been affected by changing climate conditions over the last few decades and these climate trends are predicted to continue.[9] Policies such as Zimbabwe Agriculture Investment Plan (2013-2017) are designed to increase "production, productivity and competitiveness of Zimbabwean agriculture."[10] However barriers such as limited resources, technical capacity and access to information have constrained Zimbabwe's ability to implement climate change adaptation measures which may be essential to creating long-term sustainability in agriculture and food security.[11]

Frequent natural disasters such as droughts and floods have further exacerbated poverty levels since the predominant economic activity, rain-fed agriculture, is vulnerable to climatic variability. The most common hazards affecting rural Zimbabwe are drought and mid-season dry spells. Drought has caused six of the ten worst natural disasters between 1991 and 2013.[12] Much of Zimbabwe is comprised of semi-arid agro-ecological regions IV and V, characterised by "low and erratic rainfalls and poor soils."[13] Given Zimbabwe's heavy reliance on rain-fed agriculture and livestock, drought has serious implications on food security and livelihoods. Drought also impacts on water availability for domestic and industrial use and power generation affecting cities and non-agriculture sectors.[14]

Floods occur more frequently, usually every year, and often as a result of cyclones. Recent records also show an increase in violent storms with hail and strong winds which damage infrastructure, property and crops and cause loss of life (i.e., human and livestock). Floods tend to occur in the southern and northern low lying areas of Zimbabwe, in the paths of cyclones, in between river confluences and downstream of major dams. The frequency of floods and droughts is increasing in Zimbabwe as a result of climate change.

The prevalence of landmines which were planted during the liberation war of the 1970s, remain a threat to rural farming-based livelihoods, is. Although they are not common in most parts of the country, the north-eastern part of Zimbabwe still has a recorded 187 minefields[15] and land mines are a serious threat to human and animal life in these areas. No economic or livelihood activity can be carried out in mining fields hence communities are deprived of economic and livelihood opportunities in these areas.

Another major shock affecting Zimbabwe is the HIV/AIDS epidemic. Although progress has been made in reducing the problem, Zimbabwe still has one of the highest HIV prevalence rates in the world at 15%.[16] Prevalence of HIV is slightly higher in urban areas compared to rural areas and among people ages 15-24. HIV prevalence is 1.5 times higher among women than men. Over 1.2 million adults and children were living with HIV/AIDS in 2011, and HIV-related deaths have led to 25% of children being vulnerable or orphaned.[17] Other diseases such as tuberculosis, malaria and cholera are also prevalent in Zimbabwe and are exacerbated by HIV/AIDS, climate change and lack of access to safe water and sanitation services.

Erratic rains, drought, mid-season dry spells and other negative effects on agriculture combine to cause crop and livestock price changes. The prices changes are often a threat to livelihoods since they lead to unaffordability of food when they are high and a reduction in income when they are low. Another set of hazards of note are the crop pest and diseases due to their effect of reducing yield in affected areas.

Besides lack of pastures in certain areas, some districts have experienced more animal disease outbreaks in the past 10 years compared to the period 1980-2000. The most common diseases among domesticated herbivorous animals include lumpy skin, rabies, diarrhoea, heartwater, anthrax, and foot and mouth. For poultry, newcastle and coccidiosis are the major ones identified by The Veterinary Services .This is based on the areas affected in any given year as well as the severity of damage. Rural Zimbabwe remain vulnerable to these diseases due to limited resources[18] for coordination, vaccination and awareness campaigns. Humans are also at risk since many do consume meat from animals which die of “unknown causes”. In most parts of the country loss of animals due to diseases is a major setback to livelihoods hence the inclusion of diseases as a hazard.

The last hazard nominated by the stakeholders for inclusion in this publication are the diarrhoeal diseases. The records reveal a number of outbreaks every year which affect production and in some cases lead to mortality. Diarrhoeal diseases include common diarrhoea, typhoid, dysentery and cholera. The main causes of diarrhoeal diseases are limited water and sanitation facilities. One of the worst outbreaks occurred in 2008 when over 11 000 were affected by cholera[19] countrywide. The following chapters illustrate the spatial distribution and convergence of the selected nine hazards at ward and district levels.

III. Hazard Mapping Results

Results of the hazards mapping process are shown in this section by first presenting the maps for individual hazards, the convergence map for all hazards and then four examples of the district level maps.

3.1 Drought

Drought is defined as a deficiency in precipitation over an extended period, usually a season or more, resulting in a water shortage causing adverse impacts on vegetation, animals, and/or people. Drought is a recurrent feature of climate change that occurs in virtually all climate zones, from very wet to very dry.

For the mapping of drought as a hazard, the meteorological (derived from the SPI) and agricultural drought (calculated from the Water Requirement Satisfaction Index (WRSI) for maize as a proxy for drought) were combined. For the meteorological drought, the Standardised Precipitation Index (SPI) for the years between 1981 and 2014 were calculated and used to determine whether these respective years were drought years or not. SPI was calculated from rainfall data from 44 stations across the country. SPI reflects the probability of recording a given amount of precipitation. The probabilities are standardized so that an index of zero indicates the median precipitation amount per year. SPI is negative for drought while it is positive for wet conditions. The meteorological drought map used the following classes: Mild (12 -15 drought years), Moderate (16-18 drought years) and Severe (19-21 drought years). This was over the 33 year period.

The mapping of agricultural drought was based on a WFP analysis using 10 years (2004 to 2014) Crop WRSI data from SADC and FEWSNET as a proxy for drought. This was validated with OCHA analysis based on frequency and magnitude/impact of experienced drought cases to map drought prone areas. The drought map considers the frequency and magnitude/impact of drought in a specific area. The frequency is defined as how often the phenomenon occurs in an area over a ten-year period.

Meteorological and agricultural drought were combined and mapped using the following three point scale:

Mild:	wards ranked mild for both droughts
Moderate:	wards ranked at moderate for one or both droughts
Severe:	wards ranked severe for both droughts

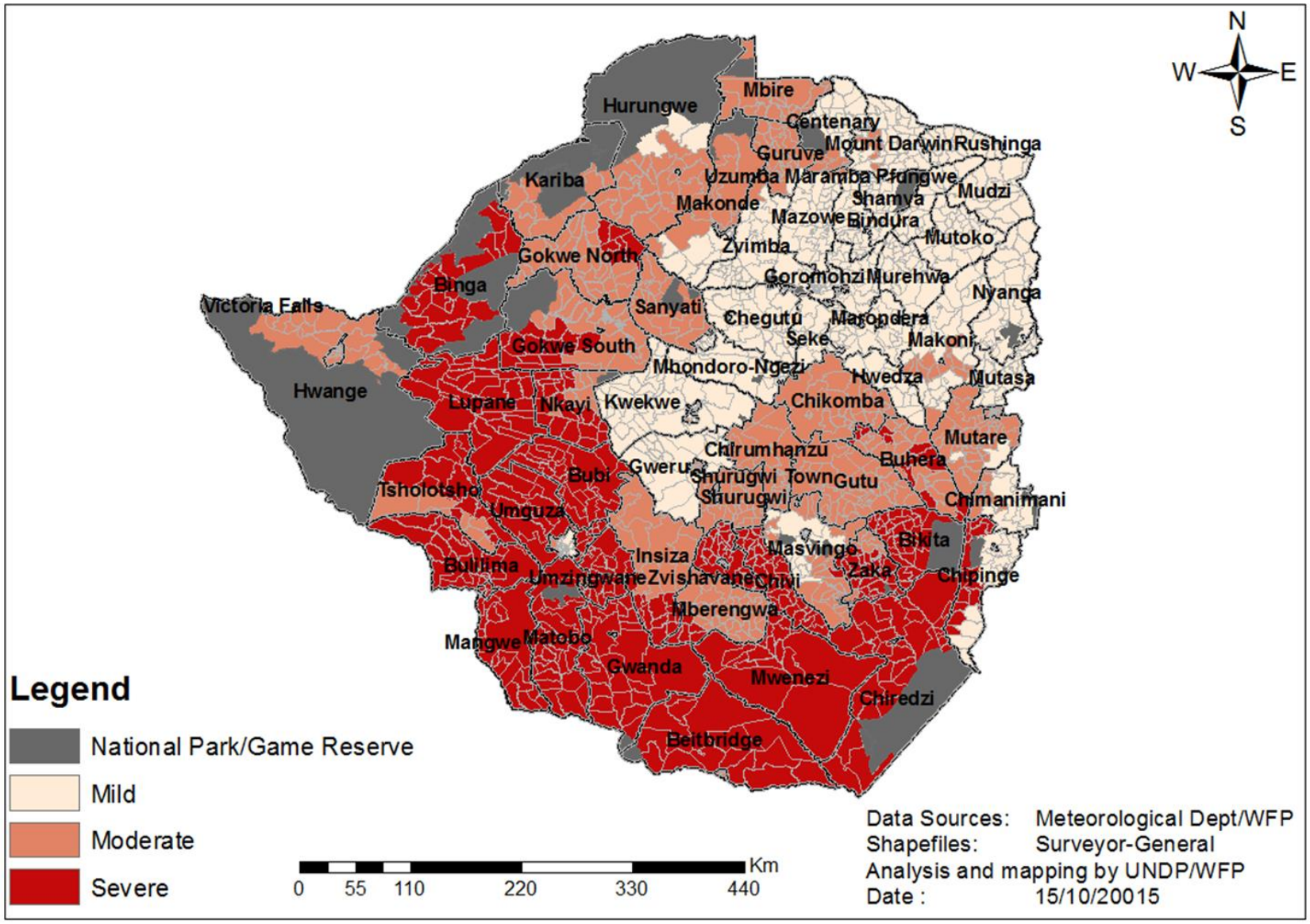


Figure 1: Map showing drought proneness in Zimbabwe

3.2 Mid-season dry spells

Dry spells are defined as prolonged periods of dry weather of at least ten consecutive days that happen after the onset of the wet season. The mid-season dry spell is described in terms of its length expressed in days and the frequency of occurrence. Its impact is directly related to the length and time of occurrence and therefore scores can be treated as one combined score.

A 5-point scale was adopted after consulting with Agronomists and Crop Science Specialists at the AGRITEX Headquarters in Harare.

None:	0 -10 days
Low:	11 -14 days
Medium:	15 -21 days
Medium high:	22 -31 days
High:	> 32 days

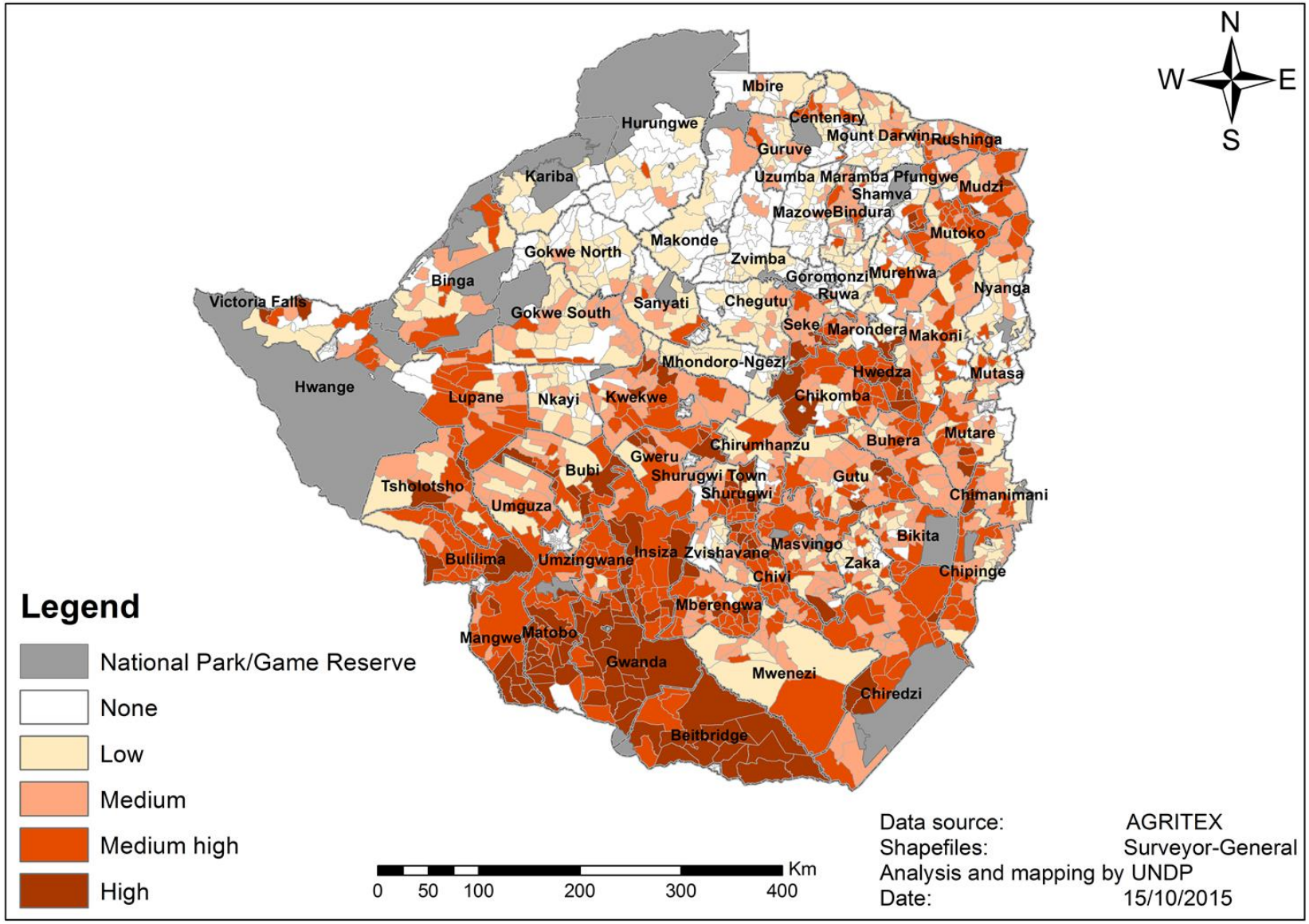


Figure 2: Map showing the mid-season dry spells in Zimbabwe

3.3 Floods

Flooding is defined as an overflow of water onto land that is normally dry. Flooding occurs due to heavy rains, tropical cyclones or rising dam levels that results in the destruction of crops and structures such as homes and other infrastructures.

The scoring of the flood prone map of Zimbabwe was based on recorded frequency of floods over a ten year period based on data from the Zimbabwe National Water Authority (ZINWA). The scoring was as follows:

None: No recorded incidences of flooding

Low: 1 to 3 incidences of flooding

Medium: 3 to 5 incidences of flooding

High: > 5 incidences of flooding

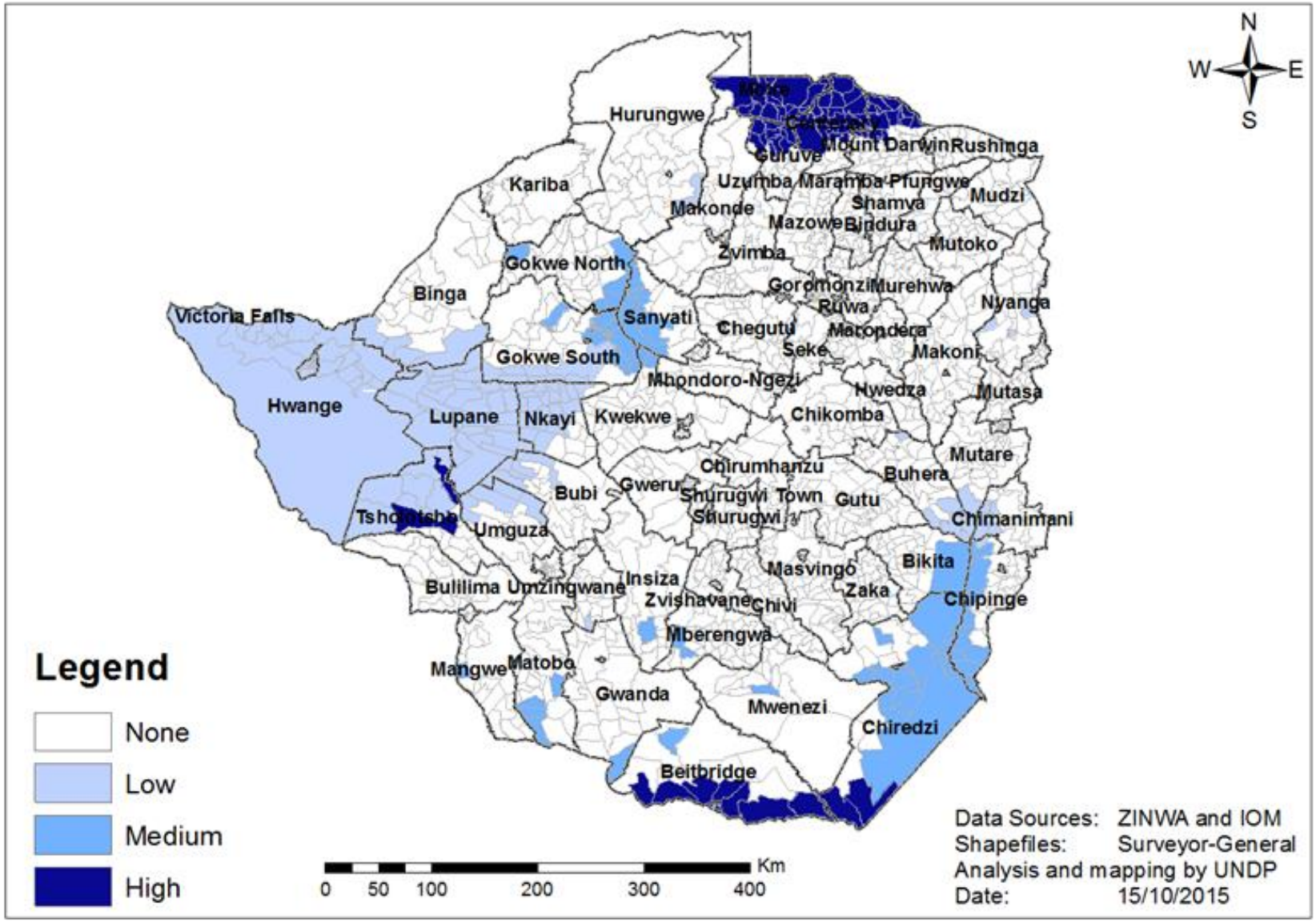


Figure 3: Map showing the flood proneness in Zimbabwe

3.4 Landmines

A land mine is an explosive which has been laid on or just under the surface of the ground. Landmines are a serious threat to human and animal life and no economic or livelihood activity can be carried out in landmine infested areas. Most of the landmines in Zimbabwe were laid out during the liberation war and seven mine fields have been identified.[20] About 626 km of the minefields are adjacent to communal lands thereby threatening livelihoods of many of these areas.[21]

The wards have been classified into the following classes based on demarcated mine fields in Zimbabwe:

None: Wards with no detected landmines

Low: Wards where landmines have been cleared and the land handed back to communities.

Medium: All wards which are next to landmine infested wards. Human and animal movement across ward boundaries makes it a hazard for these neighbouring wards.

High: This refers to all wards that are known to have landmines.

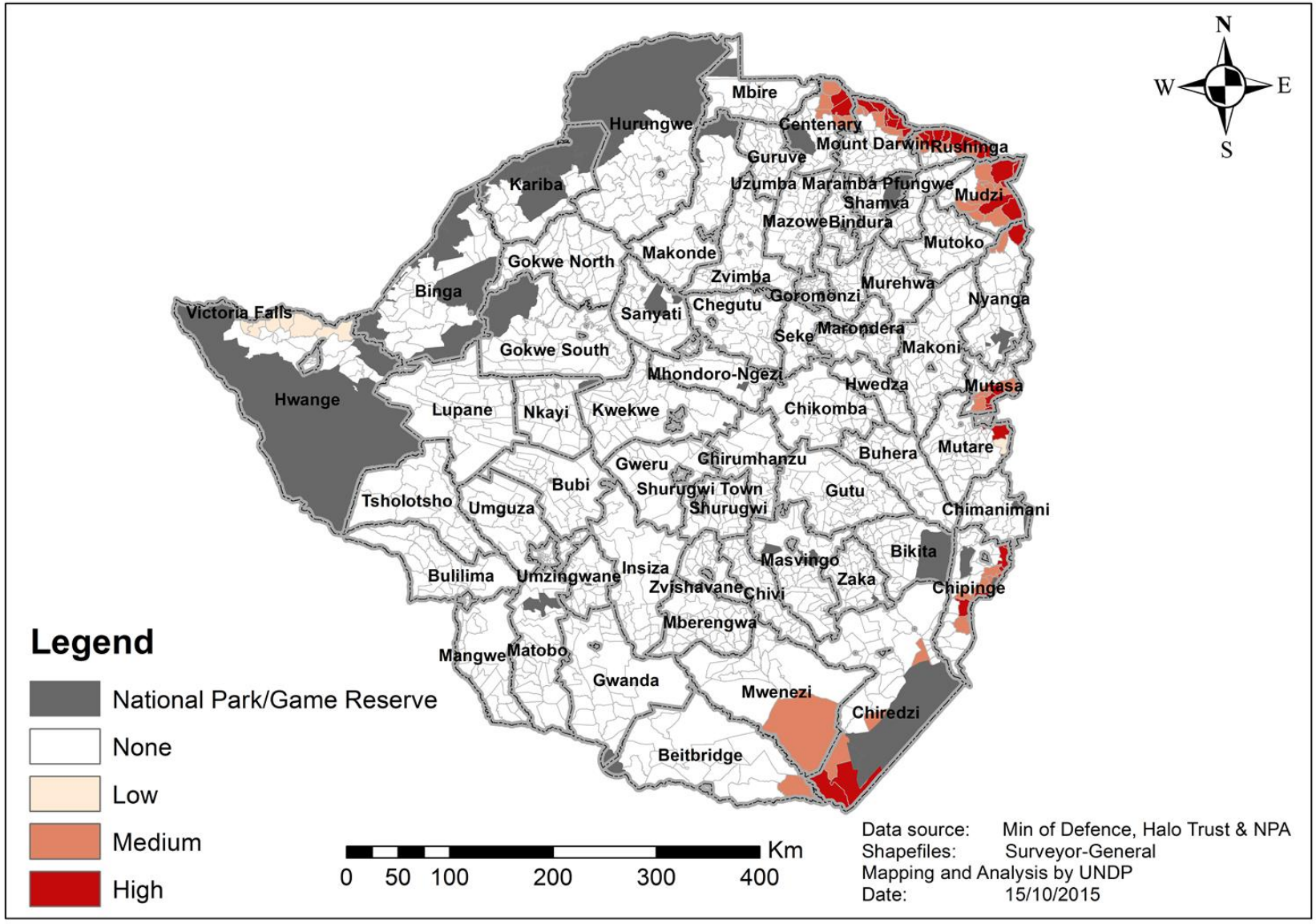


Figure 4: Map showing the landmine hazards in Zimbabwe

3.5 Cereal price changes

In this section we mapped cereal price changes after calculating maize's inter-seasonal price changes (June and October prices) for the period 2010 to 2014. The average maize price per kilogram for the months of June and October for the five years was calculated. Thereafter the average differences between winter (June) and summer (October) prices was calculated. Classes were then derived from the price differences using the following ranges:

Low:	-$0.04 - $0.05
Medium:	$0.05 - $0.10
Medium high:	$0.10 - $0.15
High:	> $0.15

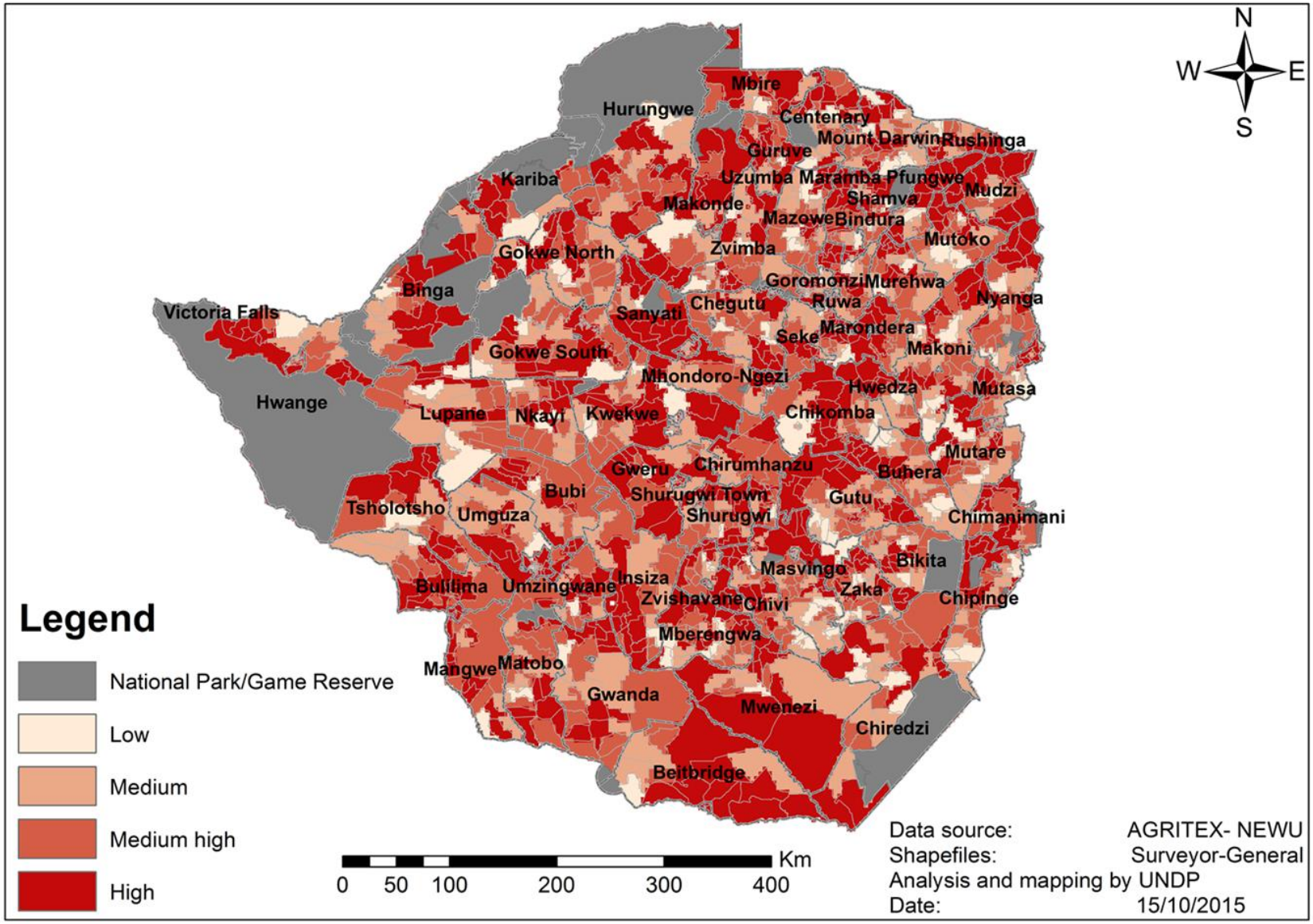


Figure 5: Map showing the the magnitude of cereal prices changes in Zimbabwe

3.6 Livestock prices

A change in livestock prices refers to the inter-seasonal price changes between June and October prices, mainly for cattle. The average cattle price per beast for the months of June and October were calculated for the period of 2010-2014. The average differences between winter (June) and summer (October) prices were then finally calculated.

Classes were then derived from the price differences using the following ranges:

Low:	-$20 - $0
Medium:	$40 - $20
Medium high:	$60 - $40
High:	> $60

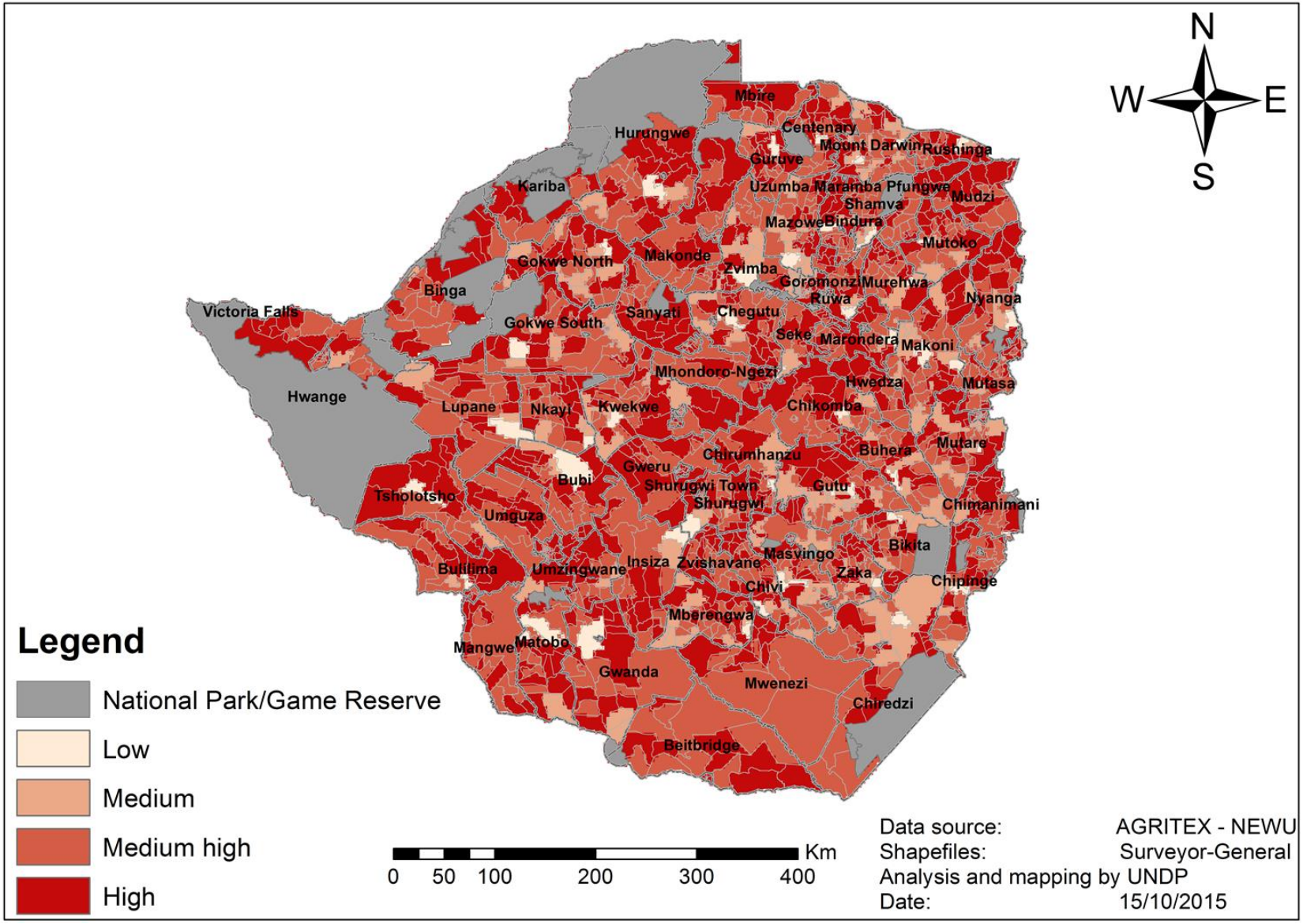


Figure 6: Map showing the magnitude of livestock price changes in Zimbabwe

3.7 Crop pests and diseases

Crop pests are defined as those pests of economic importance to livelihoods. For the purpose of the Mapping of Hazards Affecting Rural Livelihoods in Zimbabwe AGRITEX officials identified army worm, larger grain borer and quelea birds as the major pests affecting crop production based on average number of districts affected in a year as well as the severity of damage to crops. Individual maps were produced for the selected crop pests and diseases. The maps were based on following data sources:

- Quelea birds outbreak data – was mapped using small grain production as proxy for quelea prevalence
- Army worm infestation – was mapped based on cases reported to AGRITEX.
- Larger Grain Borer – was mapped based on cases reported to AGRITEX.

The individual pests and diseases scoring is based on the frequency and severity of the attacks which were then mapped. Both the individual and the combined maps adopted the following four point scale based on the five year data:

Low:	wards which experienced just one incident of one of the three pests and diseases (quelea, armyworm and LB)
Medium:	wards which experienced two incidences of any of the three pests and diseases (quelea, armyworm and LB)
Medium high:	wards which experienced all three incidences of all three pests and diseases (quelea, armyworm and LB) without severe consequences.
High:	wards which experienced high incidences of all three pests and diseases (quelea, armyworm and LB) with severe consequences.

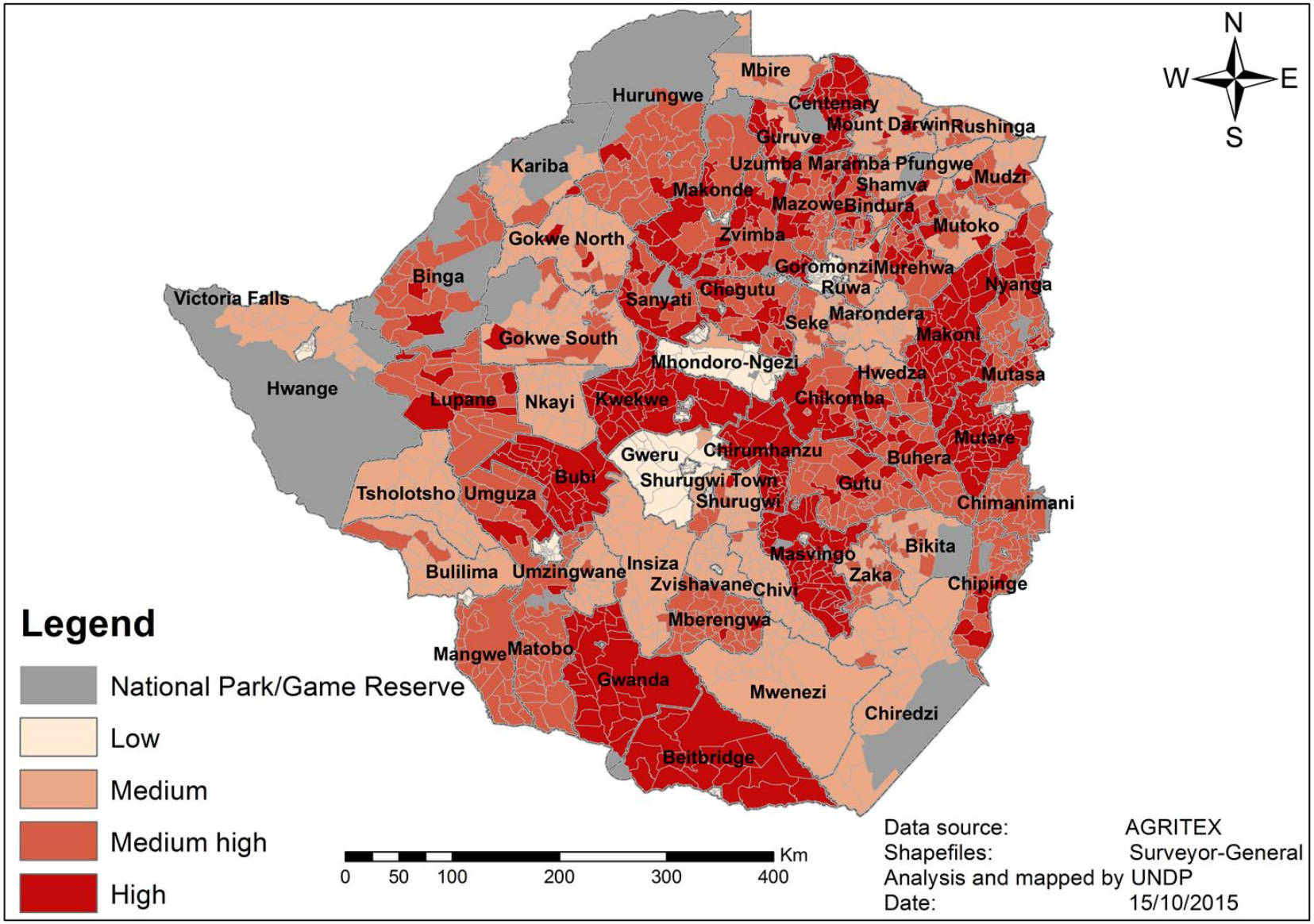
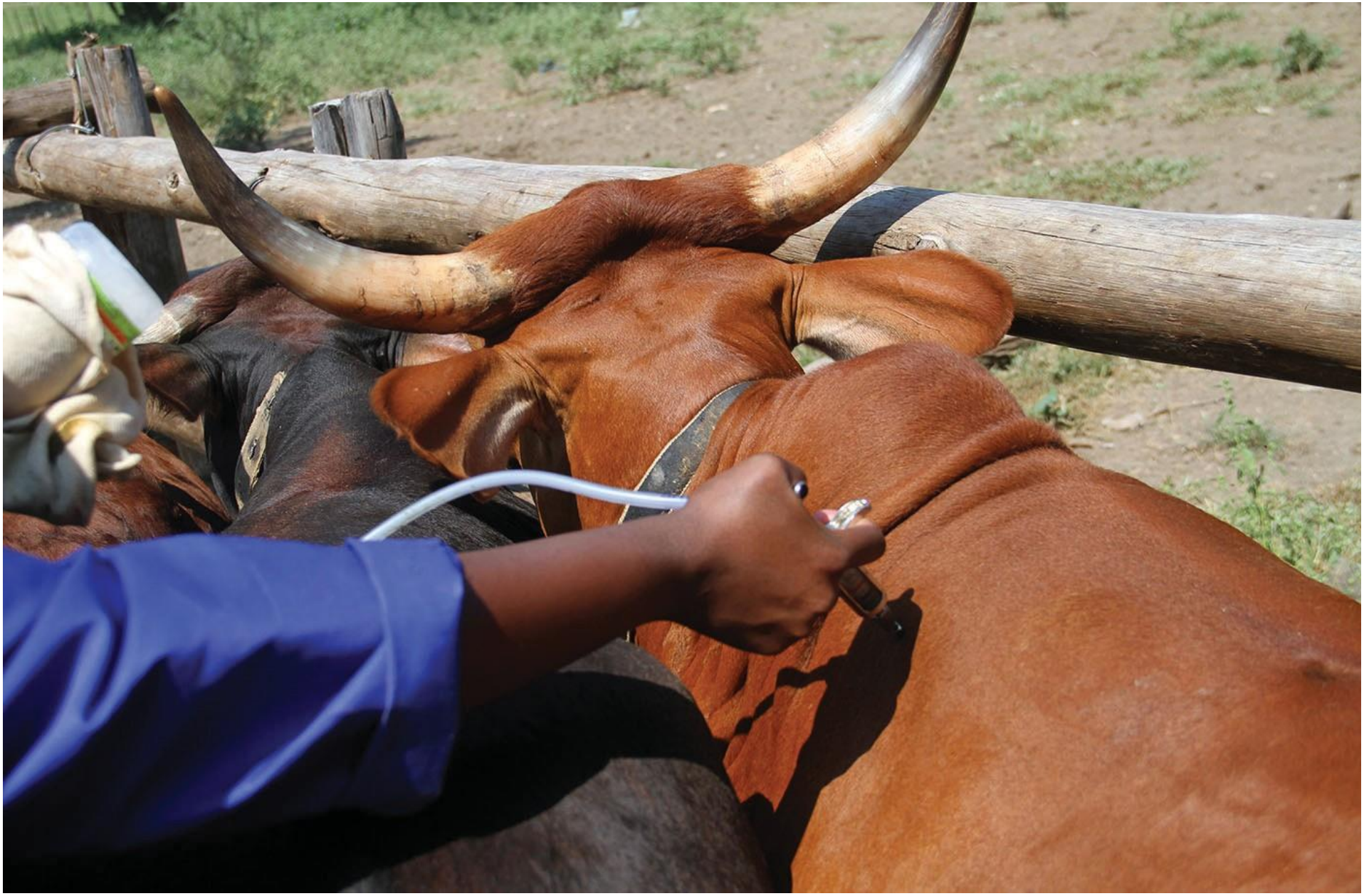


Figure 7: Map showing the crop pests and diseases prevalence in Zimbabwe



3.8 Animal diseases

The definition of animal diseases includes livestock diseases of economic importance such as anthrax, foot & mouth disease (FMD), newcastle and heartwater.

The mapping of animal diseases was based on the 2010-2014 data on reported cases of heartwater, newcastle, anthrax and FMD as recorded by the Veterinary Services Division within the Department of Livestock and Veterinary Services. Using the reported cases of the selected diseases, the individual diseases were mapped by district. heartwater, newcastle, anthrax were combined with FMD, which received a high prioritisation due to its decimating effect to people's herds of cattle and livelihoods using a 4-point classification.

Four classes were then derived using the following criteria:

Low:	No incidences of the four diseases
Medium:	wards which experienced at least one of the three diseases (Heartwater, Newcastle and Anthrax)
Medium high:	wards which experienced at least two of the three diseases (Heartwater, Newcastle and Anthrax)
High:	wards which experienced at least three of the four diseases (Heartwater, Newcastle and Anthrax and FMD)

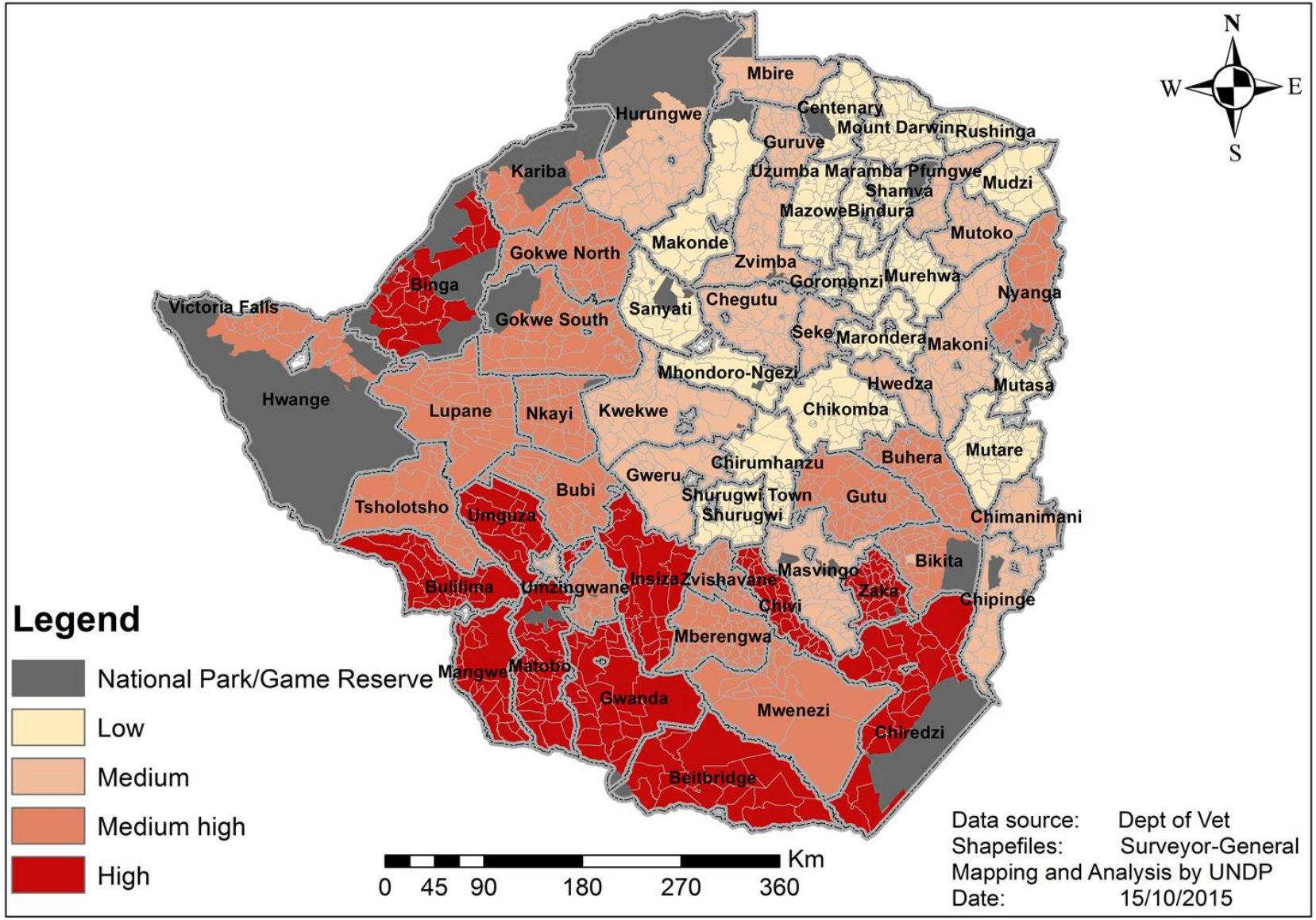


Figure 8: Map showing the livestock diseases prevalence in Zimbabwe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3.9 HIV and AIDS

HIV and AIDS prevalence is defined as the 2014 HIV and AIDS prevalence rate estimates for an adult population. The HIV and AIDS prevalence rate was used to score this parameter and a four point scale[22] was adopted. These are:

Low:	< 13%
Medium:	13 – 16%
Medium with high risk factors:	16 – 20%
High:	>20%

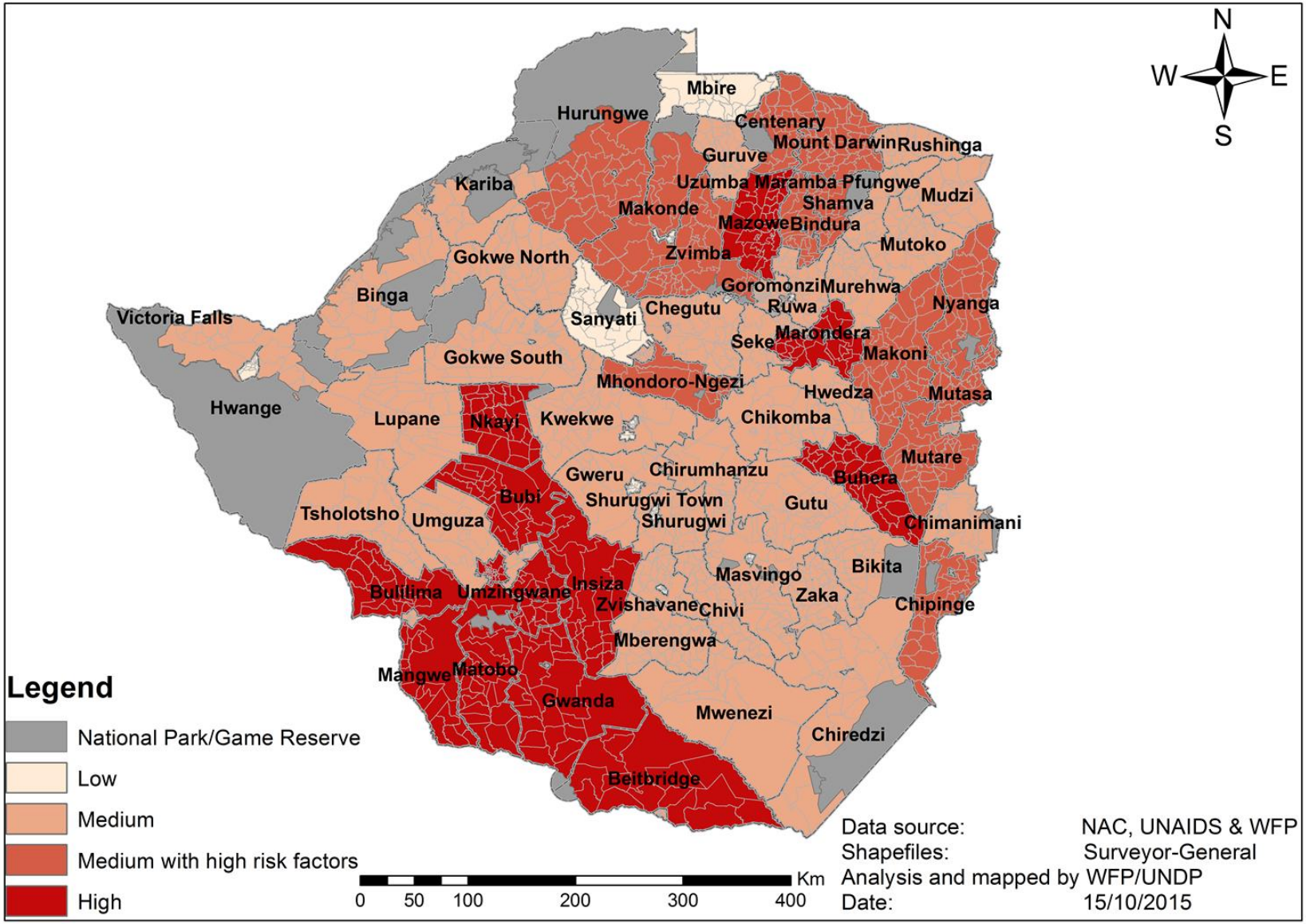

Figure 9: Map showing the HIV/AIDS prevalence in Zimbabwe

3.10 Diarrheal diseases

Diarrhoeal diseases are defined as the reported cases of cholera, dysentery, typhoid and common diarrhoea according to the Ministry of Health and Child Care. Data from health centres was interpolated to obtain figures on diarrhoeal diseases per ward. Each of the selected type of diarrhoeal disease was mapped for each year and then combined to produce the final map with four classes representing the prevalence of the diseases over the period 2010-2015.The four point scale used is:

Low:	wards affected by any one of the following diseases: common diarrhoea, dysentery or typhoid since 2010
Medium:	wards affected by any two of the following diseases: common diarrhoea, dysentery or typhoid since 2010
Medium high:	wards affected by all of the following diseases: common diarrhoea, dysentery or typhoid since 2010
High:	wards affected by all of the following diseases: cholera, common diarrhoea, dysentery or typhoid since 2010

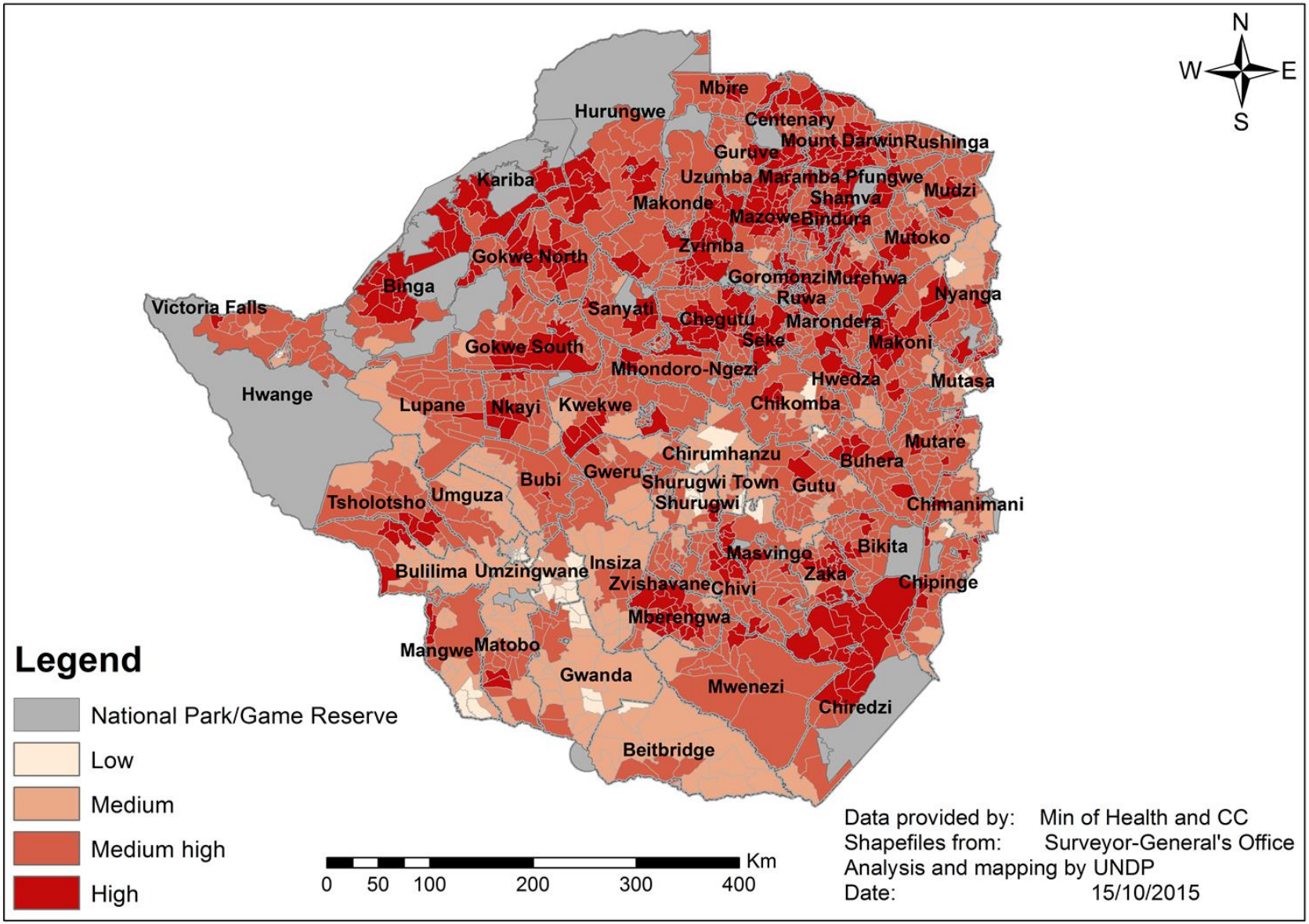

Figure 10: Map showing diarrhoeal diseases prevalence in Zimbabwe

IV. Application of the Mapping of Selected Hazards Affecting Rural Livelihoods in Zimbabwe

The mapping of selected hazards affecting rural livelihoods in Zimbabwe has generated a considerable amount of hazard information and knowledge, including data sets compiling hazards and shocks on district and ward level, which is structured to meet the needs and requirements for hazard information from different stakeholders. While recognizing that different end users have different information needs for different purposes, the presentation of the mapping of hazards are tailored to the needs of stakeholders in very general terms. The information in Annex 1, the ranking of districts by their mean hazard index and Annex 2, the percentage contributions of the hazards to the mean hazard index per district, is presented as a list of information and can be used to feed into the work of stakeholders as needed.

The following sections are examples of how this information can be used. The Hazard Convergence Map on page 31 shows an overview of all the hazards per district layered in one map. This map can be split into district and ward level information as the following chapters demonstrate with examples of Beitbridge, Chimanimani, Mhondoro-Ngezi and Mutoko.

In this publication four districts have been chosen as examples of how the hazard information can be unpacked and used. These districts give a broad picture of the type of information which it is possible to extract from Annexes 1 and 2.

4.1 Hazard Convergence Map

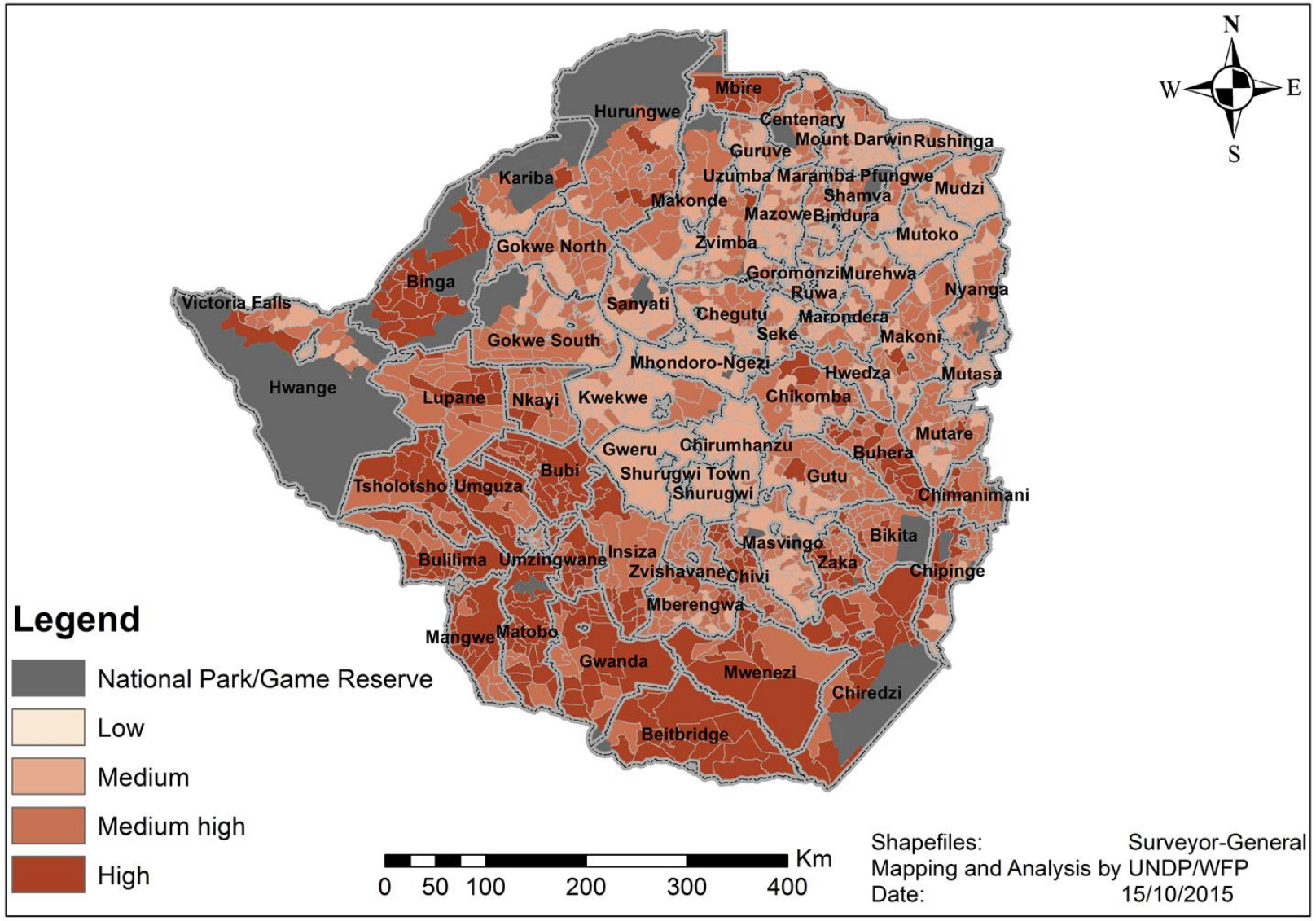

Figure 11: Map showing the proneness to all the nine hazards in Zimbabwe

4.2 District Profiles for Beitbridge, Chimanimani, Mhondoro-Ngezi and Mutoko Districts

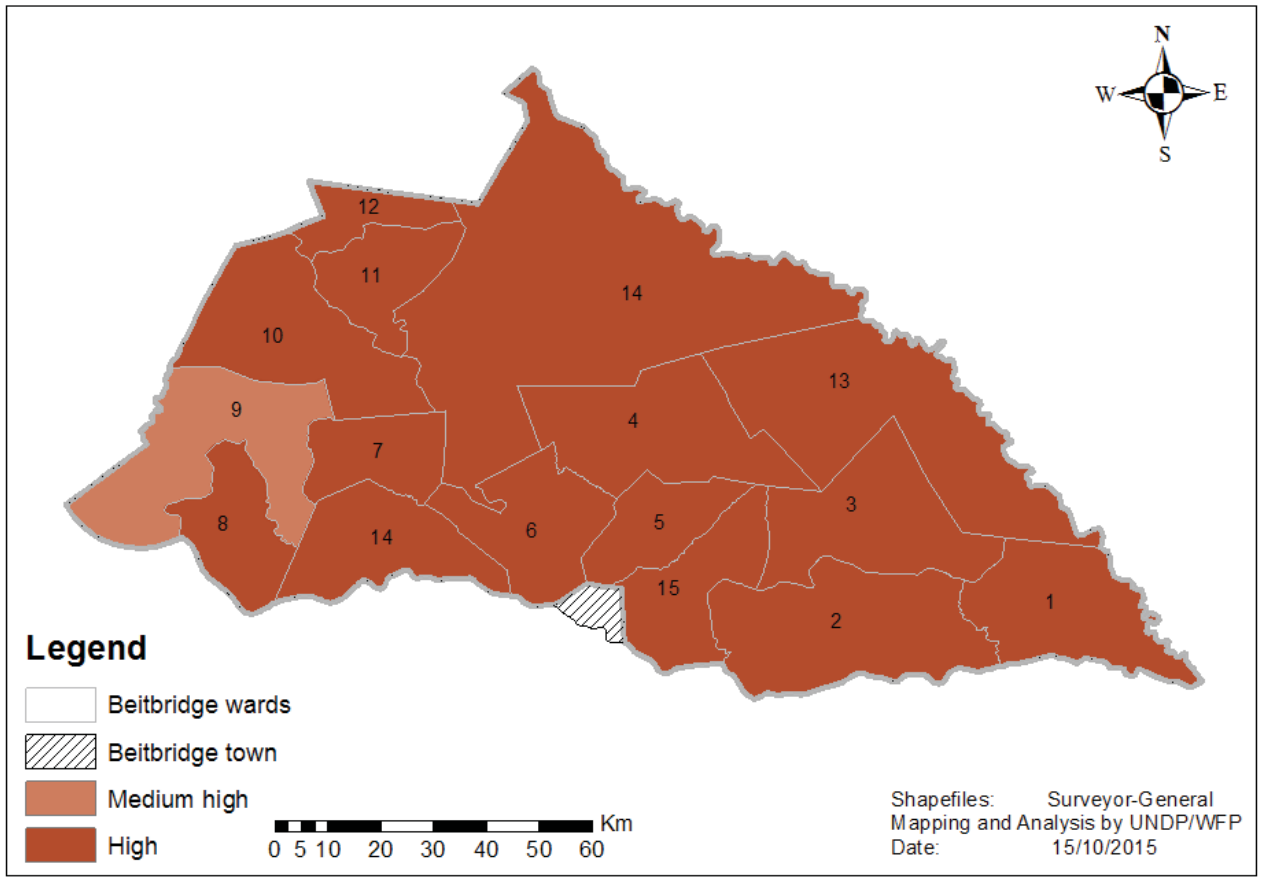

Figure 12: Map showing the hazard map for Beitbridge District

Beitbridge

Beitbridge district ranks highest in the Mean Hazard Index with a mean hazard index of 0.7317. Most of the wards in the district fall into the high category which means that they are highly affected by the majority of the selected nine hazards.

The maps in Fig 13 give the district profile of all the individual hazards. Here it is obvious that the wards in this area experience a range of hazards although only some wards are flood prone, for example. Please note that cereal and livestock prices were separated for visual purposes only, otherwise they were combined for the final analysis.

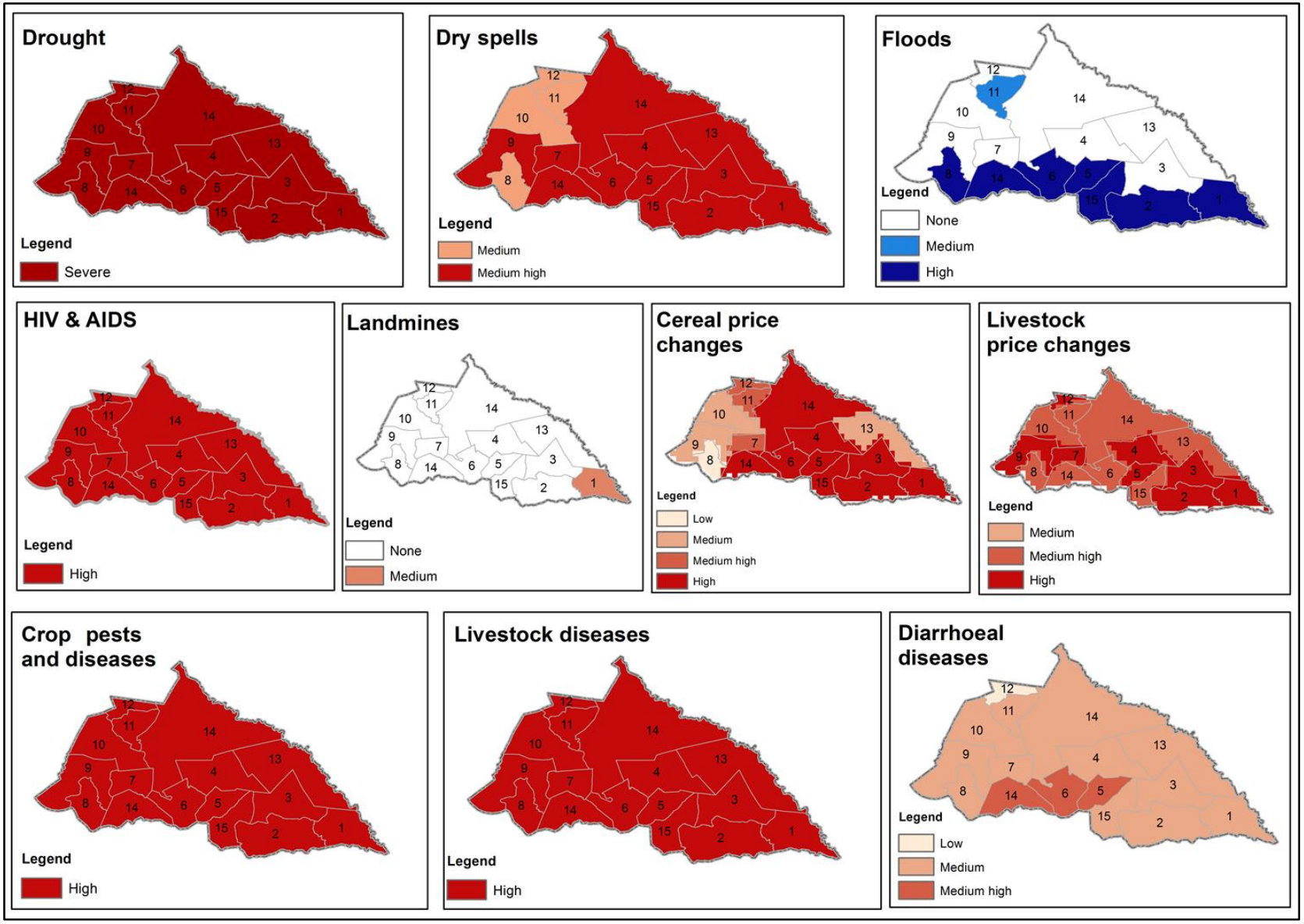

Figure 13: Maps showing individual hazards in Beitbridge District

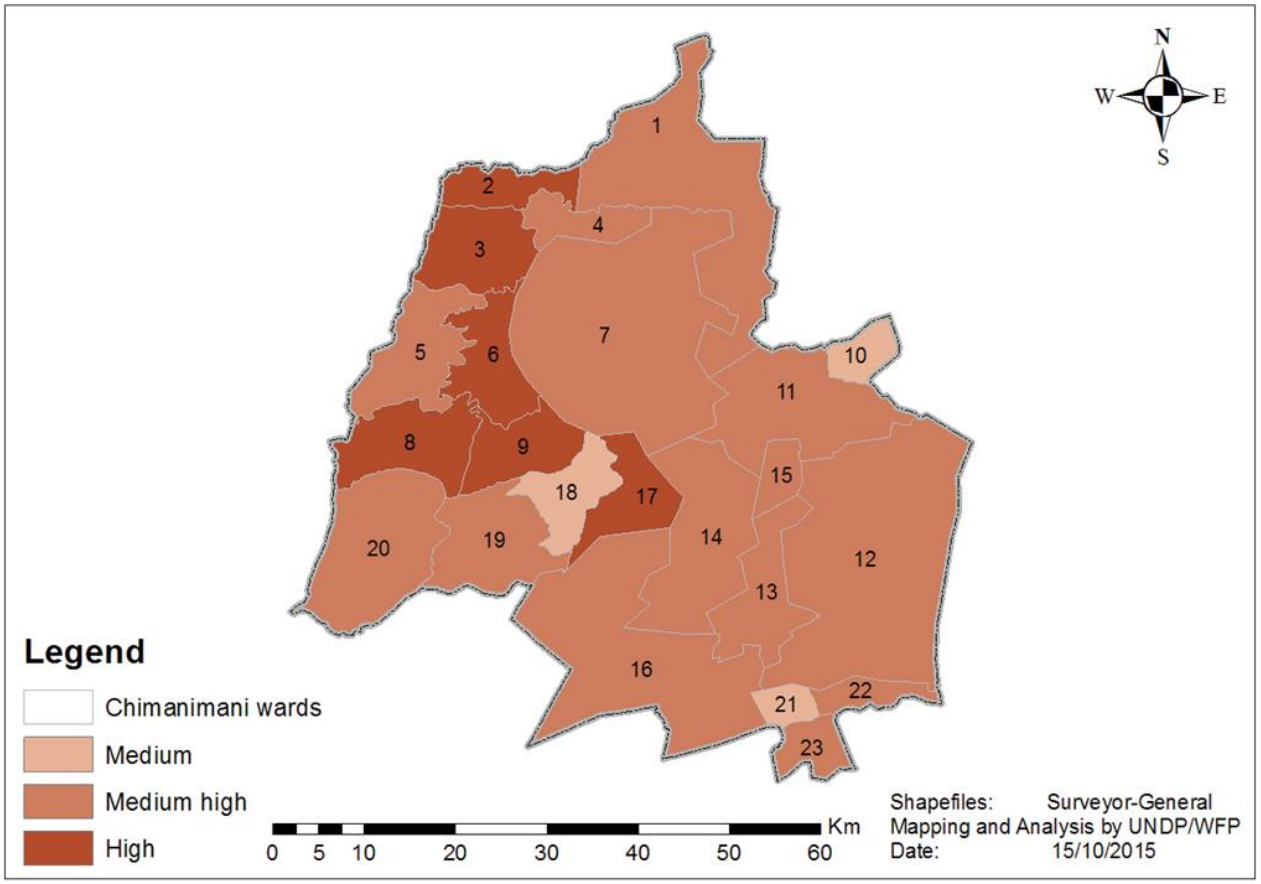

Figure 14: Map showing the hazard map for Chimanimani District

Chimanimani District

Chimanimani district is primarily a medium affected district and is ranked 24th with a mean hazard index of 0.527. The wards in Chimanimani districts rank from medium to high affected by hazards.

Figure 15 gives the district profile of the individual hazards. It shows how the wards differ in the level of impact they experience due to diversity in areas such as drought, dry spells and changes in cereal and livestock prices.

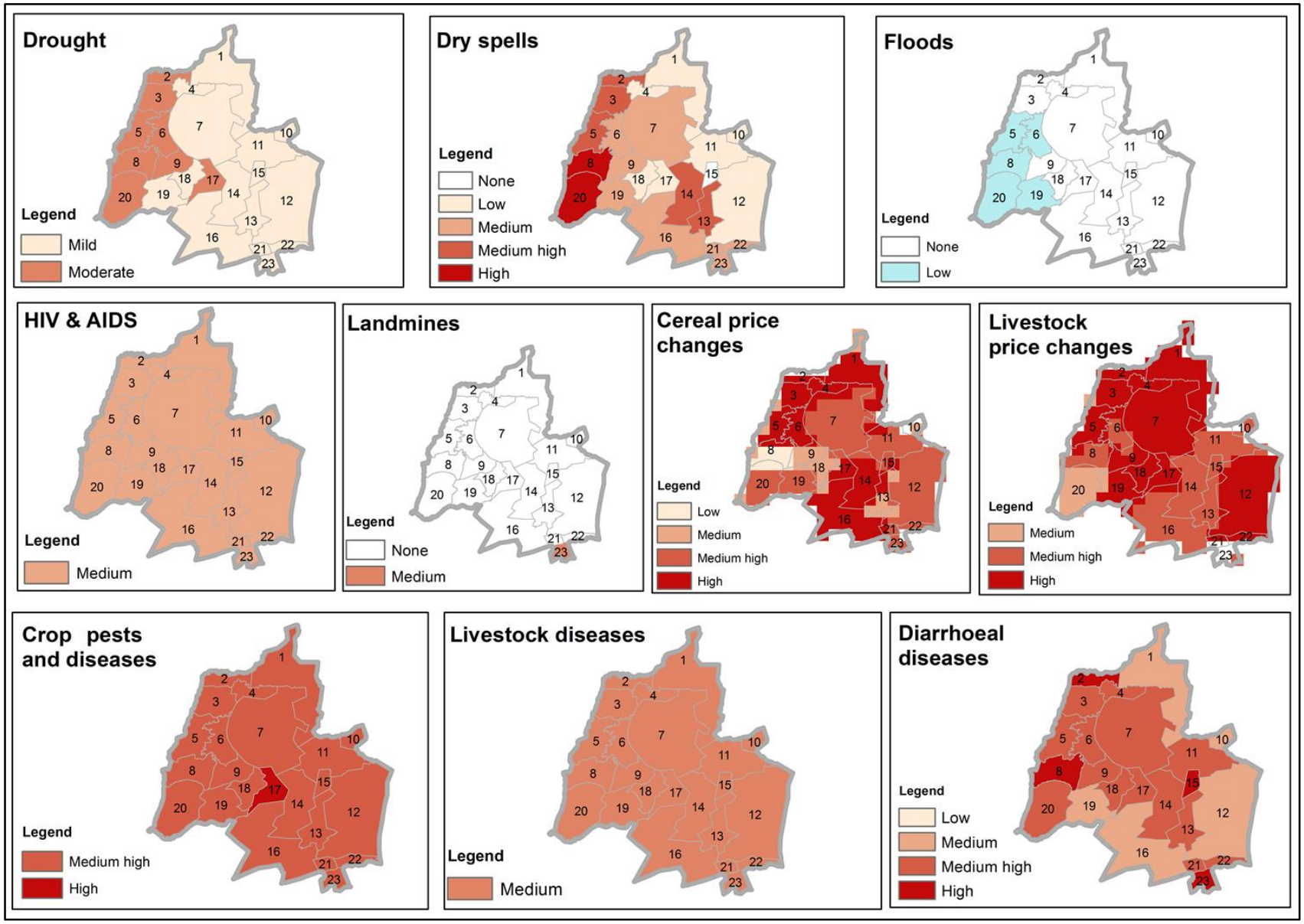

Figure 15: Maps showing individual hazards in Chimanimani District

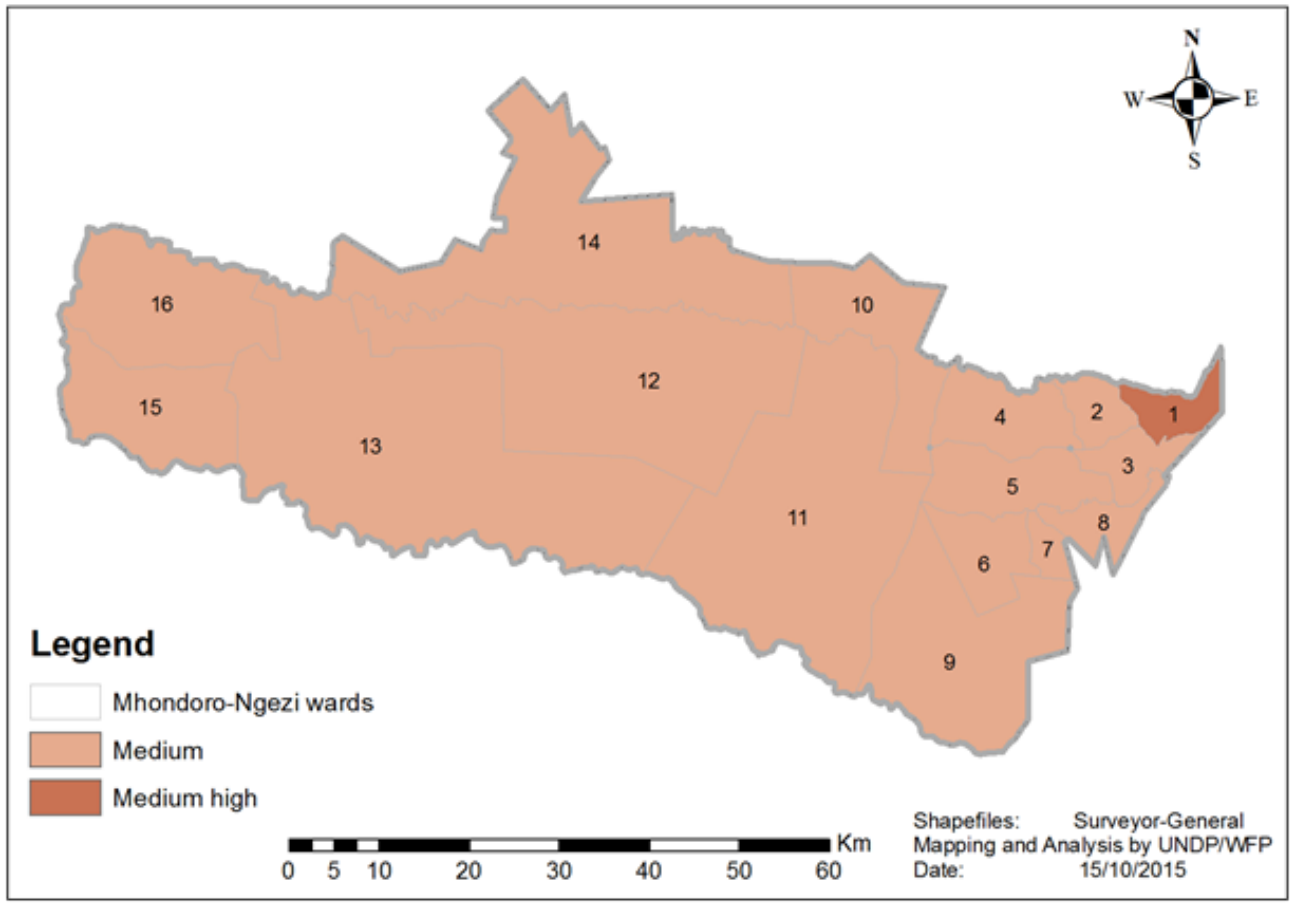

Figure 16: Map showing the hazard map for Mhondoro-Ngezi District

Mhondoro-Ngezi District

Mhondoro-Ngezi district is ranked 58th with a mean hazard index of 0.337 which falls into the medium range. The district has one of the lowest mean hazard indexes in the country. Some of the wards in this district experienced changes in crop and livestock prices and the whole district has a medium prevalence to HIV/ AIDS and diarrheal diseases.

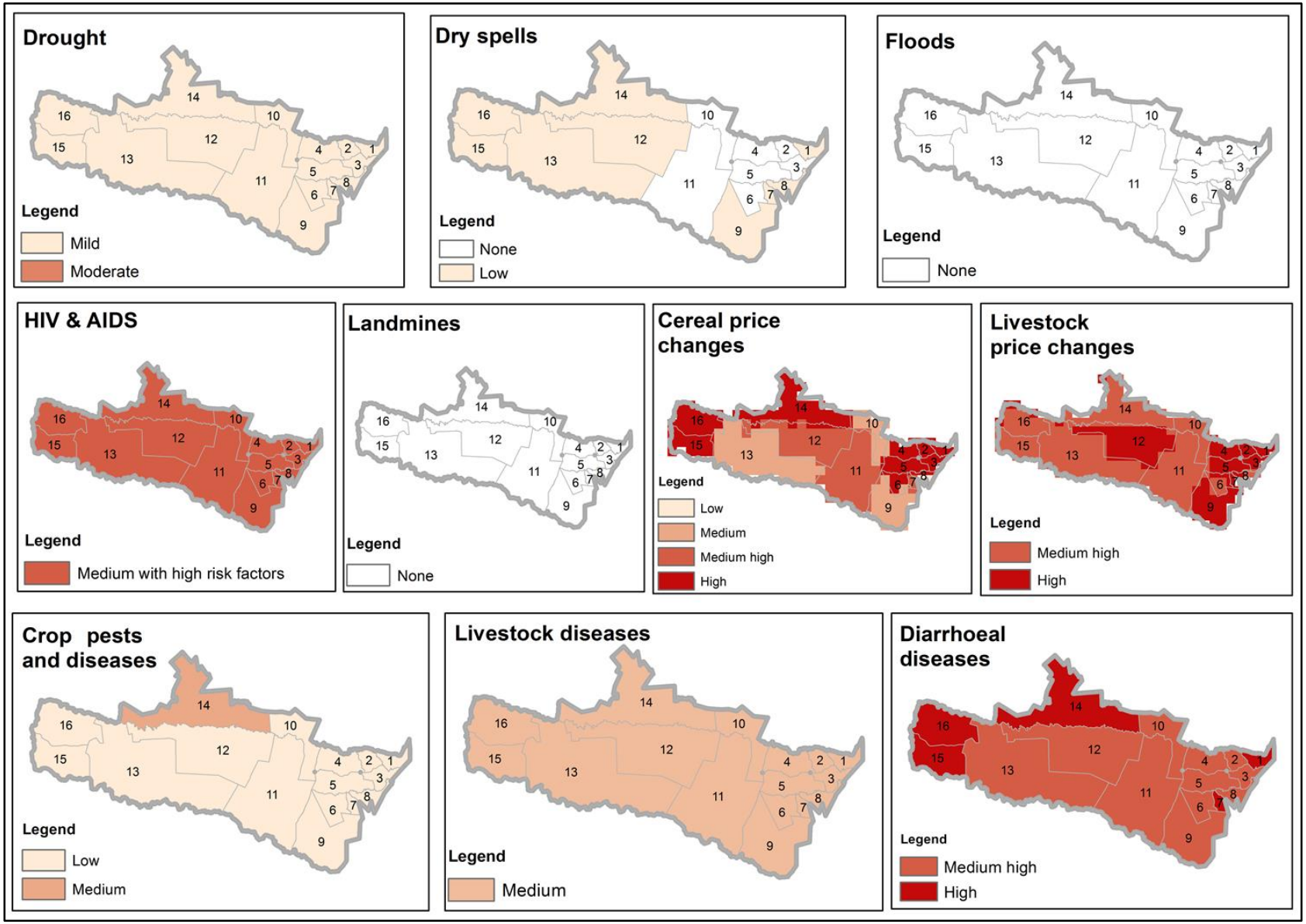

Figure 17: Maps showing individual hazards in Mhondoro-Ngezi District

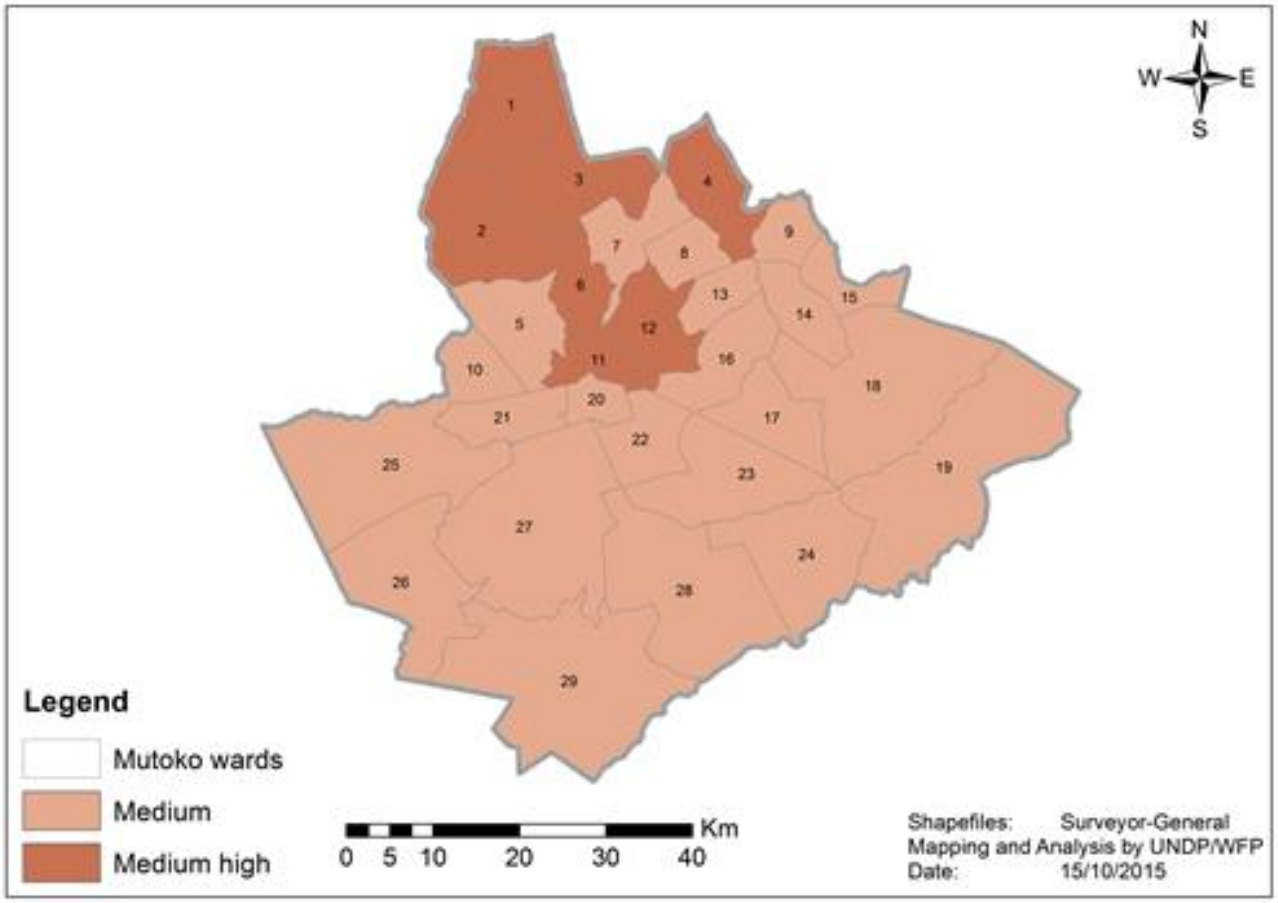

Figure 18: Map showing the hazard map for Mutoko District

Mutoko District

Mutoko District has a mean hazard index of 0.3655. It is ranked 57th on the mean hazard index.

As shown on the district map, Figure 19, most of the wards fall within the medium level in terms of proneness to all the nine hazards included in this study.

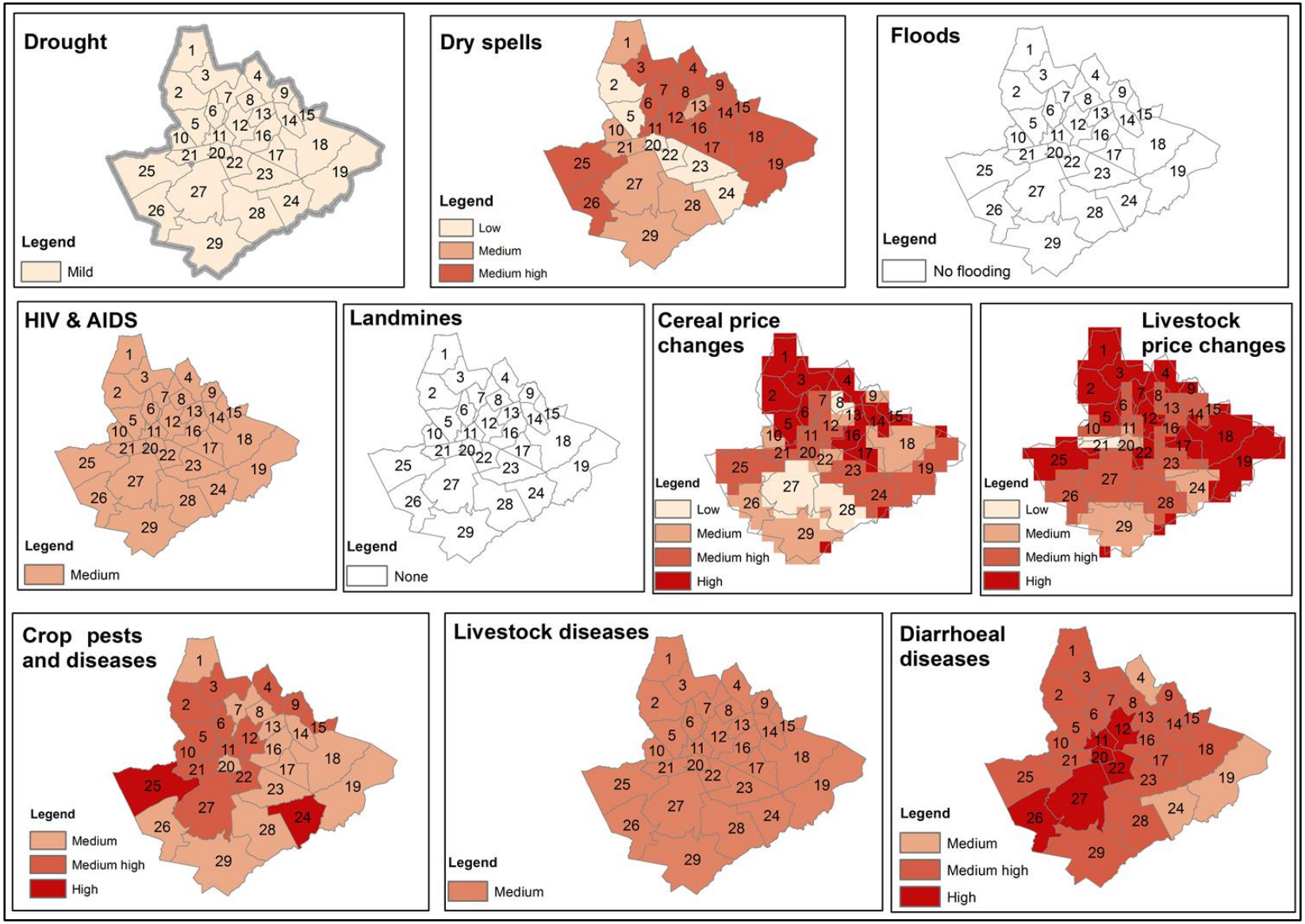

Figure 19: Maps showing individual hazards in Mutoko District

V. Recommendations

The following recommendations were drawn from the mapping of selected hazards which affect rural parts of Zimbabwe:

- The majority of the districts in the western and southern parts of the country suffer the effects of multiple hazards.
- Hazard mapping exercises need to be undertaken at least once every two years since some hazards such as drought, diarrhoeal diseases, floods and crop pests and diseases are becoming more frequent in Zimbabwe than in previous decades.
- Based on feedback from the data providers and other stakeholders, there is a need to derive indicators in the next update for mapping environmental degradation and veld fires as additional hazards.
- There is a great need for advocacy and information sharing so that this product is used to feed into evidence-based policy and decision-making at local and national levels.

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Annex 1: Ranking of Districts by their Mean Hazard Index

Rank	District	Mean Hazard Index
1	Beitbridge	0.7317
2	Binga	0.7080
3	Bubi	0.7066
4	Matobo	0.6965
5	Umguza	0.6944
6	Mangwe	0.6670
7	Gwanda	0.6522
8	Chiredzi	0.6505
9	Umzingwane	0.6432
10	Tsholotsho	0.6363
11	Buhera	0.6336
12	Bulilima	0.6328
13	Mwenezi	0.6251
14	Zaka	0.6168
15	Lupane	0.6026
16	Chipinge	0.5983
17	Chivi	0.5971
18	Mbire	0.5901
19	Insiza	0.5850
20	Nkayi	0.5544
21	Zvishavane	0.5532
22	Bikita	0.5395
23	Hurungwe	0.5273
24	Chimanimani	0.5270
25	Kariba	0.5044
26	Hwange	0.5034
27	Mutare	0.5009
28	Chikomba	0.4985
29	Makoni	0.4966
30	Mberengwa	0.4947
31	Nyanga	0.4904
32	Gokwe South	0.4880
33	Gutu	0.4860
34	Gokwe North	0.4854
35	Makonde	0.4731
36	Zvimba	0.4693
37	Sanyati	0.4680
38	Centenary	0.4671
39	Shamva	0.4639
40	Hwedza	0.4635
41	Masvingo	0.4580
42	Marondera	0.4496

43	Chegutu	0.4480
44	Uzumba Maramba Pfungwe	0.4475
45	Mazowe	0.4436
46	Bindura	0.4307
47	Mount Darwin	0.4242
48	Guruve	0.4224
49	Seke	0.4189
50	Goromonzi	0.4172
51	Murehwa	0.4146
52	Kwekwe	0.4138
53	Chirumhanzu	0.3970
54	Mutasa	0.3963
55	Rushinga	0.3829
56	Mudzi	0.3806
57	Mutoko	0.3655
58	Mhondoro-Ngezi	0.3370
59	Shurugwi	0.3247
60	Gweru	0.3205
61	Chinhoyi	0.3193

Annex 2: Percentage contributions of the Hazards to the Mean Hazard Index

District	Drought and Dry spells	Floods	HIV/AIDS	Landmines	Cereal prices	Crop pests and	Animal disease	Diarrhoeal diseases
Beitbridge	33.54	3.82	6.95	0	14.56	15.39	21.55	4.20
Bikita	35.73	0	4.06	0	16.73	10.48	21.12	11.88
Bindura	19.56	0	10.63	0	23.41	19.91	9.30	17.18
Binga	37.75	0.26	2.16	0	15.61	9.96	18.78	15.48
Bubi	42.17	0.59	8.21	0	16.34	10.40	15.05	7.24
Buhera	32.91	0.42	10.66	0	14.04	12.58	18.65	10.73
Bulilima	38.96	0	8.56	0	16.02	9.09	19.25	8.12
Centenary	12.61	22.36	6.76	1.86	14.46	22.19	7.43	12.33
Chegutu	19.19	0	5.12	0	21.38	19.20	17.93	17.18
Chikomba	41.21	0	5.25	0	18.23	15.27	8.08	11.95
Chimanimani	28.16	0.55	4	0.61	20.49	19.33	15.71	11.15
Chipinge	31.10	2.99	5.47	2.98	16.20	17.81	14.11	9.34
Chiredzi	29.38	3.97	3.06	0.19	14.06	15.79	22.17	11.39
Chirumhanzu	26.76	0	6.42	0	26.19	23.40	9.93	7.30
Chivi	32.54	0	3.76	0	16.75	11.74	23.68	11.53
Gokwe North	26.54	1.13	3.22	0	11.67	13.91	24.35	19.17
Gokwe South	26.41	2.12	4.42	0	12.31	13.77	24.26	16.71
Goromonzi	27.57	0	5.44	0	23.51	16.98	9.51	16.99
Guruve	26.44	3.73	5.38	0	23.54	10.07	18.81	12.03
Gutu	25.82	0	4.82	0	17.25	17.05	24.33	10.74
Gwanda	31.99	0.26	8.75	0	16.23	15.07	23.02	4.68
Gweru	10.60	0	7.46	0	35.21	7.37	23.64	15.72
Hurungwe	27.63	0.10	8.26	0	18.05	15.55	15.06	15.35

Hwange	27.77	2.08	3	1.32	24.37	6.68	17.47	17.32
Hwedza	28.61	0	5.06	0	21.95	14.25	16.95	13.19
Insiza	25.38	0.19	13.56	0	17.94	12.06	25.14	5.73
Kariba	21.48	0	3.86	0	21.89	8.16	21.29	23.32
Karoi	18.72	0	11.89	0	38.16	0	0	31.22
Kwekwe	18.66	0.43	5.24	0	20.66	21.48	18.09	15.43
Lupane	38.08	3.36	3.15	0	13.82	12.35	18.09	11.16
Makonde	25.36	0.12	10.12	0	22.66	17.49	8.26	15.99
Makoni	26.43	0	9.49	0	17.23	16.34	15.88	14.63
Mangwe	34.09	0.37	7.20	0	16.19	12.74	23.78	5.63
Marondera	22.94	0	15.11	0	22.90	15.73	8.81	14.52
Masvingo	19.77	0	5.16	0	19.77	24.81	16.86	13.63
Matobo	35.53	0.94	8.53	0	14.06	12.08	22.44	6.41
Mazowe	13.88	0	17.23	0	20.59	19.92	8.90	19.48
Mberengwa	23.31	0.49	4.73	0	19.70	17.12	20.90	13.75
Mbire	30.95	29.32	0	0	9.26	15.35	9.59	5.51
Mhondoro-Ngezi	17.25	0	14.32	0	31.57	4.31	12.08	20.47
Mount Darwin	17.97	10.95	9.81	6.93	17.49	9.33	8.95	18.57
Mudzi	19.10	0	6.09	2.10	28.56	12.18	10.66	21.32
Murehwa	26.33	0	5.52	0	21.59	20.68	9.66	16.22
Mutare	34.48	0.07	9.11	0.17	17.90	18.20	8.06	12
Mutasa	20.56	0	7.19	2.20	25.56	22.71	10.55	11.23
Mutoko	12.99	0	6.80	0	25.95	10.51	22.29	21.47
Mwenezi	32.80	0.30	3.64	0	19.26	17.88	16.24	9.88
Nkayi	27.55	2.83	8.47	0	18.52	9.98	18.50	14.15
Nyanga	16.28	0.35	9.69	0.24	18.96	17.45	24.04	13

Rushinga	20.58	0	6.37	3.28	27.78	9.25	10.48	22.26
Sanyati	32.64	3.74	0	0	17.43	21.09	8.53	16.57
Seke	16.25	0	5.53	0	24.67	17.04	19.09	17.43
Shamva	24.07	0	11.40	0	21.03	15.90	8.35	19.26
Shurugwi	28.38	0	7.96	0	30.18	12.21	12.17	9.11
Tsholotsho	44	6.82	2.45	0	15.92	8.17	13.47	9.18
Umguza	40.73	0.34	4.12	0	15.80	12.16	22.08	4.78
Umzingwane	38.32	0.10	11.54	0	17.80	13.09	16.50	2.65
Uzumba Maramba Pfungwe	25.11	0	5.13	0	23.83	7.69	17.95	20.29
Zaka	35.79	0	3.66	0	14.21	9.13	25.58	11.64
Zvimba	15.72	0	11.67	0	19.25	18.17	16.34	18.85
Zvishavane	33.05	0	4.25	0	19.77	12.61	21.19	9.14

Notes

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[2] Zerger, 2002, Coppock, 1995, Chen et al., 2003

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Credit	Page
UNDP	Cover Photo, 15
FAO	18, 21, 30, 33, 36, 39
The Herald	24
HALO Trust	27
Samaritan's Purse	45