



Summary: Future climate projections for Malawi

Introduction

The UMFULA research team of the Future Climate for Africa (FCFA) programme has analysed 34 Global Climate Models that provide projections for Malawi to try to distil robust messages and some key trends that may help planning and decision-making. Because each model simulates atmospheric processes slightly differently, they show a range of different outcomes for temperature and rainfall. We first look at recent trends, before considering what the future climate might hold. This is a summary of a longer brief on future climate projections for Malawi¹.

Future climate

Based on analysis of 34 models of climate projections, what might the future climate look like in Malawi?

warming throughout the country, from 0.5-1.5°C. By the 2090s, we see a stronger projected trend for warming from 2.3-6.3°C (Figure 1).

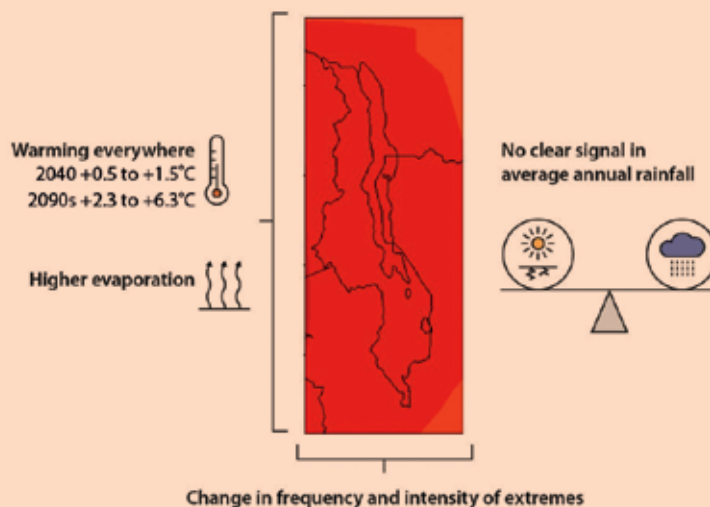
Temperature

In temperature, we see strong agreement between the models, implying that these are robust projections. By the 2040s, we see

Other things being equal, warmer temperatures are likely to increase evaporation from soil and open water.

Figure 1: Summary of climate changes in Malawi

Map shows warming is evenly distributed across Malawi



Past climate

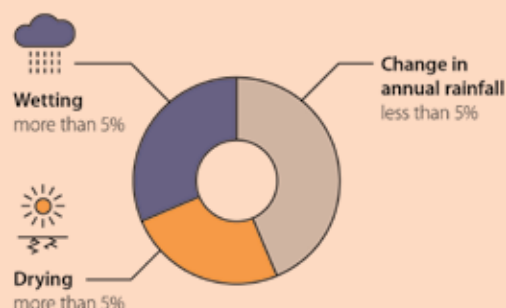
The following is evident from recent climate trends in Malawi:

- Annual temperatures are increasing (warming is occurring)
- There is a lot of variability in rainfall amounts and seasonality (i.e. when the rain falls), but there is an overall drying throughout the country. Moderate wetting trends can be seen in central and northern parts of Malawi

Rainfall

In terms of annual total rainfall, the models are highly varied (Figure 2).

Figure 2: Proportions of climate models projecting small changes (less than 5%), drier and wetter conditions across Malawi



Out of 34 models, almost half show that changes in rainfall are likely to be less than 5%, whilst the rest disagree on whether it will be wetter or drier – this means we have lower confidence in projections of future rainfall changes

Malawi's climate is diverse, with the country divided into two main climatic zones that experience different rainfall seasons. Country-wide averages disguise this geographical variation.

Taking an average of the 34 models, we see small changes by the 2040s. We see stronger trends if we look at seasons.

For September-October-November (spring/early summer) we see a likelihood of drying of up to 10%.

For December-January-February (summer), we see an overall small increase in rainfall in the country of up to 4%. By the 2090s, we see larger projected changes.

Extreme events

As climate evolves we will see an overall increase in the frequency and intensity of heatwaves. All models show an increase in the number of days with temperatures above 30°C (a threshold sometimes used to examine the sensitivity of maize to heat stress) (Figure 3).

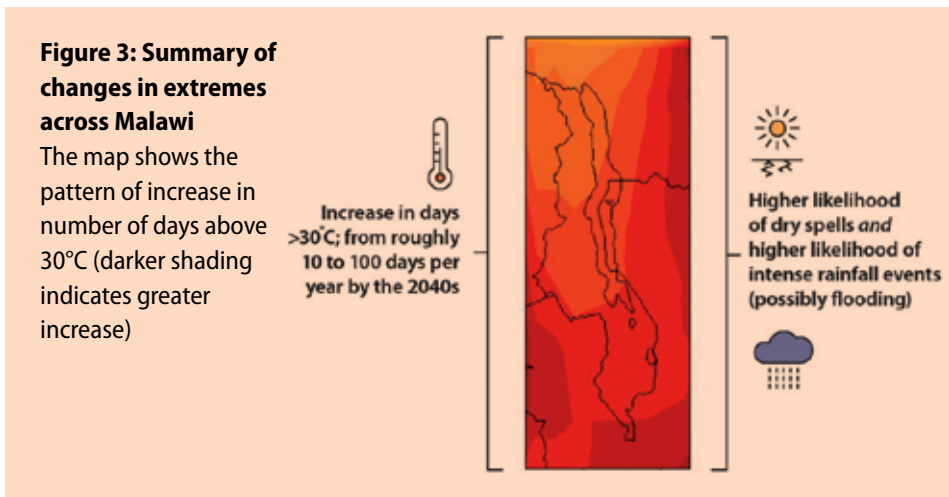
For rainfall there is strong agreement for decreases in the mean number of rain days and increases in the amount of rainfall on each rainy day (the 'rainfall intensity'). Taken together these changes suggest more variable rainfall, with both higher likelihood of dry spells and higher likelihood of intense rainfall events (often associated with flooding).

What does this mean for planning?

No model is able to predict the future with 100% certainty. Climate projections are useful to consider in planning, particularly for activities that are sensitive to temperature and water availability, such as agriculture and hydropower. The high level of agreement between models on temperature increase means that we are confident in this projection. Promoting a crop that is heat sensitive and already near the margins of tolerance for growth, for example, is likely to be unsustainable in the long run.

There is less agreement between models on rainfall, but there are some indications (low confidence) for a drying trend in September-October-November throughout Malawi – a critical time, for example, for the agricultural sector. Awareness of this means that longer-term agricultural decisions can be planned accordingly to avoid crop failure due to delay in the start of rains during November.

Taking climate change projections into account for particular planning decisions, and considering the range of futures, can support sustainability.



Endnote 1 FCFA (2017) Country climate brief. *Future climate projections for Malawi*. Cape Town: Future Climate for Africa. www.futureclimateafrica.org/resource/future-climate-projections-for-malawi/

About Future Climate for Africa

Future Climate for Africa (FCFA) aims to generate fundamentally new climate science focused on Africa, and to ensure that this science has an impact on human development across the continent. This brief was written by members of the UMFULA research team: Neha Mittal, Katharine Vincent, Declan Conway, Emma Archer van Garderen, Joanna Pardoe, Martin Todd, Richard Washington, Christian Siderius and David Mkwambisi. You can find out more about their work under 'research teams' on www.futureclimateafrica.org. The authors thank the individuals from the Department for Climate Change and Meteorological Services, Malawi who commented on early versions of this brief.



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