Climate Research for Development (CR4D)

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Building Adaptive Capacity to cope with effects of climate change on riparian based ecosystems and livelihoods in semi-arid areas of Zimbabwe

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Presentation Outline

- Introduction and Background
- The Problem
- Objectives and Outputs
- Methodology
- Results
- Conclusions
- Outputs and Outcomes
- Challenges
- Policy Implications and Way Forward
- Acknowledgements

Introduction and Background

- Climate change and other anthropogenic stressors pose a threat to riparian areas due to altered hydrologic regimes **(Dirwe et al 2019; Stella and Bendix, 2019).**

- Climate related risks to livelihoods, food security and water resources with projected global warming of 1.5˚C **(IPCC, 2018).**

- Recurrent climate change-mediated reduction in river flow regimes compromise the ecological integrity of rivers and the resultant goods and services relied upon by the local communities **(Utete et al, 2018).**

- 70% of the population of Zimbabwe (8.4 million people) lives in rural areas and relies on rain-fed agriculture and natural resources for food security and livelihoods **(Brown et al, 2012).**

- Inadequate surface water and groundwater for rural communities due to prolonged drought periods.

- Rivers account for 90% of the Zimbabwe's water supply **(Chigwada, 2005).**

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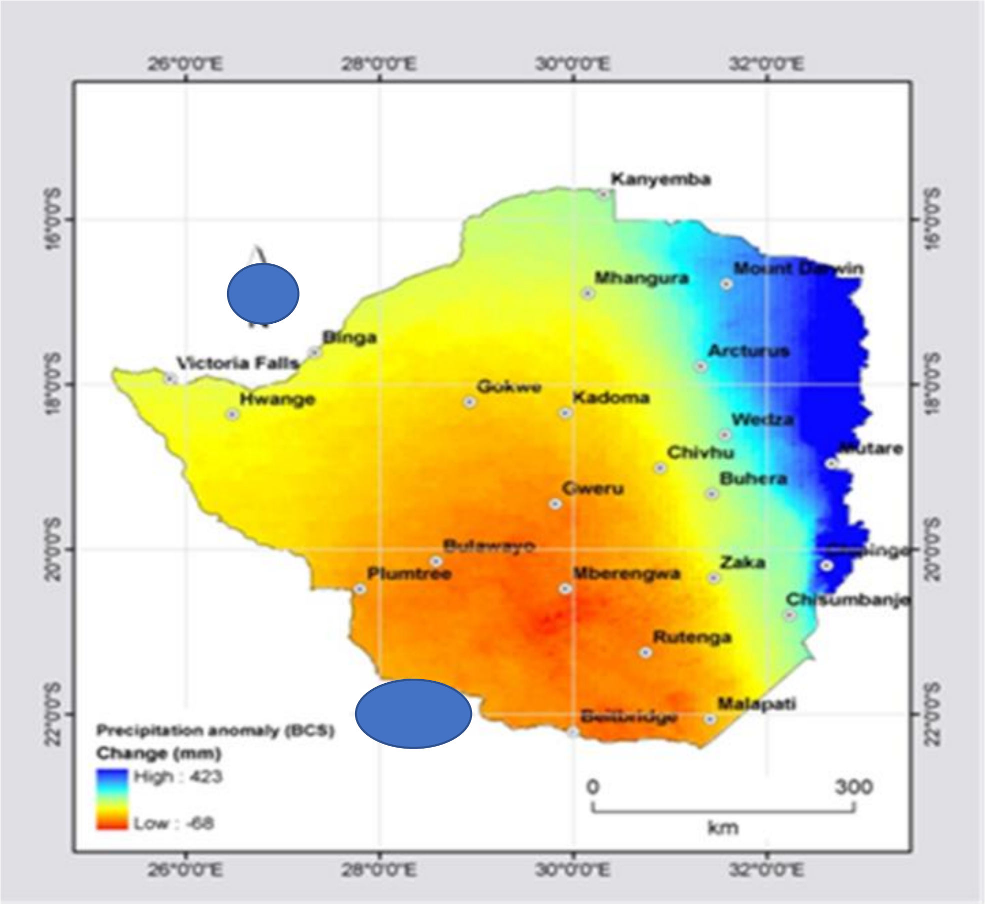
What is the problem?

- Rainfall has been erratic in the south eastern Lowveld
- Projected it to be more erratic in the near future with most models projecting a reduction in rainfall in the near-future.
- Water scarcity pose a challenge for dry land agriculture
- Affects change in phenology and hence productivity of the system
- Interacts with other multiple stressors across different land uses (eg. Communal, Protected Areas



Projected precipitation anomalies over Zimbabwe based on the difference between CSIROMK3 projections for the year 2080 and the current precipitation for the best case scenario (Zimbabwe's Second National Communication to the UNFCCC, 2014).

The Problem

Summary of extreme events in the South-East Lowveld

Event Grading	Extreme	Severe	Mild
Drought/flood years	1983, 1992	1973, 1982, 2004	1970, 1984, 1987, 1991, 1995, 2002, 2003, 2005, 2007, 2008, 2009, 2010, 2017, 2018

Aim and Objectives of the Study

Aim of the study

To explore the impact of climate change on river flow regime and riparian based ecosystems and livelihoods dependent on selected rivers in the south eastern Lowveld, Zimbabwe.

Specific objectives

a. To establish the current and model future climatic trends (temperature and rainfall) in Chiredzi, Mbire and Mwenezi District.

b. To determine the relationship between rainfall and river flow

c. To explore local knowledge on the impacts of climate change on riparian based ecosystem goods & services and livelihoods in semi-arid parts of Zimbabwe.

d. To identify livelihood coping strategies for river dependent livelihoods located along the Angwa, Manyame, Runde and Mwenezi Rivers.

e. To determine the adaptive capacity of riparian based communities in located along the Angwa, Manyame, Runde and Mwenezi Rivers.

f. Use a community-based approach to build capacity for management and restoration of ecosystems and livelihoods based on rivers.

g. Build capacity for global environmental change research by training the next generation of researchers

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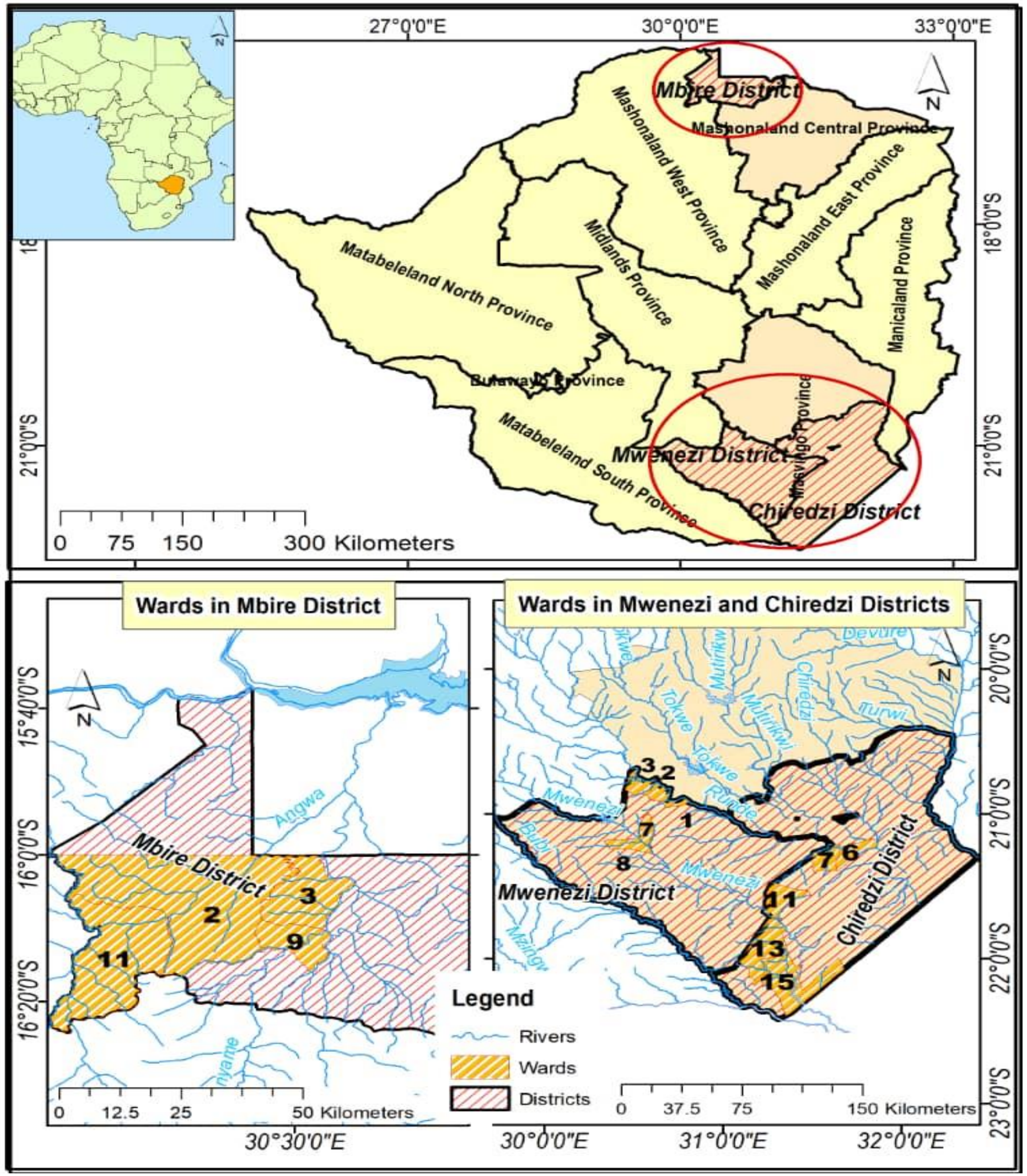
Description of the study sites



- Three rural communities, Chiredzi and Mwenezi (Indigenous Shangani People) and Mbire (Indigenous VaDoma people)
- located along the four major rivers i.e Runde River and Mwenezi River & Angwa and Manyame River respectively
- South East Lowveld covers part of the Mwenezi and Lower Runde sub catchment.
- Mbire District is located in the Mid Zambezi Valley in Mashonaland Central Province northern Zimbabwe
- altitude between 300 and 600m above sea level.
- The average annual rainfall in this region ranges between 500mm and 700mm
- mean annual temperatures that range between 25 C and 37 C.

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Methodology

- Combination of qualitative and quantitative data collection methods for the collection of bio-physical and socio-economic data.
- **Secondary data**
  - Rainfall and temperature (station and satellite)
  - River discharge
- **Primary Data Collection (Participatory Rural Appraisal Techniques)**
  - household surveys using mobile data collection (Android Phones loaded with Kobo collect software) - respondents randomly selected from purposively sampled from villages within riparian zone)
  - key informant interviews (purposively sampled)
  - 9 focus group discussions (one per ward) – Ranking Exercises, Trend Analysis, Brainstorming, Community Mapping, Problem Tree Analysis

- The **Ecosystem Millennium Assessment framework** was be adopted for the categories of ecosystems goods and services.

- The **Sustainable Livelihoods Framework (SLF)** was adopted to identify the livelihoods assets for the riparian based communities

- Field observations were done on various aspects including observations of riparian resources, socio economic status, crops grown and ground truthing for image classification.

- GIS and Satellite imagery were used to place the project beneficiary communities into a geographical landscape context.

Summary of key informants across the three districts

	Chiredzi District	Mwenezi District	Gonarezhou Conservation Trust	Mbire District
Category of key informants	Number of informants	Number of informants		Number of informants
RDC Official	1	1	N/A	1
Councilors	4	2	N/A	2
Local chiefs	2	3	N/A	0
Headman	1	2	N/A	1
Village Heads	4	5	N/A	3
Local elders	2	1	N/A	2
Local Irrigation Schemes Committee representatives	2	4	N/A	0
Technical officers (AGRITEX, HEADTEACHERS, ZINWA, CAMPFIRE OFFICERS)	4	3	3	3
Local NGOs	0	1	N/A	1
Total	20	22	3	13

Data Collection in Pictures

Participatory mapping

Focus Group Discussion

Key Informant interviews

Field observations

Field observations

Data Analysis

- The Mann Kendall trend test was performed to detect trends in mean monthly rainfall for the period 1972-2018 for both Lower Runde and Mwenezi sub-catchment
- The Mann–Kendall trend test (a non-parametric rank-based method) was used to test for monotonic trends in the streamflow records and long-term rainfall data
- Association between mean annual stream flow and precipitation was tested using the Spearman's correlation
- Data collected through the household questionnaire survey was coded by assigning numerical codes to text and then entered into Statistical Package for Social Sciences (SPSS software IBM Version 20, Chicago, USA) for analysis.
  - Descriptive statistics (frequencies) was used to summarize demographic and socio-economic data from the questionnaire response data set.
- Transcripts from KIIs and FGDs were translated to English and analysed through deductive thematic analysis was done based on themes which were predetermined by the researcher's theoretical or analytic interest in the research area and more explicitly driven.
- Maxent Modelling - Habitat Suitability Analysis in ArcGIS10.2

Climate data analysis

- A total of six downscaled Global Climate Models (GCMs) from the Coupled Model Intercomparison Project Phase 6 (CMIP6) data sets were used in assessing the likely impacts of climate change in the three districts.

- CMIP6 is a project coordinated by the Working Group on Coupled Modelling (WGCM) as part of the World Climate Research Programme (WCRP).

- The downscaled GCM data were downloaded from the following website: https://www.worldclim.org/data/cmip6/cmip6_clim10m.html.

- Temperature and precipitation data for the immediate future (2021-2040) were processed for six downscaled global climate models as in the Firth Assessment Report (AR5).

- Compared to the total set of Representative Concentration Pathways (RCPs), RCP8.5 thus corresponds to the pathway with the highest greenhouse gas emissions.

- Results for the vulnerability analysis are mostly based on the RCP8.5 representing the possible worst-case scenario.

Vulnerability Assessment

- Vulnerability assessments (VAs help to define the nature and extent of the climate change threat that may harm a given system, providing a basis for devising measures that will minimize or avoid this harm – i.e., adaptation.

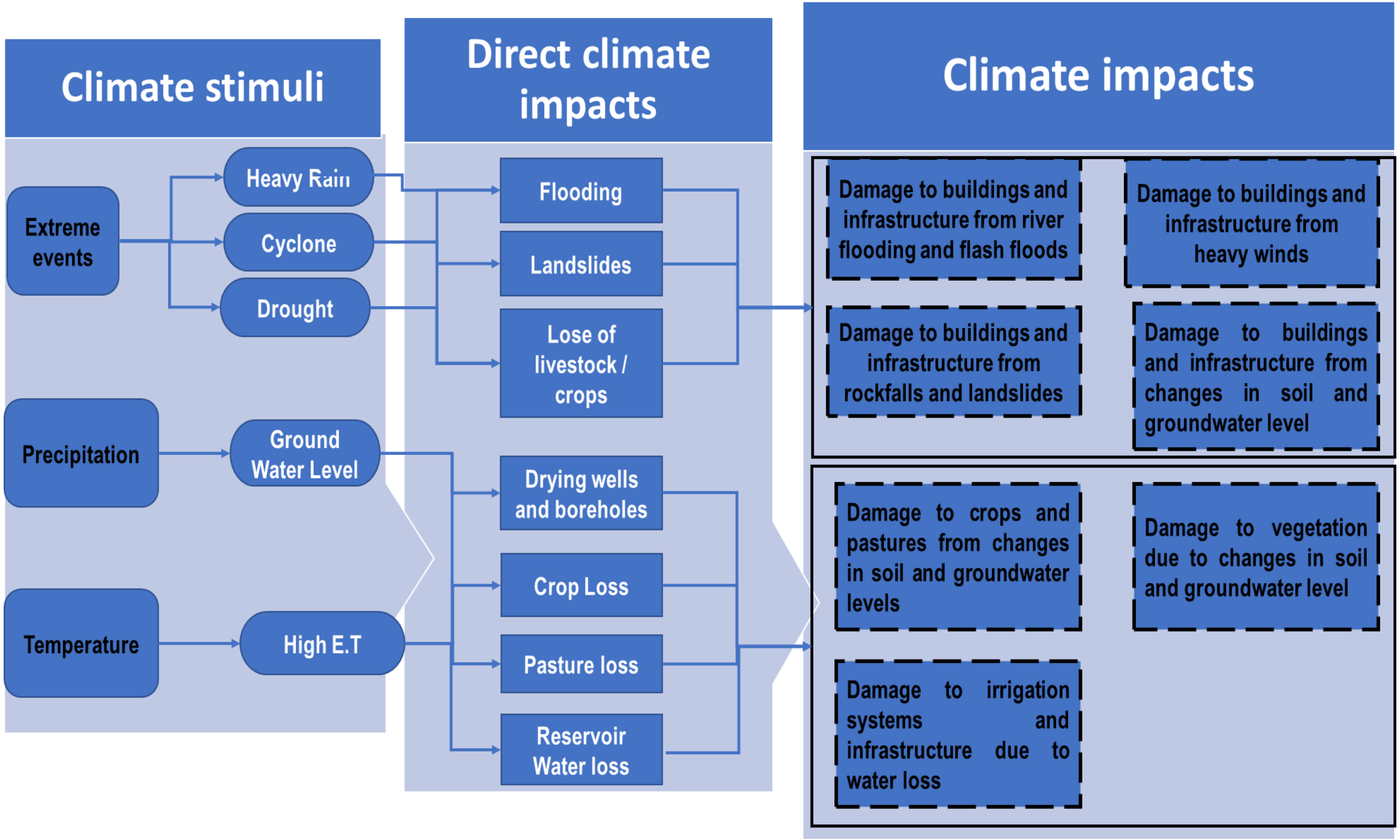
- VA - central to shaping climate change adaptation decisions as they help to define the nature and extent of the threat that may harm a given human or ecological system, providing a basis for devising measures that will minimise or avoid this harm.

- In this context, clarifying the ‘what’ in vulnerability assessments is key.

- Vulnerability of what? (e.g., people, regions, ecosystems, economic sectors) and vulnerability to what (e.g., storms, sea level rise, temperature extremes etc) – is a good first step to framing an assessment.

- Analysis done in ArcGIS10.2

Impact chain: roadmap to vulnerability assessment



RESULTS

Rainfall and Temperature Variations for Chiredzi, Mbire and Mwenezi Districts for the current climate

	Rainfall Variation				
District	Min	Max	Range	Mean	Std
Chiredzi	398.0	914	516	575.5	61.7
Mwenezi	407.0	681	274	511.4	59.3
Mbire	684.0	877	193	740.3	25.0
	Temperature Variation				
Chiredzi	20.9	24.9	4.0	23.0	0.7
Mwenezi	19.9	23.7	3.8	22.0	0.7
Mbire	19.7	25.5	5.8	23.3	0.5

- Mbire district receives more rainfall than the other two districts, whilst rainfall variability is higher for Chiredzi (range =516 mm) as compared to the other two districts.
- Mbire District on the other hand had higher temperature variability (range =5.8°C, as compared to Chiredzi (range =4°C) and Mwenezi (range =3.8°C).

Mann Kendall trend test results for Lower Mwenezi sub catchment for mean monthly and annual precipitation over the period 1972-2018

Series\Test	Kendall's tau	p-value	Sen's slope
October	-0.144	0.055	-0.277
November	-0.016	0.725	-0.046
December	0.028	0.603	0.125
January	-0.062	0.126	-0.305
February	-0.090	0.053	-0.563
March	0.020	0.740	0.083
April	0.080	0.098	0.123
May	-0.092	0.238	-0.076
June	0.116	**0.014**	0.023
July	0.160	**0.002**	0.032
August	-0.051	0.509	-0.004
September	0.082	0.346	0.045
Annual	-0.149	**0.008**	-168.000

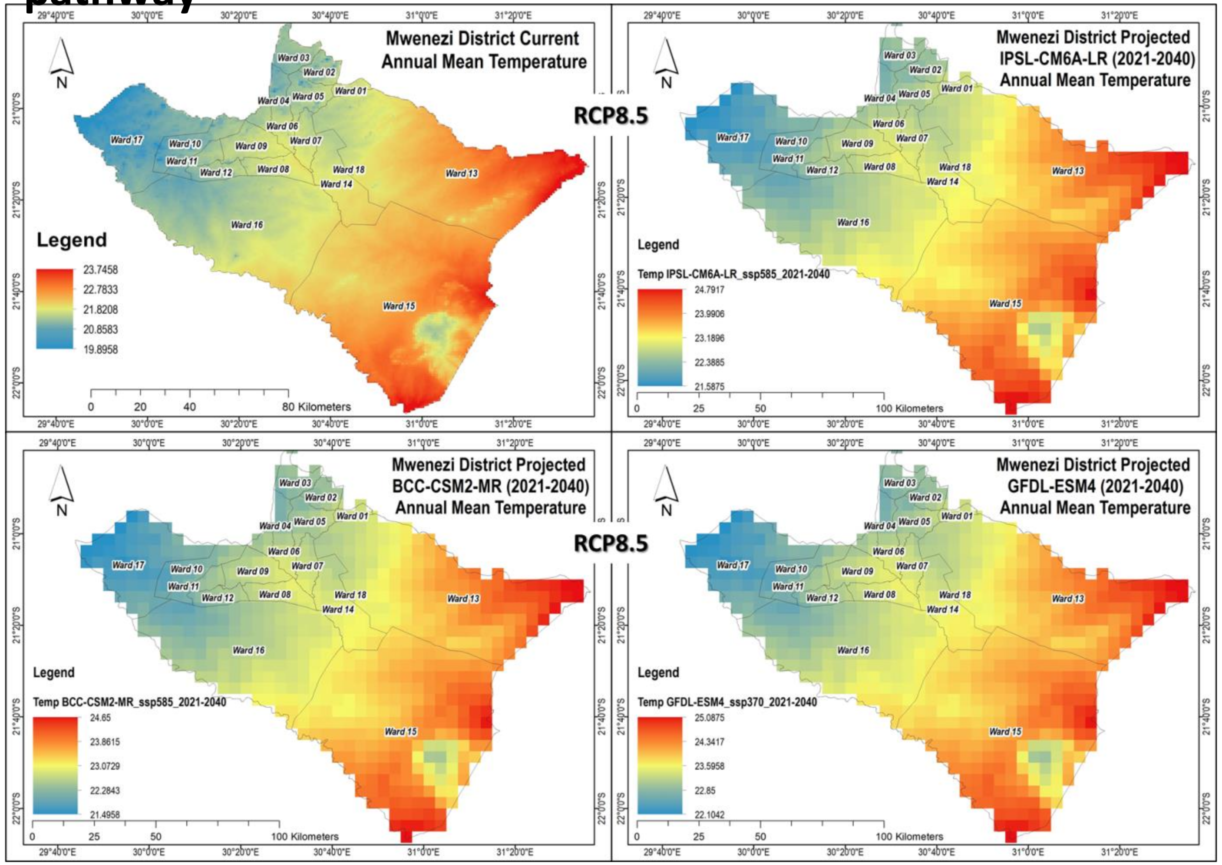
- Kendall’s Tau and the Sen’s slope indicate a positive increase in precipitation in June (p=0.014) and July (p=0.02) and a decrease in precipitation at the annual time step (p=0.008).
- The rest of the months do not indicate significant changes (p<0.05 in all cases)

Mann Kendall trend test results for Buffalo range gauging station for mean monthly and annual precipitation over the period 1972-2018.

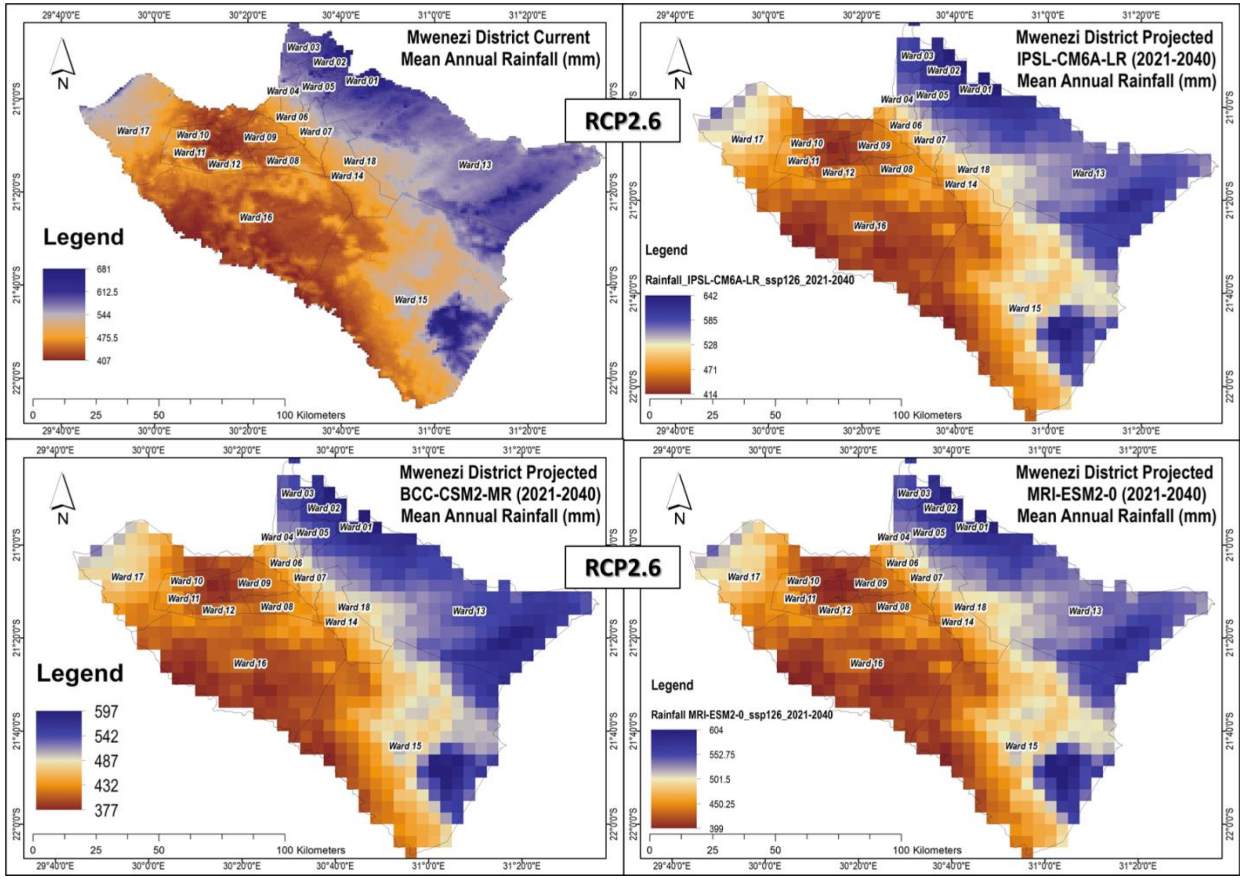
Series\Test	Kendall's tau	p-value	Sen's slope
October	-0.236	**0.000**	-0.375
November	-0.110	**0.034**	-0.342
December	-0.019	0.722	-0.083
January	-0.093	**0.005**	-0.650
February	-0.135	**0.001**	-0.860
March	0.025	0.668	0.144
April	0.048	0.309	0.077
May	-0.160	0.097	-0.175
June	0.143	**0.002**	0.055
July	0.101	**0.035**	0.020
August	-0.084	0.283	-0.033
September	0.084	0.240	0.064
Annual	-160.000	**0.002**	-180.000

- significant changes in rainfall for the wet season months October (p=0.000), November (p=0.034), January (p=0.005) and February (p=0.001); and for the dry season months June (p=0.02) and July (p=0.035).
- Kendall’s Tau and Sen’s slope show positive values for the June and July which shows an increasing trend in precipitation over the two months.
- The Kendall’s Tau and Sen’s slope had negative values for October, November, January and February indicating that there is a significant decrease in basin mean precipitation over the study period.
- The rest of the wet season months (December, March and April) do not show any significant changes in mean monthly precipitation.
- Significant decreasing trends in mean annual precipitation are also observed at annual time steps with a p value of 0.002.

Mwenezi Temperature: Current and Projected (2021- 2040) using 3 GCMS and the RCP8.5 emission and concentration pathway

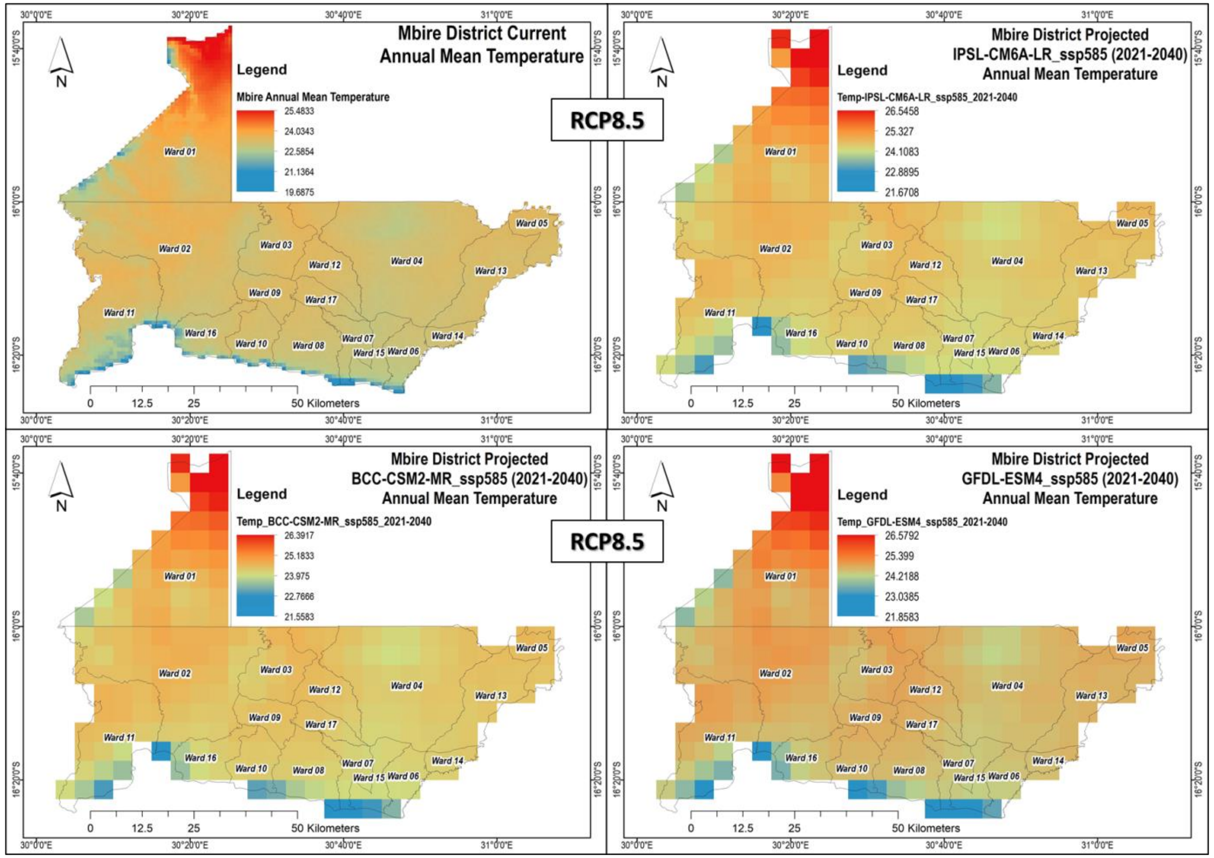


Mwenezi Rainfall: Current and Projected (2021- 2040) using 3 GCMS and the RCP8.5 emission and concentration pathway

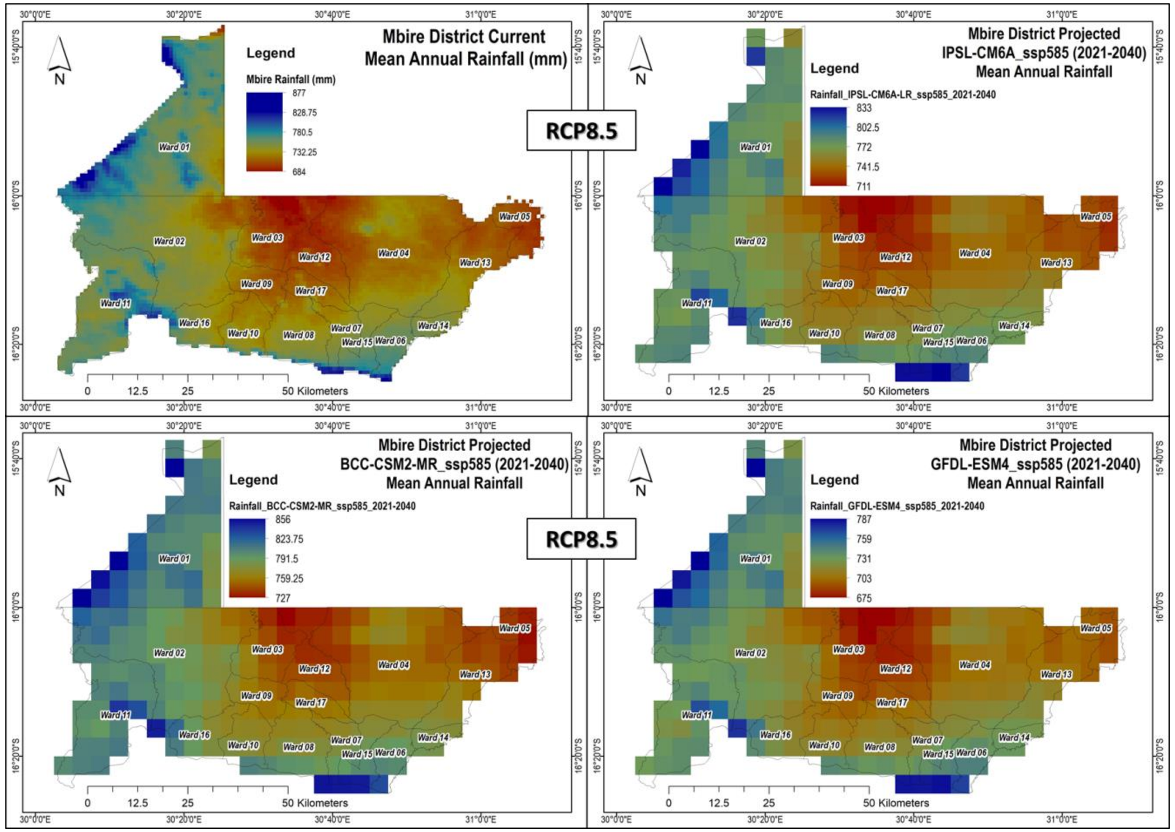


- The average of models for both RPC 2.6 and RPC8.5 for the immediate future period (2021-2040) showed a likelihood of reduced rainfall for all the models.
- Thus, the immediate future is likely to be drier as compared to the current rainfall regime and less rainfall should be expected
- The immediate future is likely to see higher temperatures for Mwenezi District.

Mbire Temperature: Current and Projected (2021- 2040) using 3 GCMS and the RCP8.5 emission and concentration pathway



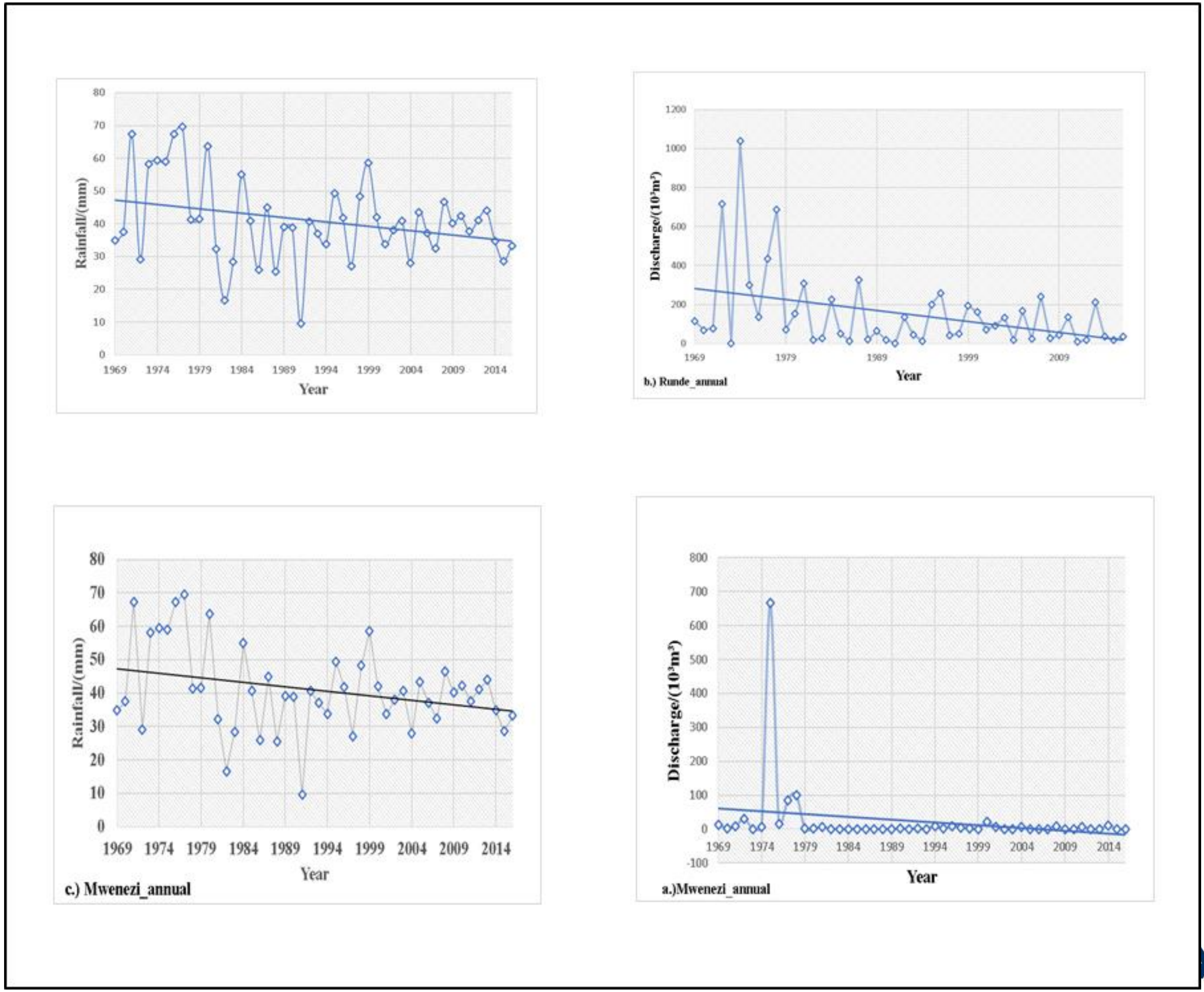
Mbire Rainfall: Current and Projected (2021- 2040) using 3 GCMS and the RCP8.5 emission and concentration pathway



- The RPC8.5 scenario also showed reduced rainfall ranging from 704.3 – 825mm. Again, this is less than the current rainfall. Thus, less rainfall should be expected in the immediate future

- there were marginal differences in temperatures for both RPC scenarios (RCP2.6 and RCP8.5)

Annual mean precipitation and stream flow trends on Lower Runde and Mwenezi sub catchments



- The low rainfall in 1972 and the early 1990s and post 2000 had a major impact on stream on Runde river recording zero flows for the year.

- A rise in the stream flow graphs for both rivers is observed in the year 2000 (Cyclone Eline) and this also coincides with high rainfall.

Mann Kendall trend test results for E83 gauge station on Lower Runde sub catchment for mean monthly and annual discharge

Series\Test	Kendall's tau	p-value	Sen's slope
October	-0.172	**0.021**	-0.588
November	-0.287	**0.013**	-61.050
December	-0.183	**0.024**	-992.412
January	-0.059	0.241	-1053.714
February	-0.233	**0.031**	-3741.313
March	-0.173	0.102	-2433.273
April	-0.112	0.154	-462.750
May	-0.231	0.061	-134.769
June	-0.227	**0.047**	-27.625
July	-0.286	**0.000**	-27.111
August	-0.234	**0.001**	-0.333
September	-0.342	**0.022**	-8.375
Annual	-0.202	**0.037**	-1743.110

Significant trends are indicated in bold

- significant decreasing trends in discharge were observed for the wet season months;
- The month of February has the largest statistically significant decrease of 3741.313m^3 as indicated by the negative Kendall's tau value and the Sen's slope magnitude.
- The mean annual discharge shows a significant decreasing trend and a large negative slope value of 1743.110m^3 which indicate a decrease in annual flows by 1743.110. m^3

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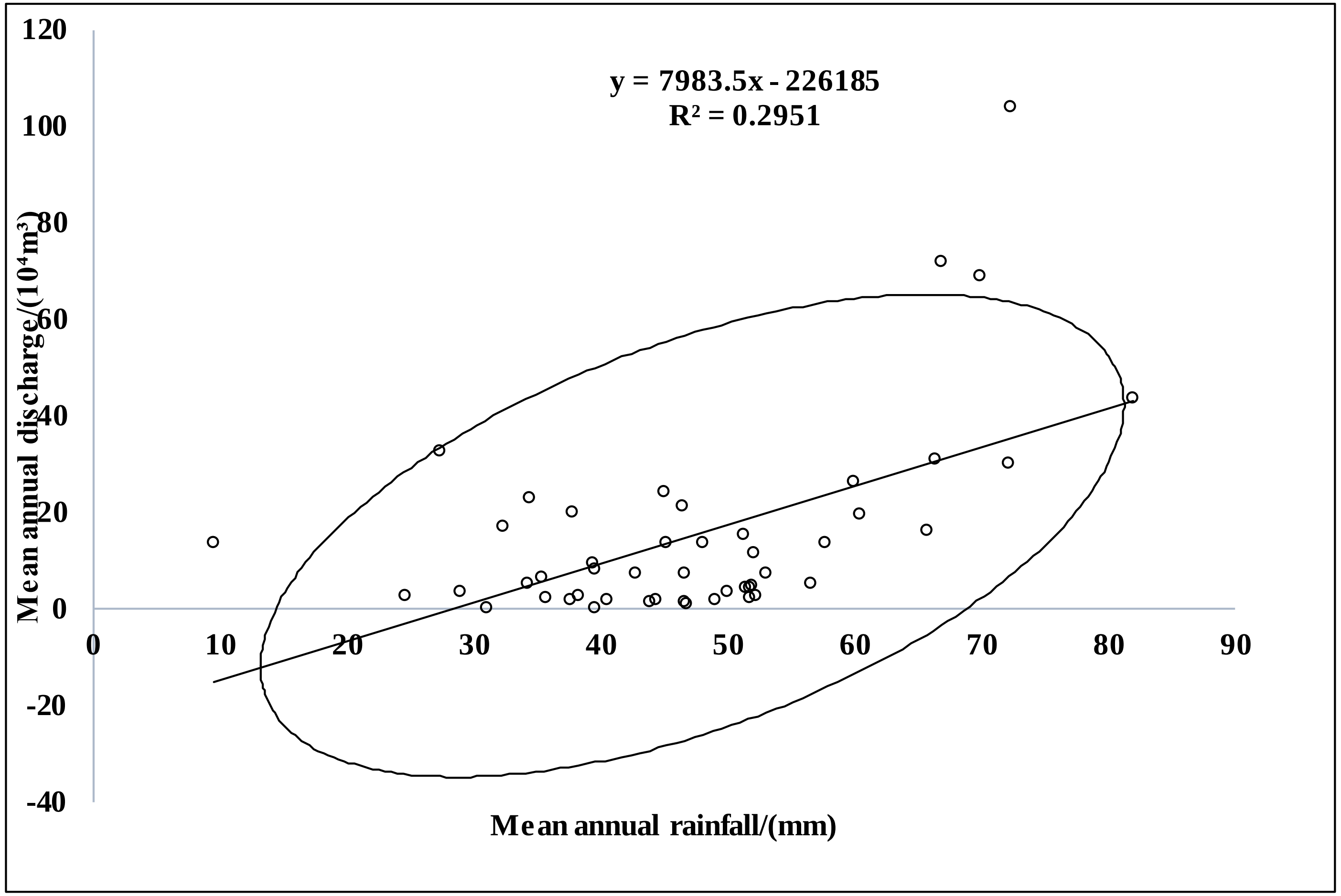
Mann Kendall trend test results at monthly and annual base for B79 discharge gauge on Mwenezi for the study period 1972-2018.

Series\Test	Kendall's tau	p-value	Sen's slope
October	-0.021	1.000	0.000
November	-0.089	0.181	-0.900
December	0.089	**0.013**	3.045
January	0.084	0.265	6.550
February	0.078	1.000	3.649
March	0.019	0.788	0.000
April	-0.015	0.864	0.000
May	0.118	0.193	1.837
June	0.099	0.254	0.188
July	0.158	0.053	0.722
August	0.084	0.343	0.000
September	-0.003	0.982	0.000
Annual	-0.177	**0.033**	-200.000

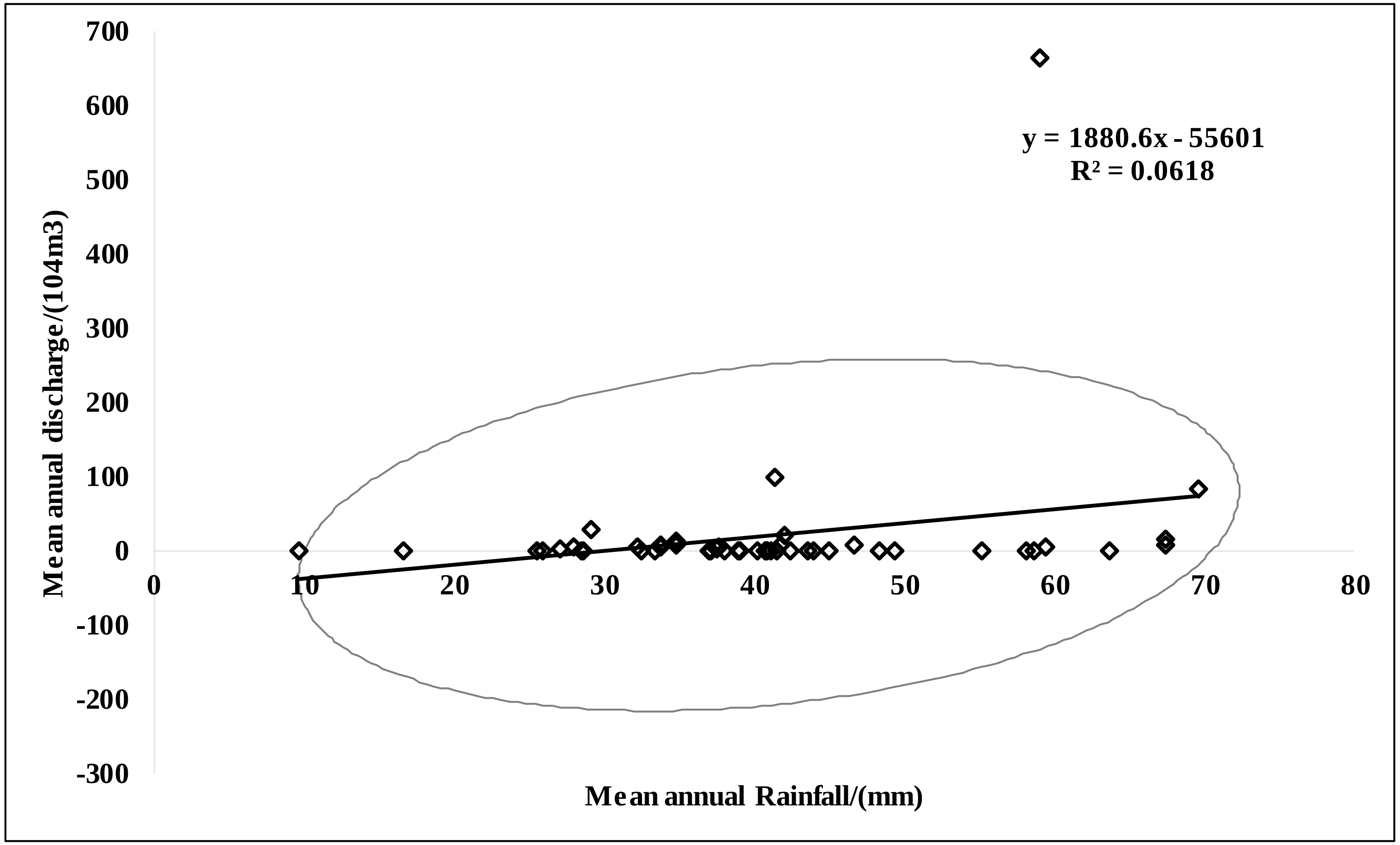
- significant increase in discharge for the month of December (p=0.013)
- There is no significant change in all the other months.
- However, there is a significant decrease in discharge at the annual time step decreased (p=0.033)

Relating stream flow and precipitation trends - Runde River



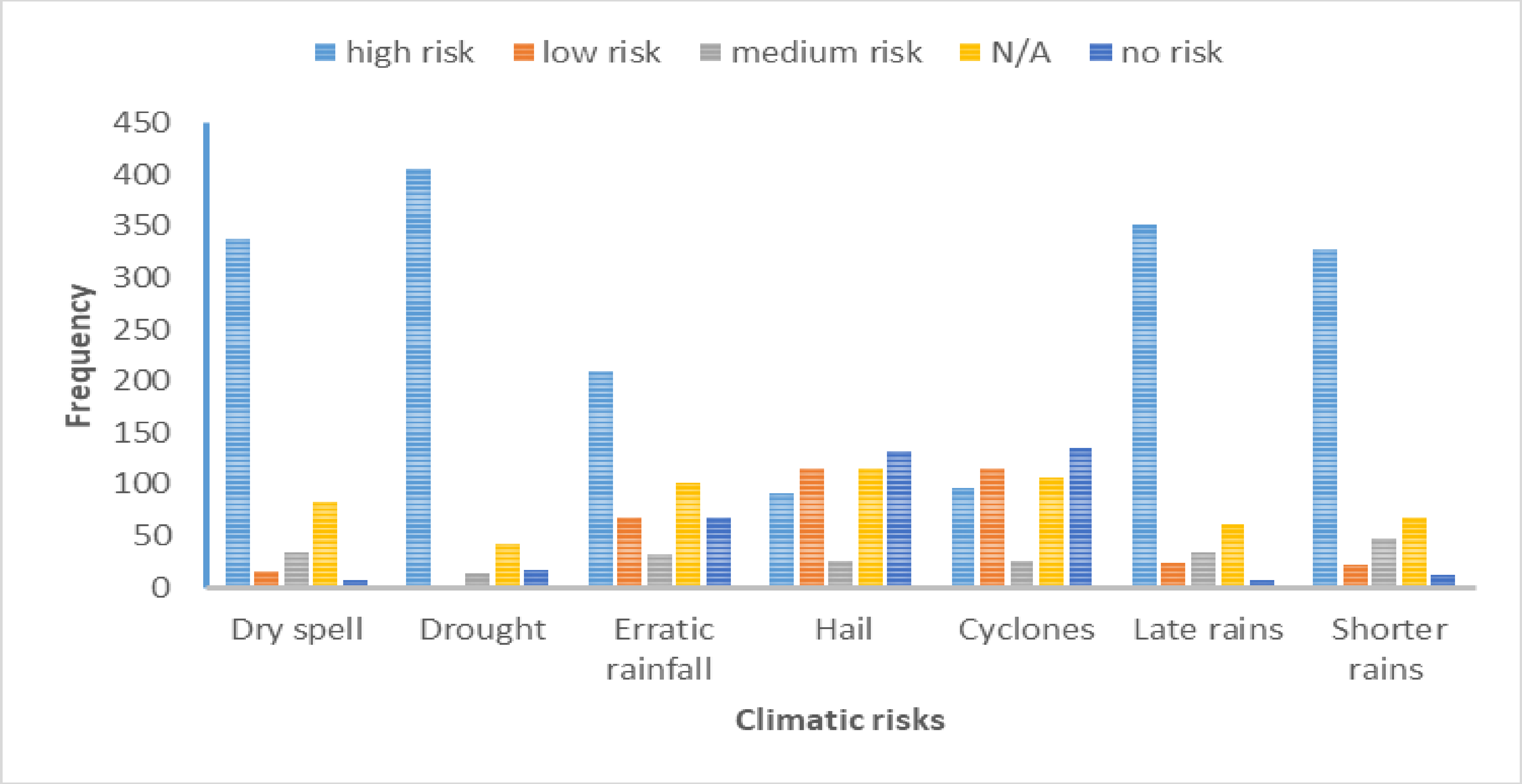
- a positive relationship (r^2- value =0.2951, p=0.008) between mean annual stream flow and precipitation.

Relating stream flow and precipitation trends – Mwenezi River



- no statistically significant association between stream flow and precipitation (r^2 =0 .0618, p=0.653)

Local Knowledge regarding climatic risks



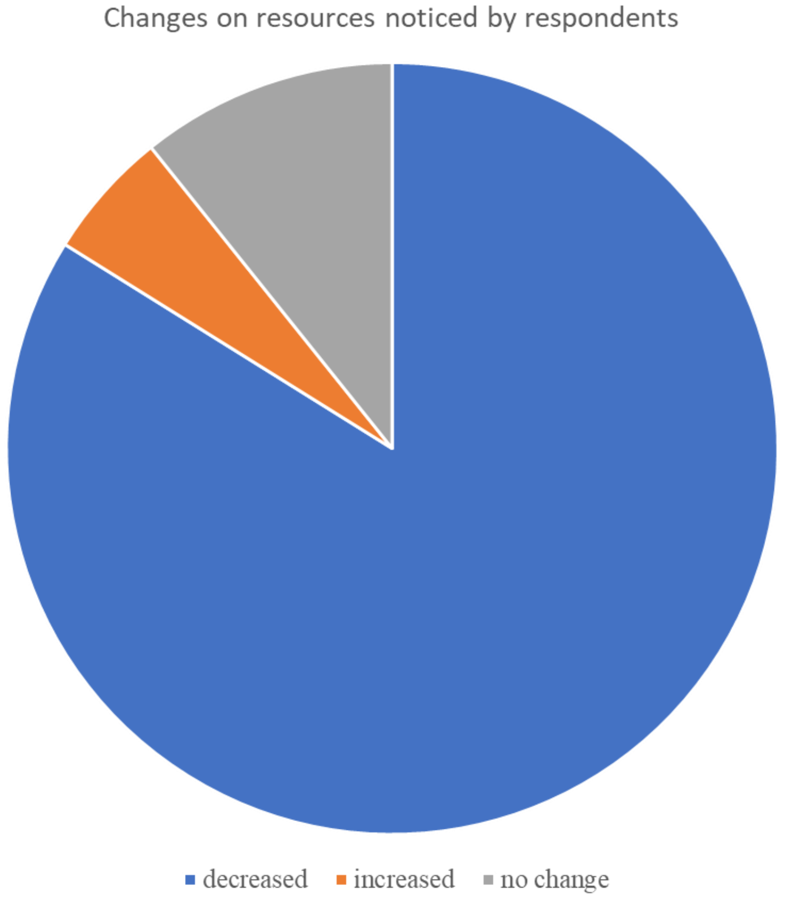
Local Knowledge on river flow trends and riparian goods and services

- Key informants and FGD participants reported the following annual trends of water flow in Mwenezi river:
  - In January water flow will be VERY low;
  - February it will be Very high ;
  - March moderate April and May it will be low ;
  - June it will be very low and from July to December water flow will be very low close to zero

- The Shangani Indigenous women can narrate how the changing climate had impacted the flow regime of the Mwenezi River and phenology and availability of flora and fauna from their vicinity.

- The key species used included Adansonia digitata, Tamarindus indica and the Strychnos species (S. cocculoides and S. madagascariensis).

Local Knowledge on changes in riparian based resources



- area has seen a remarkable decrease in resources over the past 5 years due to climate change.

- Ecosystem services no longer available, for instance fish from the river have decreased.

- Because of the changes in seasons, people have now resorted to nature for a living, for instance cutting firewood for sell, sand mining and brick moulding.
  - all these coping strategies have resulted in heavy damage to the riparian ecosystems hence facilitated in the general depletion of resources

- From the respondents it is very clear that the dry spells are increasing and this has posed high risk on the natural resources on which people depend on.

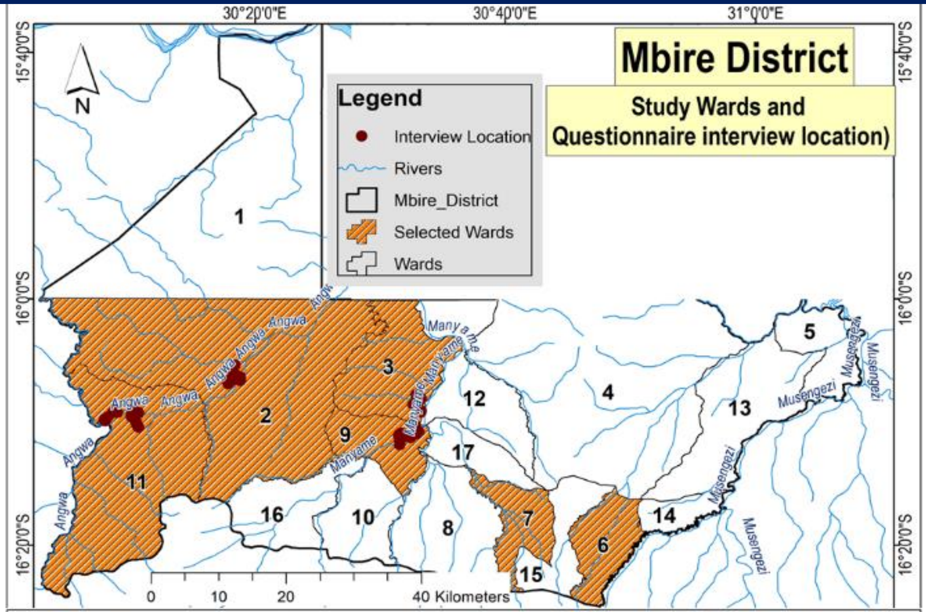
Local community perceptions of impacts of climate change and climatic hazards on riparian based ecosystem goods and services

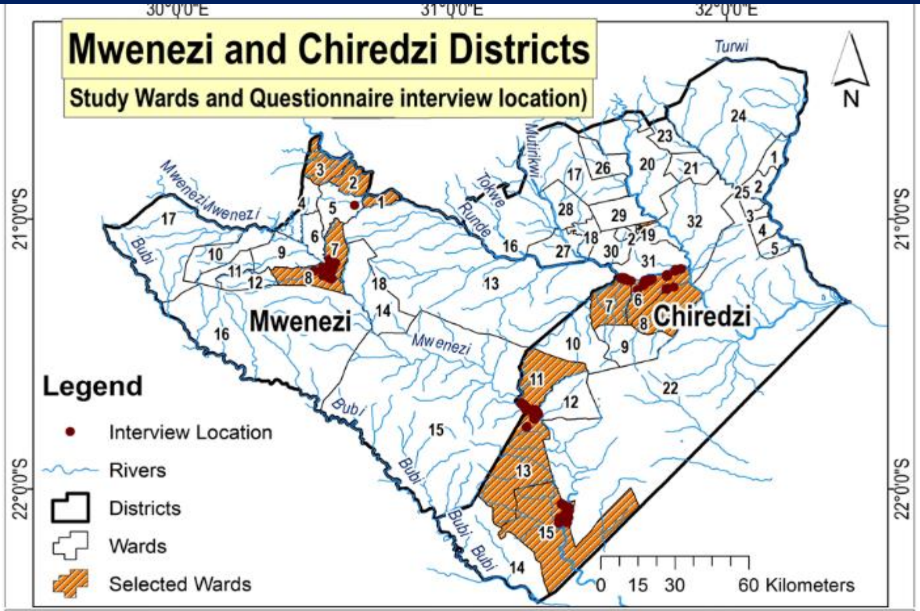
Perceived impacts of climate change and climatic hazards

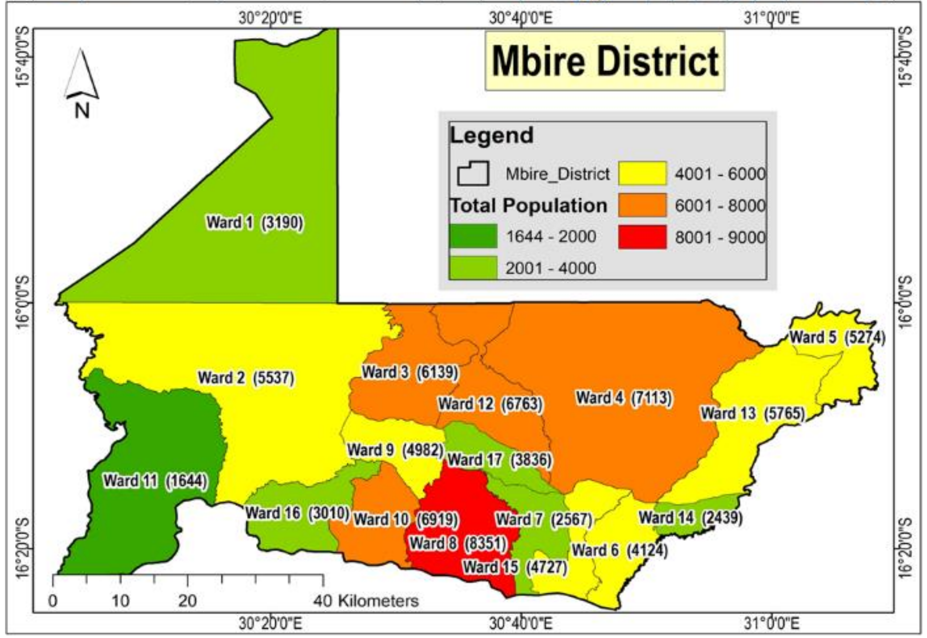
Category	Description	Low Impact	Medium Impact	High Impact	No Idea
Provisioning	Fish	15	11	94	39
	Fruits	11	21	85	42
	Fibre	26	21	67	45
	Wood	19	22	76	42
	Clean Water	16	26	71	46
	Medicine (e.g. Plants)	12	25	64	58
Supporting	Soil formation	33	13	46	67
	Biodiversity (Flora & Fauna	12	21	56	70
	Habitat	34	17	34	74
Regulation	Climate regulation	29	21	40	69
	Pollination of crops	32	25	28	74
	Control Flooding	28	30	28	73
	Store Carbon	29	29	28	73
Cultural	Inspiration	18	12	55	74
	Recreation	30	22	31	76
	Education	38	18	29	74
	Aesthetic	25	22	37	75

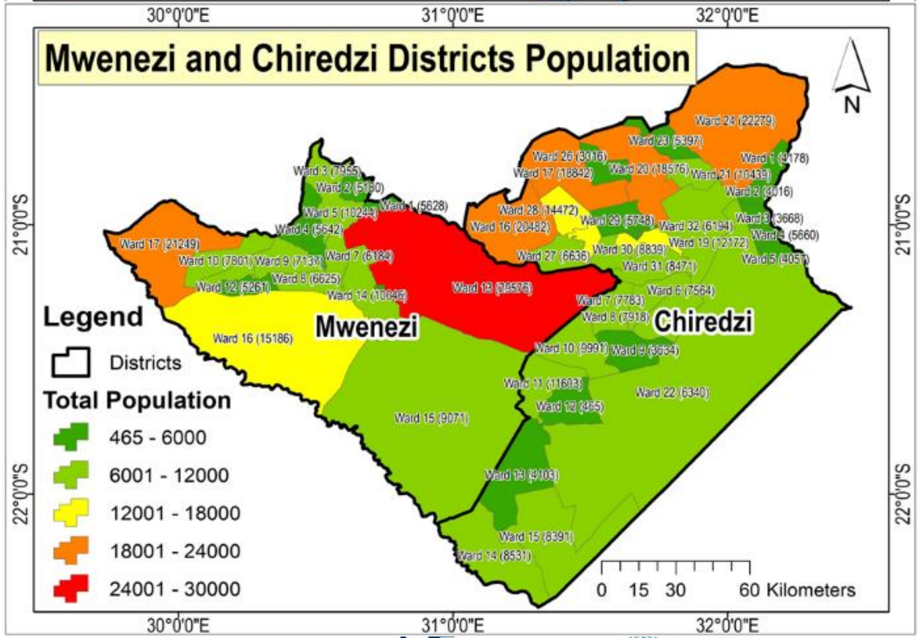
Impacts on physicalasseassts and ecological infrastructure

Demographic profile of the 3 Districts

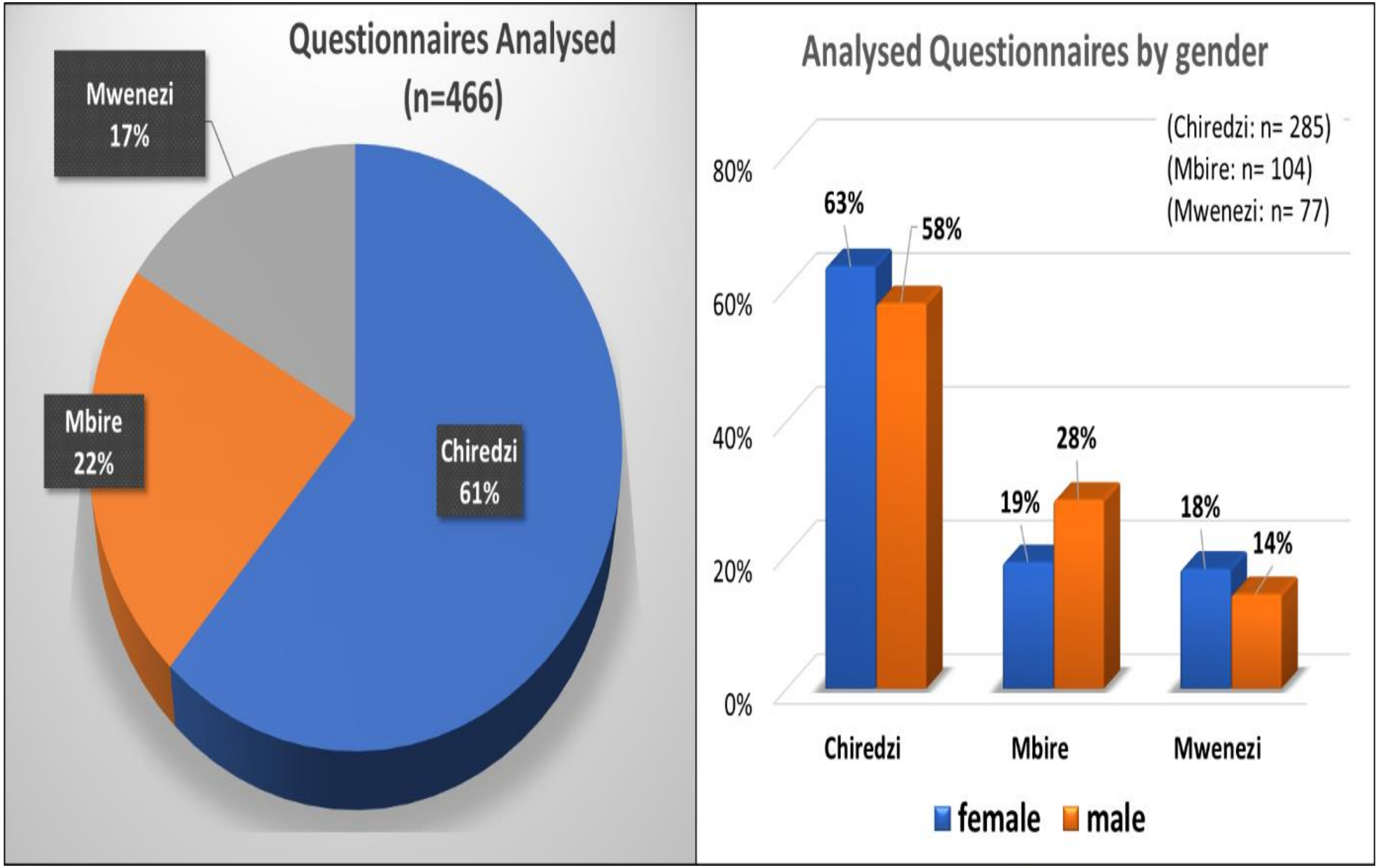




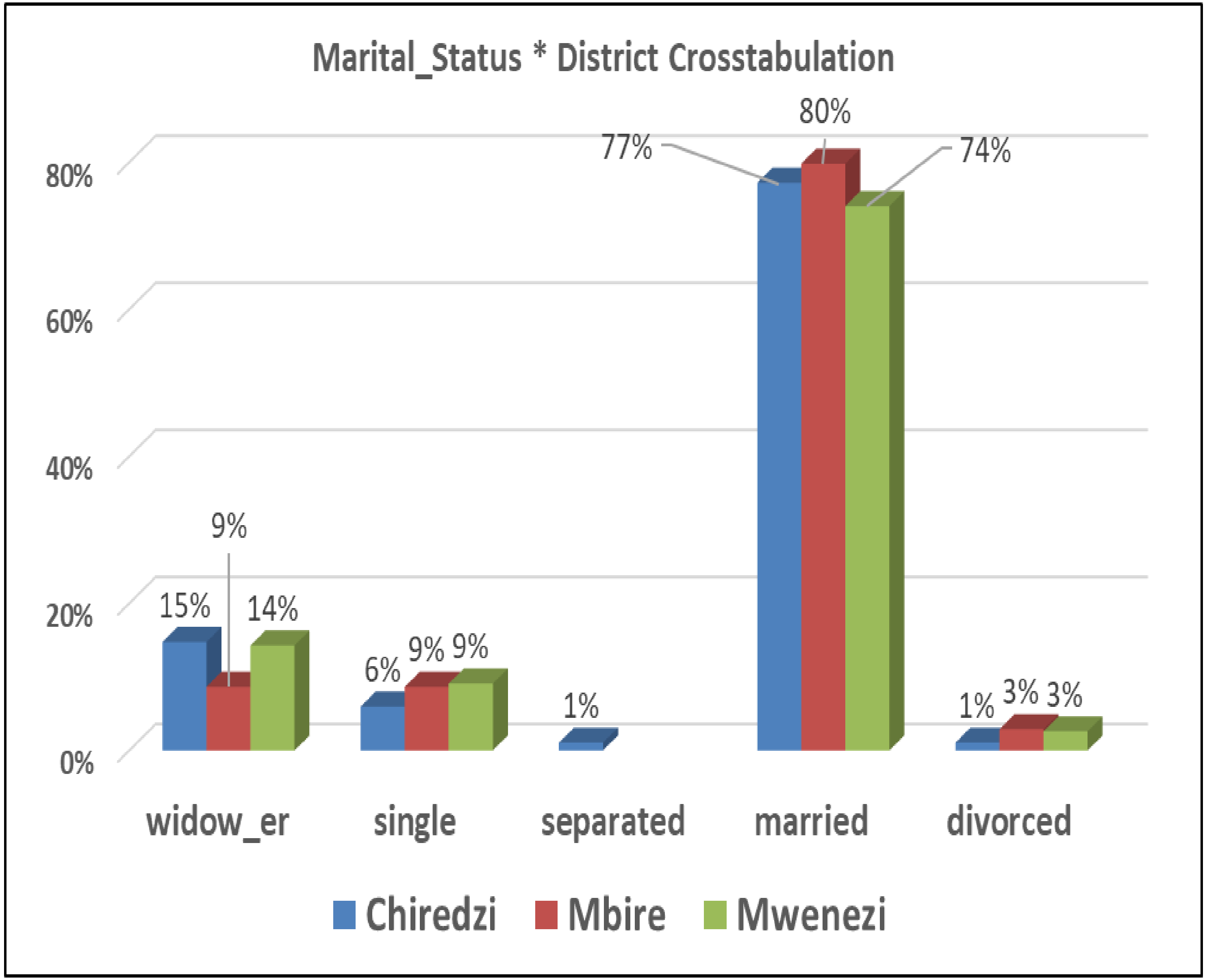




Summary demographic profile of respondents



Clarifying the 'what': People



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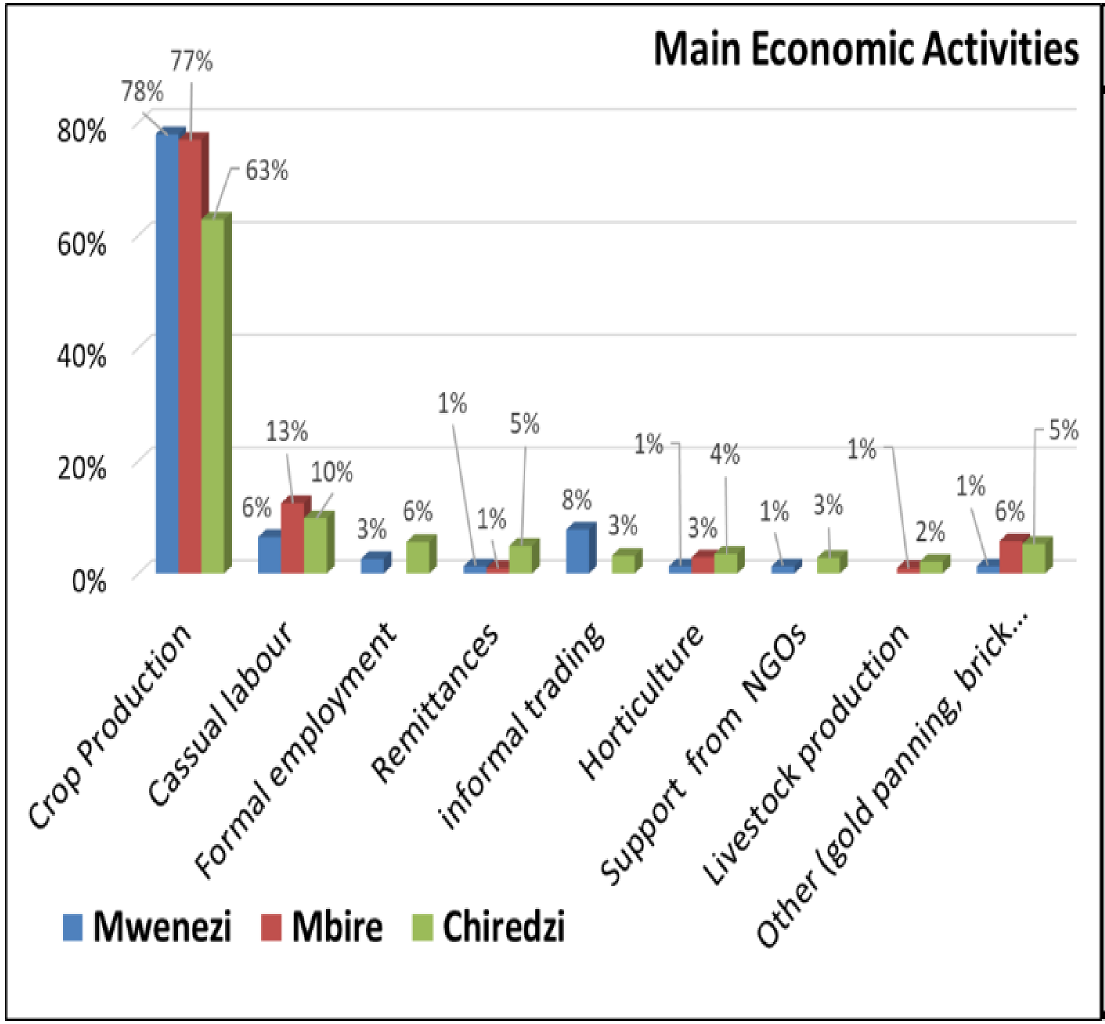
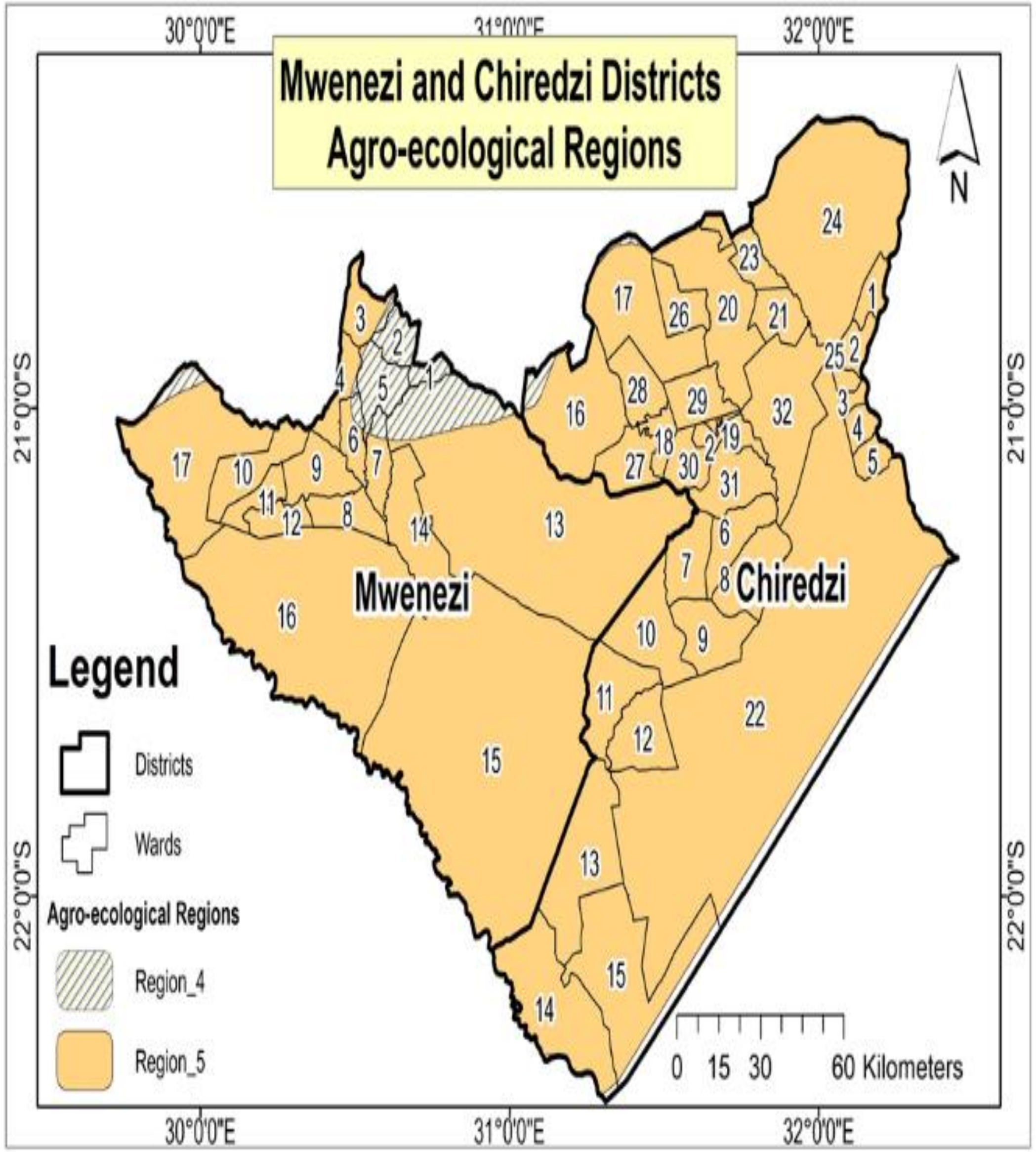
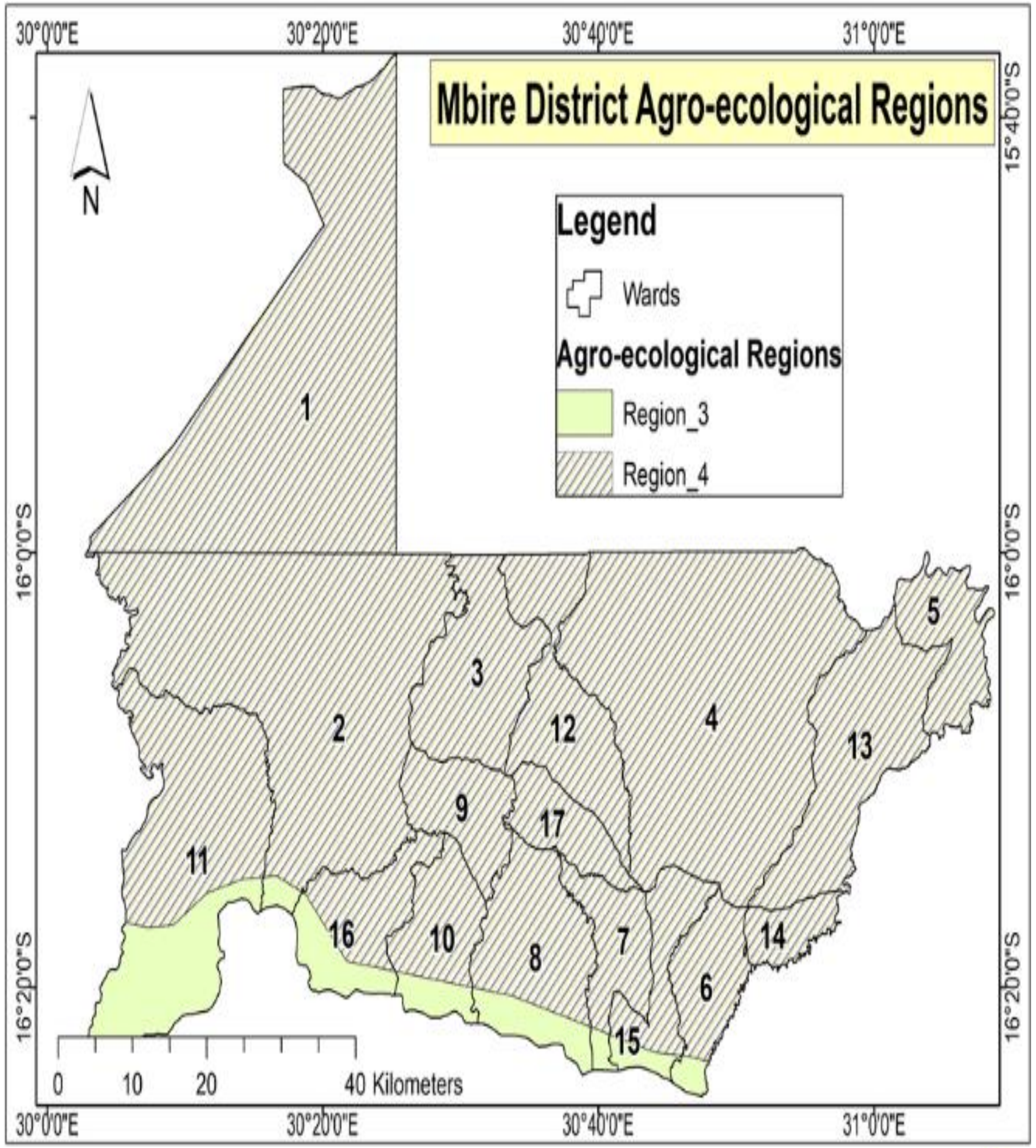
Clarifying the 'what': Economic Systems



	Mwenezi	Mbire	Chiredzi	Total
Crop Production	60	80	179	319
Casual labour	5	13	28	46
Formal employment	2		16	18
Remittances	1	1	14	16
informal trading	6		9	15
Horticulture	1	3	10	14
Support from NGOs	1		8	9
Livestock production		1	6	7
Other (gold panning, brick moulding, weaving, pension)	1	6	15	22
Total	77	104	285	466

Clarifying the 'what': Regions





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Vulnerability to "what": Current temperature and rainfall variation

Rainfall Variation					
				Mean	**Std**
Chiredzi	398.0	914	516	575.5	61.7
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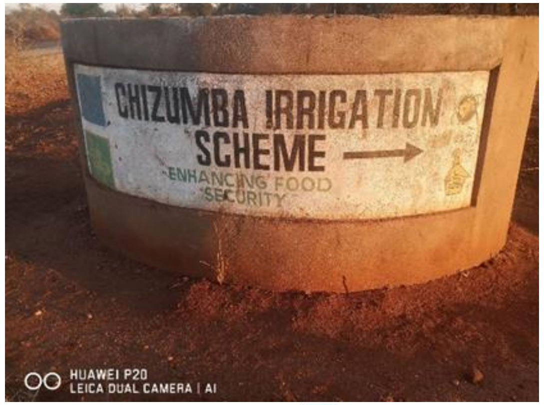
Vulnerability of ‘what’: Pastures (rangelands)

- For this study, rangelands were defined as any extensive area of land that is occupied by native herbaceous or shrubby vegetation which is grazed by domestic herbivores.
- For the determination of the extent of suitability of rangelands, all areas with grassland, wooded grasslands and bushland/shrubland were grouped together into the rangeland category.
- High resolution satellite imagery from google earth were used to identify these land cover categories.
- Under the current climate, the three districts had high values for maximum suitability with Chiredzi (92%), Mwenezi (94%) and Mbire at 90%.
- parts of these districts which are very suitable for grasslands.
- The disaggregation of grassland suitability by ward showed that Chiredzi had 11 districts out of 32 with maximum suitability above 70%
- On the other hand, Mwenezi district had 11 districts out of 18 with maximum suitability exceeding 70%
- Mbire district had 7 out of 17 districts with maximum suitability exceeding 70% .

LEK on Nature Based Solutions Nature based solutions



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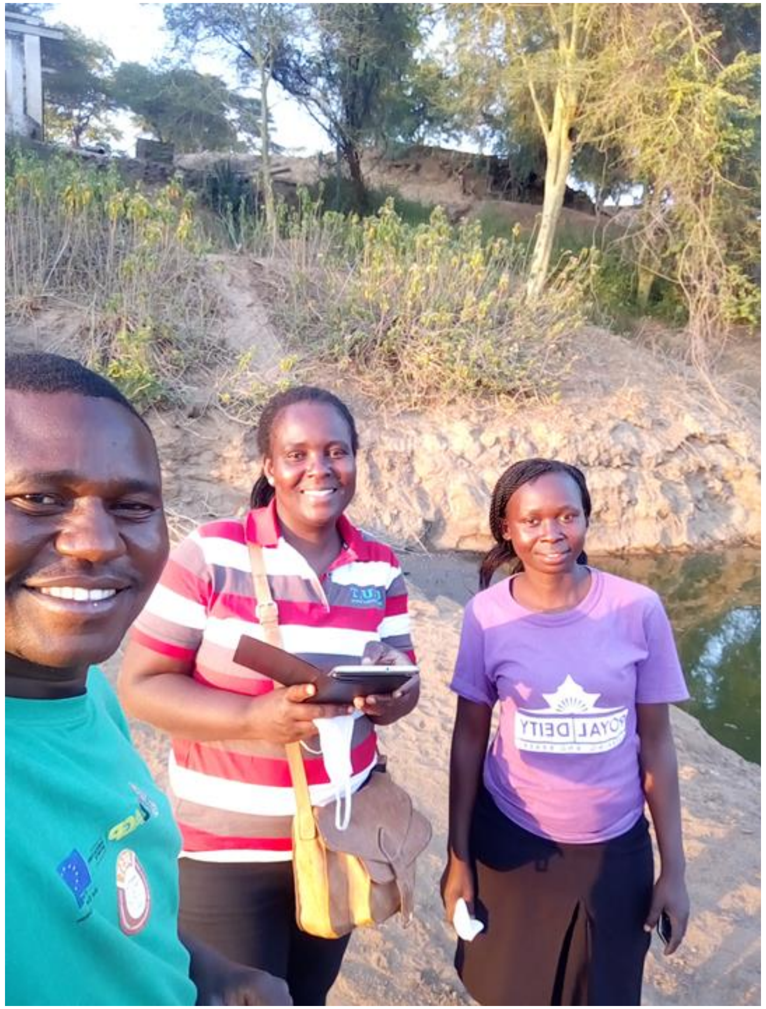
Safeguarding Activities……….

Engine site for the Chilonga irrigation Scheme



Dredging of the heavily silted Runde River

Conclusion

- The future will be characterized with higher temperatures and less rainfall
- Most wards will become unsuitable for pasture / rangeland.
- Rearing livestock will be difficult in future
- The three study districts are vulnerable regions owing in part to:
  - lack of financial, institutional and technological capacity, low adaptive capacity, endemic poverty, low technology uptake, and dependence on rain fed agriculture.
- This was evident from the demographic profile of respondents (e.g., high population, lack of significant tertiary qualifications, dependence on rainfed agriculture) as is the case for most wards in most districts.

Conclusion

- Understanding local knowledge of climate change and community-based strategies for resilience are important in the face of a changing and unpredictable climate
- Need to embrace sustainable solutions to climate change impacts in light of the current LEK
- Ecosystem restoration vital to promote healthy ecosystems for resilience building
- People need to adopt better technologies to adapt to the changing climate.
- Adaptations to include adopting irrigation, rainwater harvesting, greenhouse-based horticulture production
- People should be willing to grow more of the so-called small grains as an adaptation measure to climate change.
- Instead of livestock production, people should consider wildlife-based livelihoods like wildlife tourism, etc

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Outputs/Outcomes

Vulnerability assessment and mapping of adaptive capacities for riparian based rural communities

Documentation of local knowledge on strategies used by riparian based communities to cope with changes in the flow regime of perennial river systems

Documentation on how livelihoods and riparian ecosystems goods and services have been impacted by climate change

Capacity bulding of institutions and practitioners (hydrologists, fisheries unit, environmentalists, climate change managers, local NGOs) involved in water resources management

Post Doc Dissertation
2 Master of Science dissertations, 2 Female MPhil, 1 Book Chapter, 3 manuscripts in progress, 3 Technical reports and
Policy Briefs

SDGs (1, 2 , 13 and 15), Agenda 2063, IPBEs, COP26 priorities (Adaptation & Resilience; Nature), National and Sub-national Policies and Development Plans
IPCC Reports; Nationally Determined Contributions under Paris Agreement

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Outputs/Outcomes

- 5 Manuscripts under development
- 6 Symposium Presentations e.g COMA, UKCDR (4 Virtual and 2 Physical) and 1 Project showcase
- Training manuals and Field Reports
- Community Engagement – Inception, Feedback and Validation Meeting
- Mentoring and Skills building

SUPPORTING COP26 PRIORITIES THROUGH RESEARCH ON INTERNATIONAL DEVELOPMENT & CLIMATE CHANGE

UKCDR WEBINAR
THURSDAY 12TH NOVEMBER
14:00-15:30 (GMT)

Showcasing impacts resulting from UK-funded research on climate change + global development, sharing learning and providing networking opportunities.

- Modern Energy Cooking Services *(Prof Ed Brown, UK Low Carbon Energy for Development Network)*

14:50 – 15:15 PANEL 2: SHOWCASE PRESENTATIONS AND Q&A

- Improving how knowledge on forests and trees is understood and used to tackle the climate crisis *(Dr Robert Nasi, Centre for International Forestry Research (CIFOR))*
- Safeguarding riparian ecosystems and livelihoods as safety nets and in the face of a changing climate change: insights from a semi-arid savannah, Zimbabwe *(Dr Olga Kupika, Chinhoyi University of Technology)*
- Development of Coastal Bangladesh Under Climate Change Scenarios *(Prof Robert Nicholls, Tyndall Centre for Climate Change Research, University of East Anglia)*

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Publications

Non-journal

- Kupika O.L (2020) Building adaptive capacity to cope with effects of climate change on riparian based ecosystems and livelihoods in semi-arid areas of Zimbabwe. In UKCDR's webinar, "Supporting the COP26 priorities through research on international development and climate change" UK-Funded Research Project Showcase Booklet.

Book Chapter

- Mwera P, **Kupika O. L.** and Moyo E.N. (2021) Perceived Impacts of Climate Change on Riparian Ecosystem Goods and Services: A Case Study of Rural Communities Living along Mwenezi River, Southeast Zimbabwe, In Nyikahadzoi K and Mhlanga L (eds) Climate Change Impact, Adaptation and Mitigation in Zimbabwe Case Studies From Zimbabwe's Urban and Rural Areas. Published by KAS & UZ.

MSc Projects

1. Chipere Ronald (C108833A) Investigating the interactive effects of land-use land-cover changes on stream flow and vegetation productivity on Mwenezi and Lower Runde sub catchments (2020)
2. Mwera Petros (C19135858B) Local community perceptions of riparian based ecosystem goods and services in the face of climate change: a case study of rural communities living on the edge of Mwenezi River southeast, Zimbabwe

MPhil Project

Ruth Chinomona : Ethnobotanical Survey And Conservation Status Of **Riparian Indigenous Woody Plants Used To Promote Drought Resilience**: Case Study Of Sengwe Communal Area.

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Publications

- **OPeD**

Indigenous people are using nature based Non-Timber Forest Products (NTFPs) solution to mitigate against climate change: insights from the Shangani people in Zimbabwe (Under Review)

- **Podcasts**

Africa Climate Conservations:

https://anchor.fm/sophie-mbugua/episodes/Community-Driven-Climate-Solutions-eia3na/a-a2vn2fn

- **Dissemination Videos**

International Women Day Video by CUT Marketing and Publication Department
https://www.facebook.com/hue.mutema/videos/10215594752662292

Chipere R, Olga Laiza Kupika, Tongai Mwedzi and Webster Gumindoga (2020) Interactive effects of land-use and climate change on streamflow and riparian forest productivity: Lower Runde and Mwenezi Catchments, Zimbabwe, 21st WaterNet/WARFSA/GWPSA Symposium, Integrated Water Resources Management for Sustainable Development in Eastern and Southern Africa, 28 October 2020.

Achievements

- University Focal Point and Facilitator for National Climate Change Mainstreaming Programme – Provincial Development Plans- Collaboration between University and the Ministry of Environment, Climate, Tourism and Hospitality Industry
- Improved networking and international and regional collaborations (e.g.Partner in OVERCOME Project and KAZA Livelihoods Monitoring Project)
- Committee Member Climate Change Learning Strategy (launched in April 2021).
- Participated in Workshops on National Climate Policy Issues eg NAP
- Nominated to the Gonarezhou Conservation Trust In Country Working Groups in the Great Limpopo TFCA (Community Livelihoods, Health, Water & Food Security ; Conservation, Wildlife Management and Veterinary)
- Funding for CIRCLE ISP and Research Uptake.
- Appointed member of the University Research Committee
- Education 5.0 Champion Representative

Training And Capacity Building in pictures

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Challenges and Opportunities

- Covid 19 Pandemic Lockdown
  - Health risks
  - Delays in data collection
  - Postponement of planned engagements e.g. Adaptation Futures Conference
  - Travel ban restrictions (no visit to external host institution)

- Climate Data availability - station data (most stations not working) – rely on satellite data

- River discharge data not available - gauging stations not working

- One female MPhil student migrated to SA (locked down)

Policy Implications and Way Forward

- Climate Proofing - mainstreaming climate change into adaptation and mitigation strategies and programmes into local development plans
- Design green technology sustainable solutions to harvest clean river water for livestock, irrigation and domestic purposes
- Education and awareness to promote sustainable land use and water management systems (ESD)
- Women Indigenous Peoples (IPs) engagement and empowerment for improved river health and NTFPs value chains (for neglected riparian indigenous wild plants) and food production systems (Gender Inclusion)
- Develop a Model for transboundary riparian ecosystems assessment and ecosystem restoration projects e.g. afforestation and reforestation (mitigation) in the MZBR and the TFCAs.
- Develop a toolkit (adopt the SES Model) for community based real time/ digital monitoring of riparian ecosystems goods and services.
- Enforcement of laws to halt river bed cultivation and degradation & restore ecological infrastructure
- Access and Benefit Sharing Mechanisms - Motivate for Payments for Ecosystem Services (PES) schemes as an innovative approach to nature conservation in TFCAs.

Acknowledgements

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