Zimbabwe Meteorological Services Department

Climate Issues and Facts: Zimbabwe

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OUTLINE

INTRODUCTION

- Weather and Climate- Definitions
- Zimbabwe Climate
- Factors controlling Weather & Climate
- Weather related Hazards
- Climate Change facts- Zimbabwe.
Weather vs Climate

Weather

- is the state of the atmosphere at a given time and place. The atmospheric parameters include temperature, humidity, precipitation, cloudiness, wind, and barometric pressure.

  **In contrast to weather,**

- **Climate** is the set of meteorological conditions that prevail in a particular place or region over a long period of time. Climate can vary over broad time scales, from years to millennia.
- **Climate** is the long-term statistical expression of short-term weather.
Zimbabwe Climate

- **Hot Season** - mid-August to mid-November (hot day time T°C 26°C to 36°C)
- **Main rainy season** - mid-November to mid-March (intercepted by 4 to 5 dry spells)
- **Cool season** - mid-May to mid-August (mild day time T°C 20°C to 29°C)
- **Post rainy season** - mid-March to mid-May (mild and sunny, 23°C to 31°C)
Factors controlling climate

- Latitude which determines the amount of radiation received at any time of the year.
- Position in relation to land, sea and ocean
- Altitude which greatly influences temperature
- General circulation of the atmosphere and its perturbations.
- Nature of the underlying surface; soil type, water
- Vegetation cover
- Topographical features
ITCZ – December/January/February
‘Guti’

- This is a cool moist southeasterly airflow which causes cloudy conditions. If this condition becomes well established it results in widespread drizzle and rain in places.
- In summer if a guti sets in, it results in convergence; hence increasing rain and thunder activity in the country if conditions allow.
- Severe guti may push crucial rainfall activity out of the country and drier weather will be experienced over whole country.
Main rain months

Zimbabwe Average Monthly Rainfall in mm (1980/81 to 2009/10)
A start of the rain season is attained when a place receives 20 mm in 1 or 2 days and there is no dry spell of more than 10 days expected in the following 30 days.

All dates for 2010/11 season onsets fell in November. The scale on the side of the map shows the days of the month from the 1st (bottom) to the 30th (top).
Rainfall Amts Vs Latitude

Zimbabwe Rainfall Distribution by Latitude

- Rainfall vs Latitude
Zimbabwe Mean Annual Rainfall
R/fall amts Vs Altitude

Zimbabwe Rainfall Distribution by Altitude

ALTITUDE (METRES ABOVE MEAN SEA LEVEL)
Zimbabwe’s hottest & warm areas (Av.Tx)
Zimbabwe’s coldest and warm areas (Av.Tm)
Weather related Hazards

- Tropical cyclones
- Floods and flash flooding
- Drought and intra season dry spells
- Thunderstorms and lightning
- Hail storms
- Heavy rains
- Ground frost
- Heat Waves
Prediction of met hazards

- Biggest challenge is the prognosis lead time.
- Thunderstorms, lightning and hailstorms – hours to 1 day.
- Ground frost – 3 days to 1 week.
- Tropical cyclones – 1 week
- Heavy rains and floods – 3 days to 2 weeks.
- Dry spells – 2 weeks.
- Meteorological Drought – 3 months
Heavy rainfall

- A rainfall measurement of more than 100mm in 24 hours is regarded as a severe weather event.
- Usually associated with mesoscale severe convection or the passage of a tropical cyclone.
- Fortunately, Madagascar acts as a deviator of more than 95% of tropical cyclones from the South West Indian Ocean.
Lightning and hailstorms

- A result of very high convective available potential energy – high temperatures.
- Usually occur during the first half of the season or after some days clear skies and very high temperatures.
- Highland areas are prone to lightning – those that lie along the main watershed.
Hailstorm damage in 2009/10

- Two people were killed in Dotito
- 51 homesteads destroyed in Muzarabani
- Three schools destroyed in Mhondoro
- Hundreds of hectors of tobacco destroyed in Magunje.
HAILSTORM: One of schools destroyed in Mhondoro
Hailstorm damage in 2009/10 - economic impacts

- Hundreds of hectares of tobacco destroyed in Magunje.
- PLEASE INSURE YOUR CROP!

TOUGH CHOICE... Mr Petros Ndambakwa and his wife Rhoda of Kapare Village destroy tobacco plants after a hailstorm wreaked havoc in Magunje last week. Scores of farmers have lost tobacco worth thousands of dollars to hailstorms prompting calls from various stakeholders for crop insurance.
Hailstorm

- Homestead destroyed in Muzarabani
PUPILS at Nyangwena Primary School in Mhondoro clear roofing debris after a hailstorm destroyed their school last week.

Hailstorm destroys schools

Herald Reporter

“This is a double blow to me because my property was also damaged. Thank God my children and I escaped unharmed.”

Kariba floodgates to be opened

THE Zambesi River Authority will soon open the Kariba Dam floodgates and authorities have started issuing warnings to villagers in low-lying areas of the Zambesi River on the impending floods.
Vacate homes to avoid floods: Met Office

Dry spell set to end: Met Office

Northern Mills have already started receiving light to moderate rainfall. The forecast for Masvingo, Gwanda and some stations in the highveld area has recorded high amounts of rainfall in recent days. The Met Office said the heavy rains that cloud system responsible for the rains would continue to hover over most parts of the country.

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Heavy rains are expected to pound most parts of the country starting tomorrow, and bring a prolonged dry spell that has seen many farmers anticipating heavy rains. The Met Office said the heavy rains that cloud system responsible for the rains would continue to hover over most parts of the country.

Dry spell forces tobacco growers to reap early

Hailstorm leaves 54 Muzarabani families

The Herald

Agriculture

Hailstorm destroys schools

The Herald

Agriculture

Farmer dies after hailstorm

The Herald

Agriculture

Cabinet to meet over dry spell

The Herald
- Weather and Climate
- Factors controlling Weather
- Zimbabwe Climate
- Weather related Hazards
- Climate Change facts- Zimbabwe.
What is Climate Change?

- **Climate change** is any long-term significant permanent change in the “average weather” of a given area/region.

- Average weather may include average temperature, precipitation, wind and pressure patterns.

- It involves changes in the average state of the atmosphere over duration ranging from decades to millions of years.
IS THE CLIMATE OF ZIMBABWE CHANGING?

- YES

IS THERE ENOUGH EVIDENCE TO SUPPORT THAT?

- YES.
Why is it changing?

- Both Nature and Human activities cause the Change
- UNFCCC (1992) attributed the change to human activities which alter the composition of the global atmosphere.

Main Human activities

- Industrial Revolution in Europe.
  - Rapid increase in greenhouse gas emissions
  - Increase in population growth
  - Increased deforestation and landuse
  - Increased atmospheric aerosols
  - Need to increase agricultural production
Climate change/variability? The difference

- Climate change refers to statistically significant variation in either the mean state of the climate or its variability persisting over extended periods (typically decades or longer).
- Climate variability refers to variations in the mean state and other statistics (standard deviation, occurrence of extremes) of the climate on all temporal and spatial scales.
Annual Mean Maximum T°C (Daytime Temps)

Zimbabwe Annual Mean Maximum Temperature °C (1962 to 2004)
Zimbabwe: temperature and rainfall extremes

- The temperature analysis shows a distinct trend towards higher temperature. Positive trends can be detected for the temperature time series in Zimbabwe from 1962 to 2004.
- Both annual min and max temps are showing an increasing trend.
- Annual average max and min air temperature has increased by around 2 degrees Celsius respectively during the past 100 years.
Annual Mean Night Temperatures

Zimbabwe Annual Mean Minimum Temperature
°C (1962 to 2004)
There is a trend towards decreasing number of cold days. There is also a noticeable increase in amplitude and duration of the mean annual deviation from the long-term average.

Most of the temperature rise was observed over the last 40 years. Five warmest years on record for Zimbabwe have occurred since 1987 and that the increased frequency of droughts since 1990 (90/91, 91/92, 92/93, 93/94, 94/95, 97/98, 01/02, 02/03, 04/05, 06/07).
Nyanga’s Av. Afternoon Temps

NYANGA MAXIMUM TEMPERATURE

YEAR

TEMPERATURE (DEGREES CELCIUS)

Nyanga’s Average Night Temps

NYANGA MINIMUM TEMPERATURES

YEAR

TEMPERATURE (DEGREES CELSIUS)

Chipinge’s Night Temps

CHIPINGE MINIMUM TEMPERATURE

YEAR

TEMPERATURE (DEGREES CELCIUS)
Chipinge’s Daytime Temps

CHIPINGE MAXIMUM TEMPERATURE

TEMPERATURE (DEGREES CELCIUS)

YEAR

Chipinge's Daytime Temperatures
Zimbabwe: rainfall patterns

- Seasonal precipitation (1901-2008) and monthly rainfall (1901-2008) trends in Zimbabwe have been analyzed.
- Negative precipitation trends are observed for the summer period.
- The month on month rainfall totals reveals an increasing in rainfall in the months of October and December.
- November, January, February and March reveal a decreasing trend. The observed trends reveal distinct patterns thus emphasizing the occurrence of floods and droughts in the country.
Zimbabwe: rainfall Analysis

Average seasonal rainfall (1901/2 to 2007/8)

\[ y = -0.4852x + 684.99 \]
30 year climatic period Moving Av.

Average rainfall (mm) for 30 year climatic periods from 1930 to 2010

Meteorological Services Zim 2011
## OLD CLIMATE vs NEW CLIMATE

<table>
<thead>
<tr>
<th>Station</th>
<th>Rainfall in old climate (annual)</th>
<th>Rainfall in new climate (annual)</th>
<th>% change</th>
<th>Blue line represents old climate Red line represents new climate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Victoria Falls</td>
<td>684.7mm (1905/06-1934/35)</td>
<td>635.2mm (1975/76-2004/05)</td>
<td>-7.17%</td>
<td></td>
</tr>
<tr>
<td>Matopos</td>
<td>598.4mm (1903/04-1932/33)</td>
<td>548.8mm (1975/76-2004/05)</td>
<td>-8.36%</td>
<td></td>
</tr>
<tr>
<td>Nyanga</td>
<td>960.3mm (1905/06-1934/35)</td>
<td>1209mm (1977/78-2006/07)</td>
<td>25.94%</td>
<td></td>
</tr>
</tbody>
</table>
Past 30yr Climate period vs Recent 30yr Climate period

Comparison of GUTU monthly rainfall in mm
(past climate 1930-60 and new climate 1980-2010)

Meteorological Services Zim 2011
Chipinge Average Annual Seasonal Rainfall (1954/55-2008/9)
Economic Sectors affected by climate Change

More adverse than beneficial impacts on biological and socioeconomic systems

Climate Changes

- Temperature
- Precipitation
- Sea Level Rise

Health Impacts
- Weather-related Mortality
- Infectious Diseases
- Air Quality - Respiratory Illnesses

Agriculture Impacts
- Crop Yields
- Irrigation Demands

Forest Impacts
- Forest Composition
- Geographic Range of forests
- Forest health and productivity

Water Resources Impacts
- Water supply
- Water quality
- Competition for water

Impacts on Coastal Areas
- Erosion of beaches
- Inundation of coastal lands
- Additional costs to protect coastal communities

Species and Natural Areas
- Loss of habitat and species
Climate and health are inextricably linked in a number of ways. Climate affects some of the most fundamental determinants of health: air, water, food, shelter and disease. It also plays a powerful role in the occurrence and spread of diseases worldwide, e.g. malaria, diarrhoea etc. Mosquitoes that carry many of these diseases tend to thrive in warmer, wetter climates. Scientists are therefore concerned about an increased risk of water-borne diseases due to global warming that changes the survival rates of pathogens, coupled with increased rain and flooding, which mobilize contaminants.
Hazards for the future due to climate change and global warming

- **EXAMPLE – MALARIA**
  - Study done by Ebi et.al, 2005
Climate Change & Malaria (potential transmission) in Zimbabwe Baseline 2000 2025 2050

Ebi et al., 2005
2025 projections: Malaria potential transmission due to climate change
2050 projection
Thank you
Tatenda
Siyabonga