

THE 2023-2024 SEASONAL CLIMATE OUTLOOK



**MINISTRY OF NATURAL RESOURCES AND CLIMATE CHANGE
DEPARTMENT OF CLIMATE CHANGE AND METEOROLOGICAL SERVICES**

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EXECUTIVE SUMMARY

The 2023/2024 rainfall season is expected to be influenced by El Niño conditions, which is the unusual warming of waters in the Eastern-Central Equatorial Pacific Ocean. The Department of Climate Change and Meteorological Services (DCCMS) using all possible phenomena that drive rainfall in Malawi has come up with the forecast for 2022/2024 rainfall season from October 2023 to April 2024.

In summary, from October to December 2023, normal total rainfall amounts are expected over most areas of the country. However, there is a high likelihood of below-normal rainfall in November, particularly in southern and northern Malawi. Planting rains or the onset of the rainy season may be delayed by at least two weeks in some areas.

From January to March 2024, most areas should anticipate normal to below-normal total rainfall amounts, with the possibility of above-normal rainfall in January. There is also a high chance of prolonged dry spells in the month of February.

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1 INTRODUCTION

October to April marks the main rainfall season in Malawi. The Department of Climate Change and Meteorological Services (DCCMS) has been closely monitoring the conditions that may shape the 2023/2024 rainfall season. Historically, the main rains commence from November, starting from the south and gradually spreading northwards. Pre-season rains, locally known as Chizimalupsya, often precede the main season.

The main drivers of rainfall in Malawi include the Inter-tropical convergence zone (ITCZ), Congo air-mass, easterly waves, and tropical cyclones. These systems are influenced by various factors, including mean sea level pressure, upper-level winds, and sea surface temperatures in the tropical Pacific, Indian, and Atlantic Oceans.

Global climate models are projecting moderate to strong El Niño conditions for a significant portion of the 2023/2024 rainfall season. El Niño is characterized by unusual warming of waters in the Eastern-Central Equatorial Pacific Ocean and typically leads to drier conditions over Southern Africa, potentially including southern Malawi. Historical seasons that are analogous to the upcoming 2023/2024 season out of which the El Niño conditions prevailed include: 1982/1983, 1997/1998, 2009/2010, and 2015/2016.

2 SUB SEASONAL RAINFALL FORECASTS

In this section, sub-seasonal total rainfall forecasts and associated categories are presented. The maps on the right depict the expected rainfall amounts in millimeters (mm), while those on the left depict the forecasted rainfall categories in relation to the average (normal). Four categories are utilized:

- Category 1 (brown) signifies below-normal rainfall amounts.
- Category 2 (yellow) indicates normal to below-normal rainfall amounts.
- Category 3 (cyan) represents normal to above-normal rainfall amounts.
- Category 4 (blue) denotes above-normal rainfall amounts.

2.1 OND (October, November, December) Sub season

During the OND (October to December) sub-season, Malawi is expected to receive normal to above-normal rainfall (indicated by cyan on the map). However, there may be pockets of normal to below-normal rainfall amounts (indicated by yellow) particularly in the southern areas of the country (Fig 2.1-left). Otherwise, the total rainfall amounts are below 400mm across the country (Fig 2.1-right).

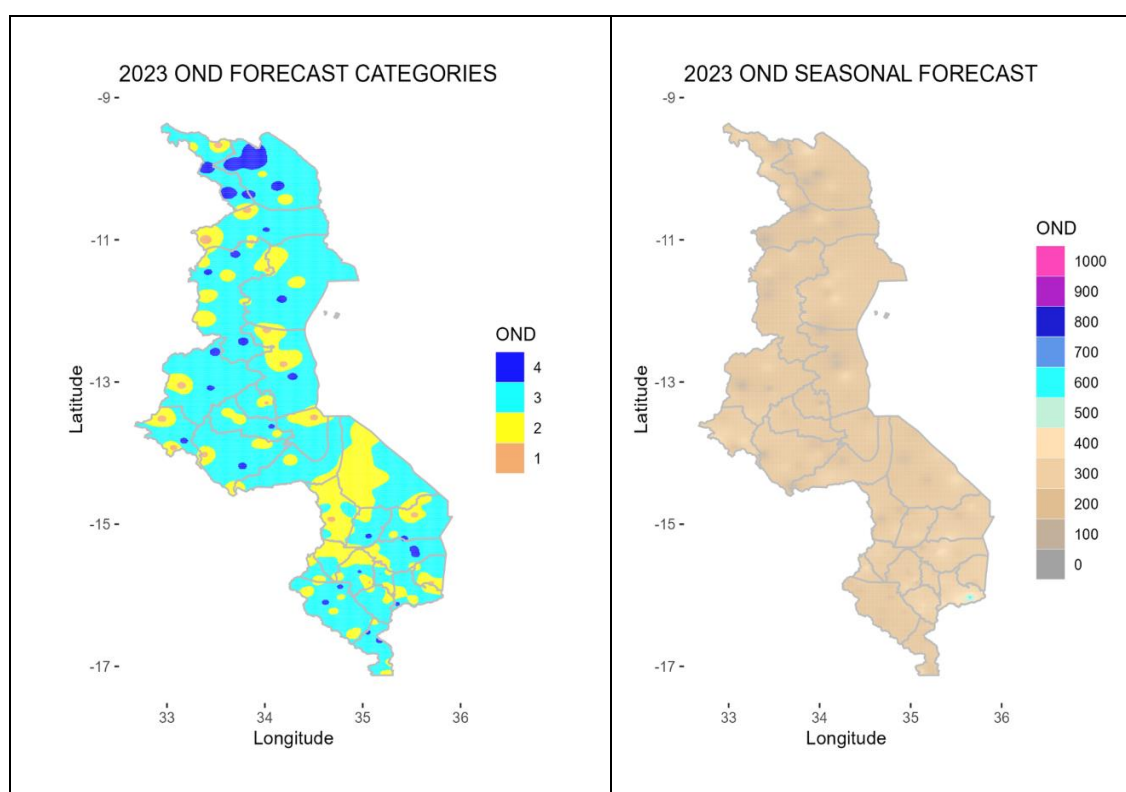


Figure 2.1 OND forecast categories (left) and OND forecast rainfall amounts (right)

2.2 NDJ (November, December, January) Sub season

During the NDJ (November to January) sub-season, the lower Shire Valley, northern, and some central areas of the country are expected to receive normal to above-normal rainfall (indicated by cyan on the map). However, there may be pockets of normal to below-normal rainfall amounts (indicated by yellow) particularly in the southern highlands and the upper Shire Valley area (Fig 2.2-left). The highest rainfall amounts are expected in Mulanje that may reach 800mm, but the rest of the country may receive rainfall totals ranging from 400 to 700mm (Fig 2.2-Right).

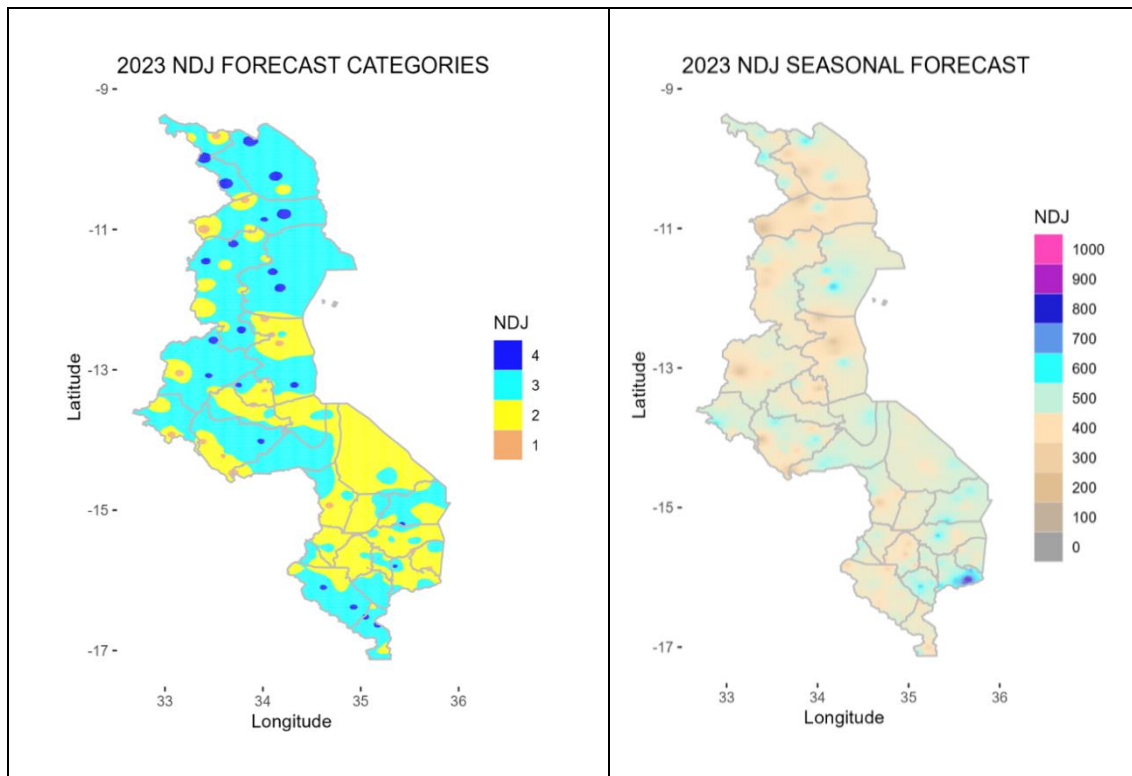


Figure 2.2 NDJ forecast categories (left) and NDJ forecast rainfall amounts (right)

2.3 DJF (December, January, February) Sub season

Rainfall amounts for the DJF (December to February) sub-season are forecasted to be normal to below-normal over the southern and central areas of Malawi. In contrast, normal to above-normal rainfall is expected for most areas in the lower Shire Valley and northern areas of the country (Fig 2.3-left). Rainfall totals will be between 400 and 900mm across the country (Fig 2.3-right).

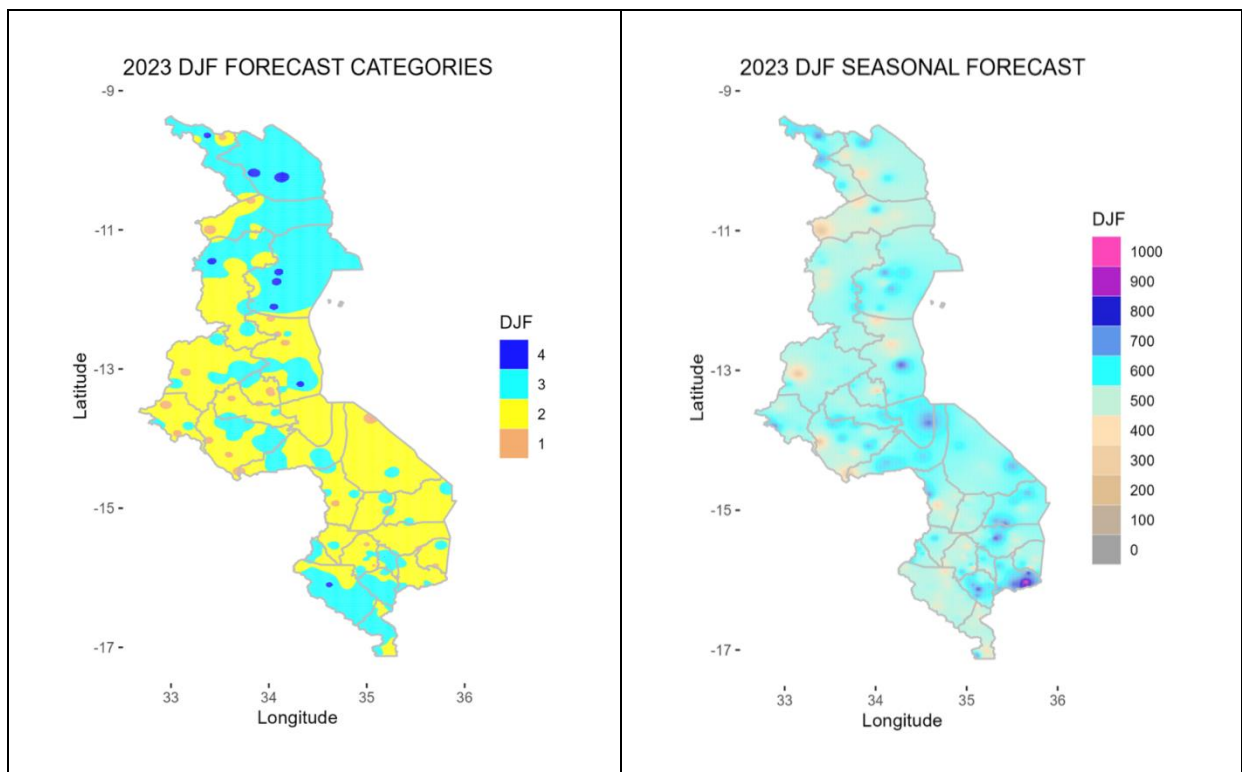


Figure 2.3 DJF forecast categories (left) and DJF forecast rainfall amounts (right)

2.4 JFM (January, February, March) Sub season

During the JFM (January to March) sub-season, the forecast indicates normal to below-normal rainfall (yellow) for a significant portion of Malawi. However, there is a possibility of normal to above-normal rains in some parts of the north and the Shire Valley area (Fig 2.4-left). The rainfall total amounts range from 300 to 800mm, Fig 2.4-right.

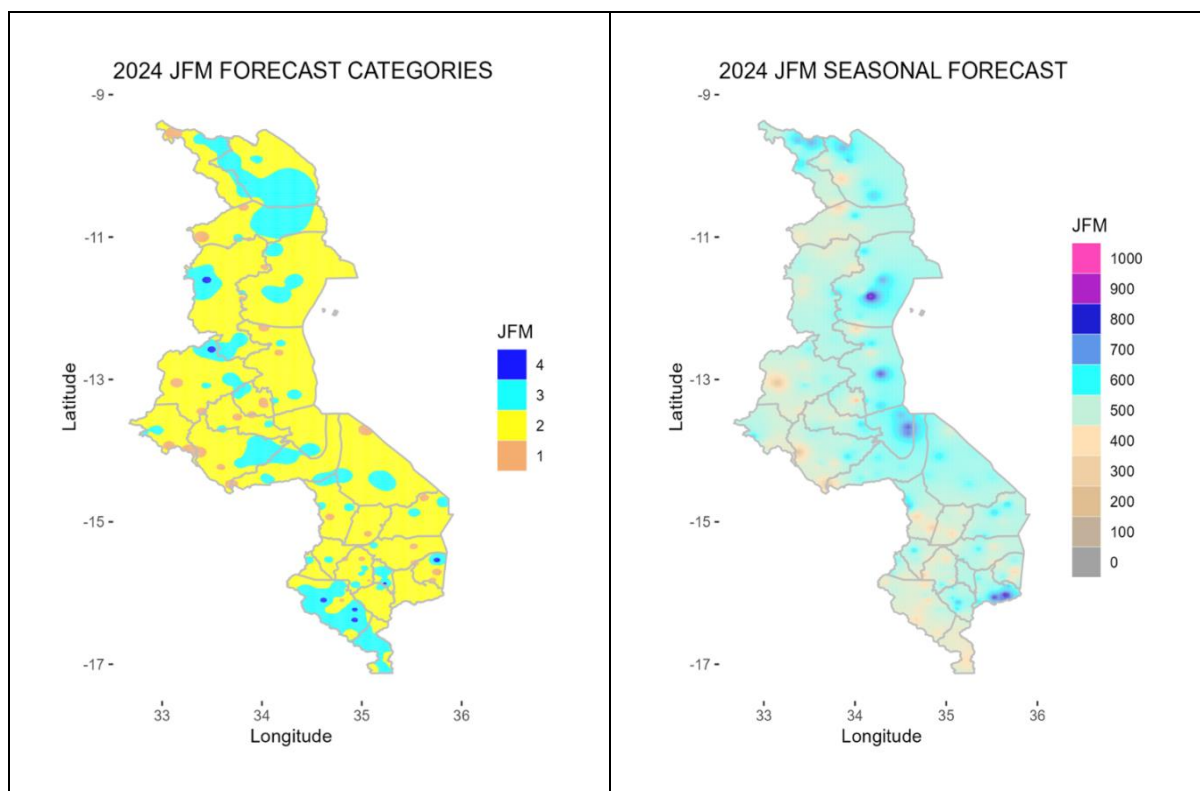


Figure 2.4 JFM forecast categories (left) and JFM forecast rainfall amounts (right)

2.5 FMA (February, March, April) Sub season

During the FMA (February to April) sub-season, the forecast suggests the likelihood of normal to below-normal rainfall (indicated by yellow) in Malawi, with few areas experiencing normal to above-normal rainfall (Fig 2.5-left). The total rainfall amount is around 300 and 400mm over many places but may exceed around 600mm in some areas in Nkhatabay, Karonga and Mulanje, Fig 2.5-right.

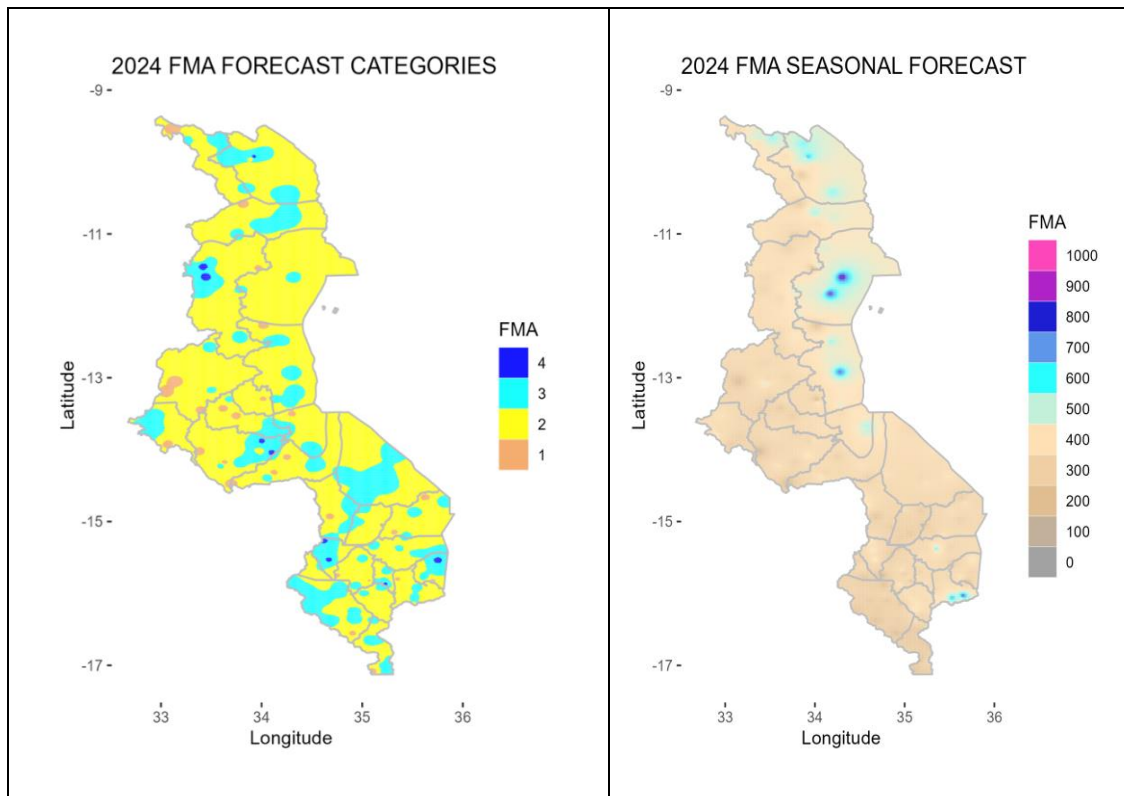


Figure 2.5 FMA forecast categories (left) and FMA forecast rainfall amounts (right)

3 MONTHLY RAINFALL FORECASTS

In this section, the sub-seasons are split into monthly rainfall forecasts. The maps on the right show the forecasted rainfall amounts in millimeters (mm), while those on the left depict the forecasted rainfall categories in relation to the normal, as previously explained in the sub-seasons section.

3.1 October

During the month of October, there is a chance of normal to above-normal rainfall amounts occurring over the country (Fig 3.1-left). This suggests the likelihood of Chizimalupysa rains in most areas, which serve as a precursor to the main rainfall season. However, it is normal for some areas not to receive rainfall at all during this time. Though there is likelihood of above normal rainfall in many areas, the actual amounts are below 10mm or even zero in many places during this month, Fig 3.1-right.

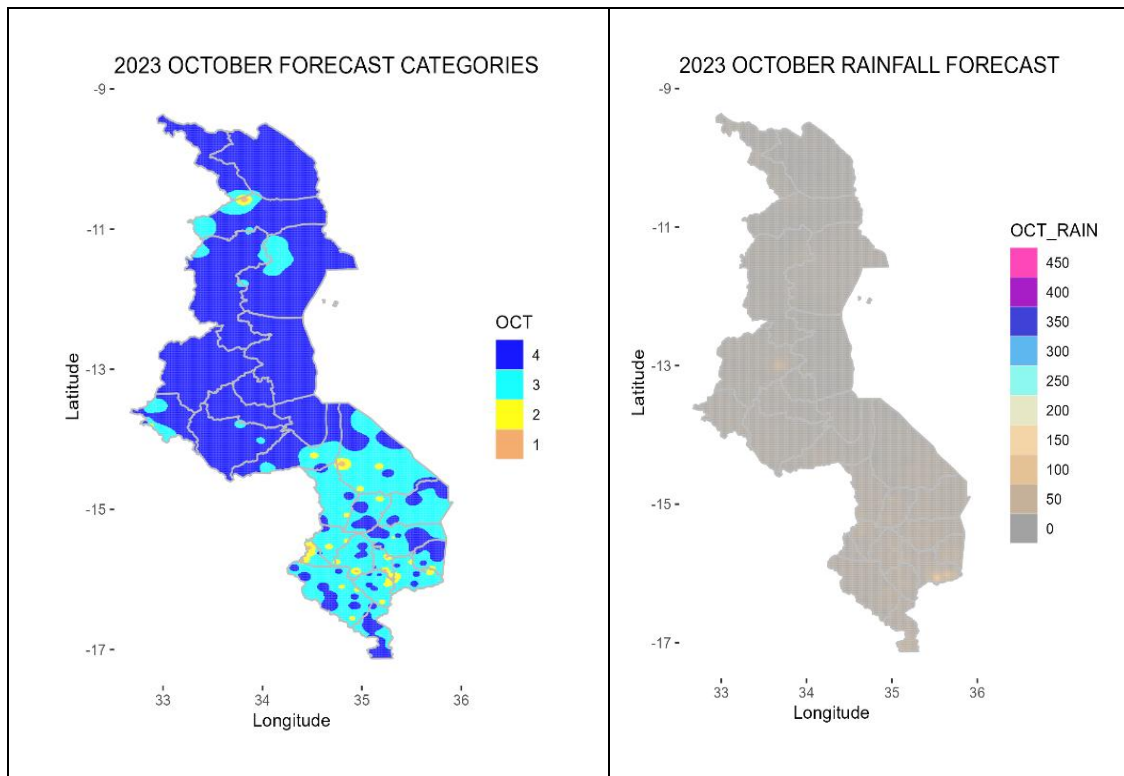


Figure 3.1 October forecast categories (left) and October forecast rainfall amounts (right)

3.2 November

A normal to below-normal rainfall situation is forecasted for many areas in the north and south of Malawi, while the central areas are likely to receive normal to above-normal rainfall during November, Fig 3.2-left. Rainfall totals over many places will be between 50 and 100mm but can extend to 150 over few places, Fig 3.2-right.

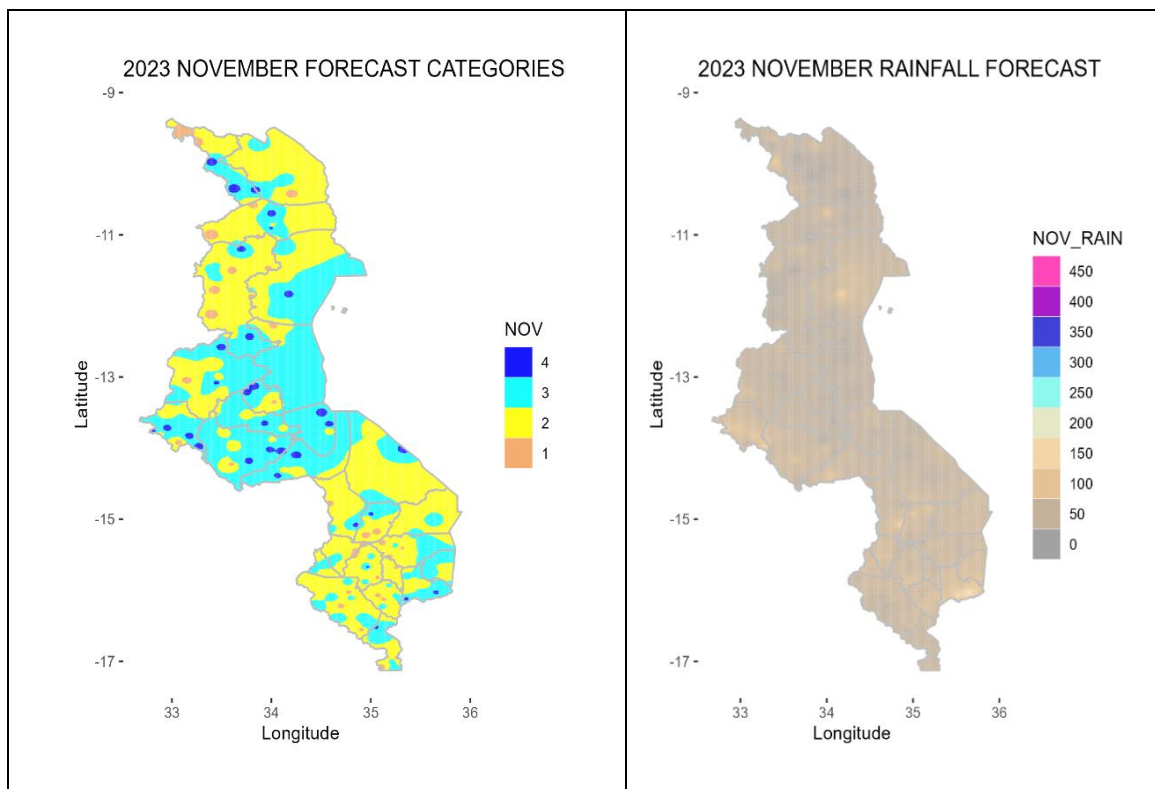


Figure 3.2 November forecast categories (left) and November forecast rainfall amounts (right)

3.3 December

In December, most areas are expected to receive normal to above-normal rainfall. However, some areas may receive less than their normal rainfall, as indicated by the color yellow on the forecast map, Fig 3.3-left. The rainfall amounts for this month range from 100 to 400mm, Fig 3.3-right.

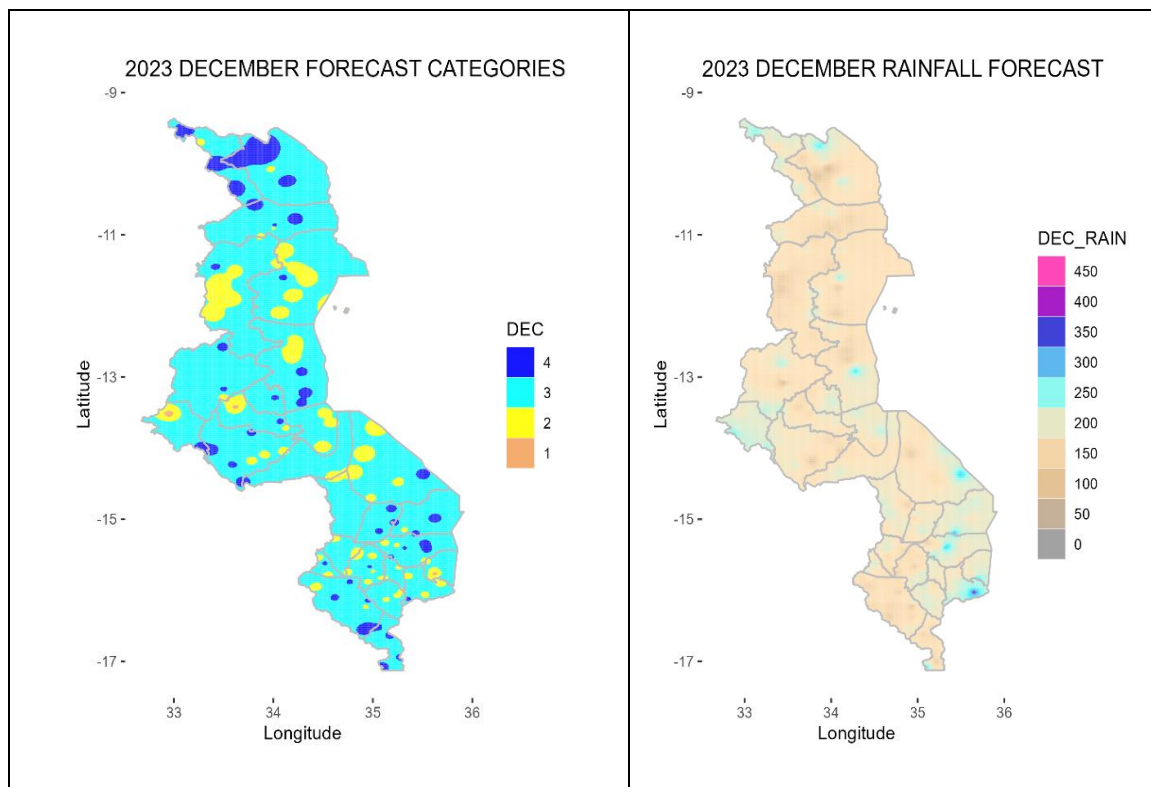


Figure 3.3 December forecast categories (left) and December forecast rainfall amounts (right)

3.4 January

In January, most areas are expected to receive normal to above-normal rainfall. However, some areas may receive less than their normal rainfall. Pockets of dry spells lasting about a week are possible in some areas (yellow), Fig 3.4-left. However, rainfall totals will be between 100 and 350mm, Fig 3.4-right.

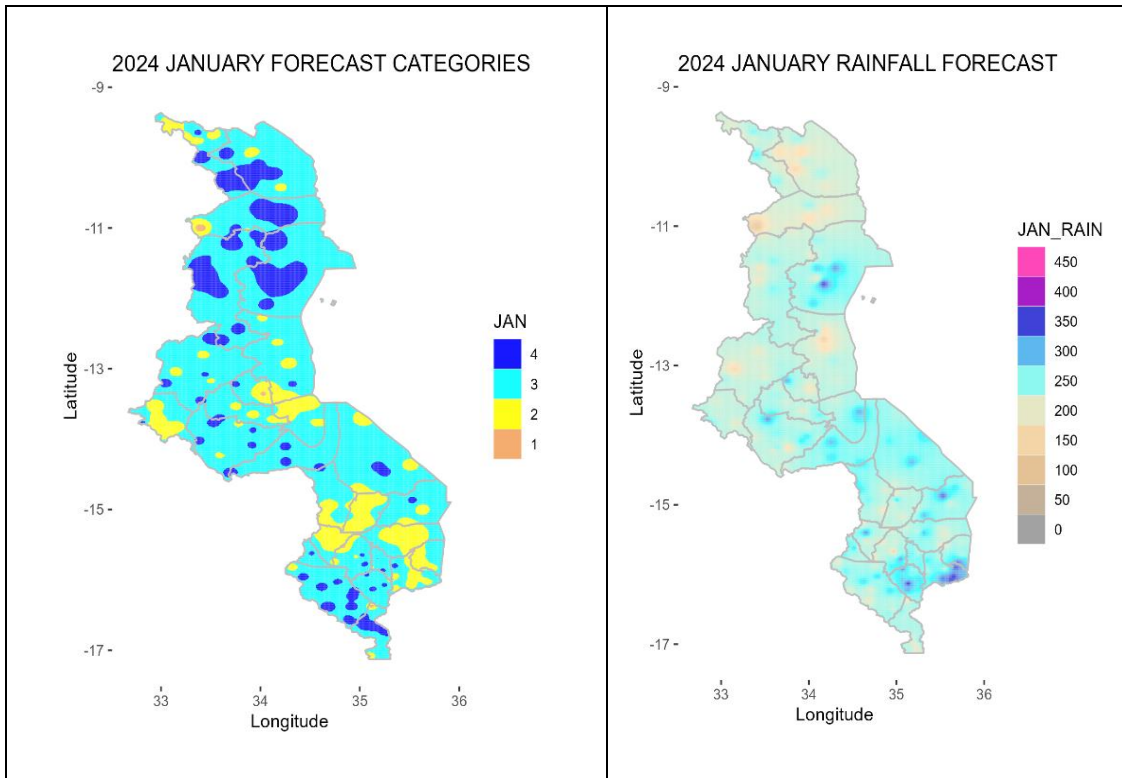


Figure 3.4 January forecast categories (left) and January forecast rainfall amounts (right)

3.5 February

During February, it is likely that most areas of Malawi will experience normal to below-normal rainfall, and there is also a high risk of prolonged dry spells during this month, Fig 3.5-left. The total rainfall totals are less than January which range from 100 to 250mm, Fig 3.5-right.

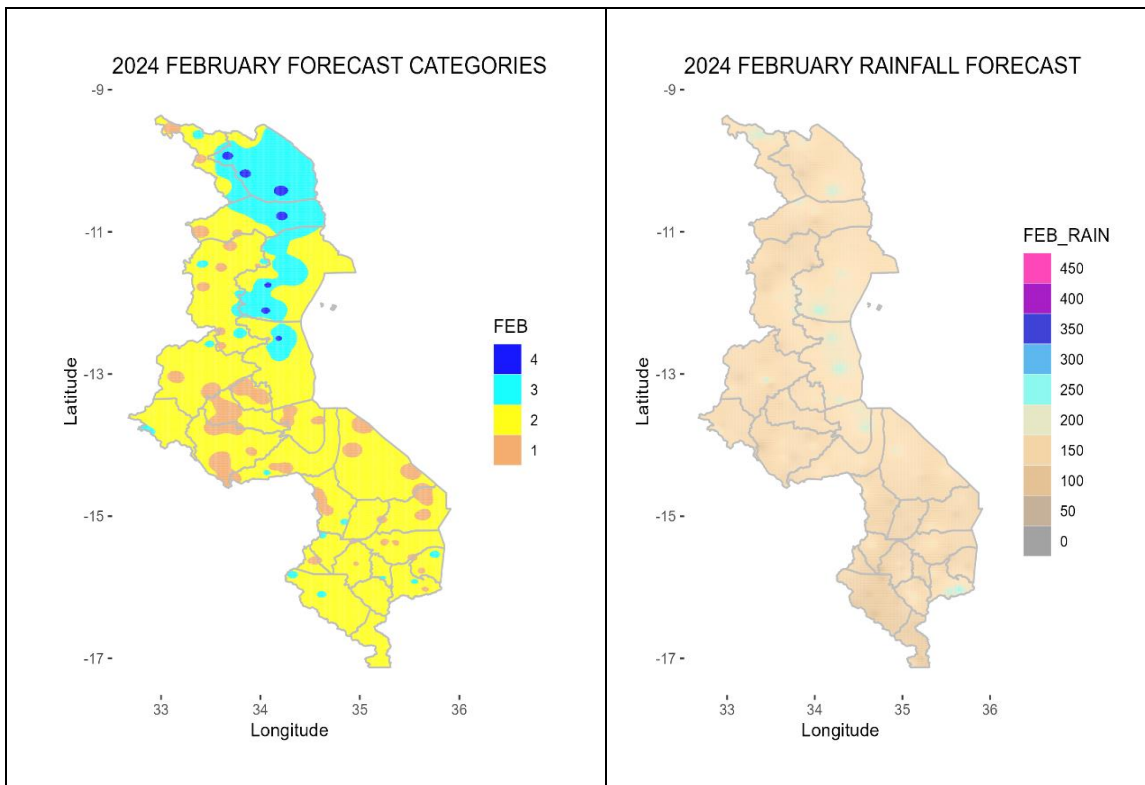


Figure 3.5 February forecast categories (left) and February forecast rainfall amounts (right)

3.6 March

Generally, normal to above-normal rainfall is expected during this month. However, a normal to below-normal situation is possible in some areas, particularly in the north, Fig 3.6-left. The rainfall totals range is very large from 50mm over many places to 300mm particularly along the lakeshore, Fig 3.6-right.

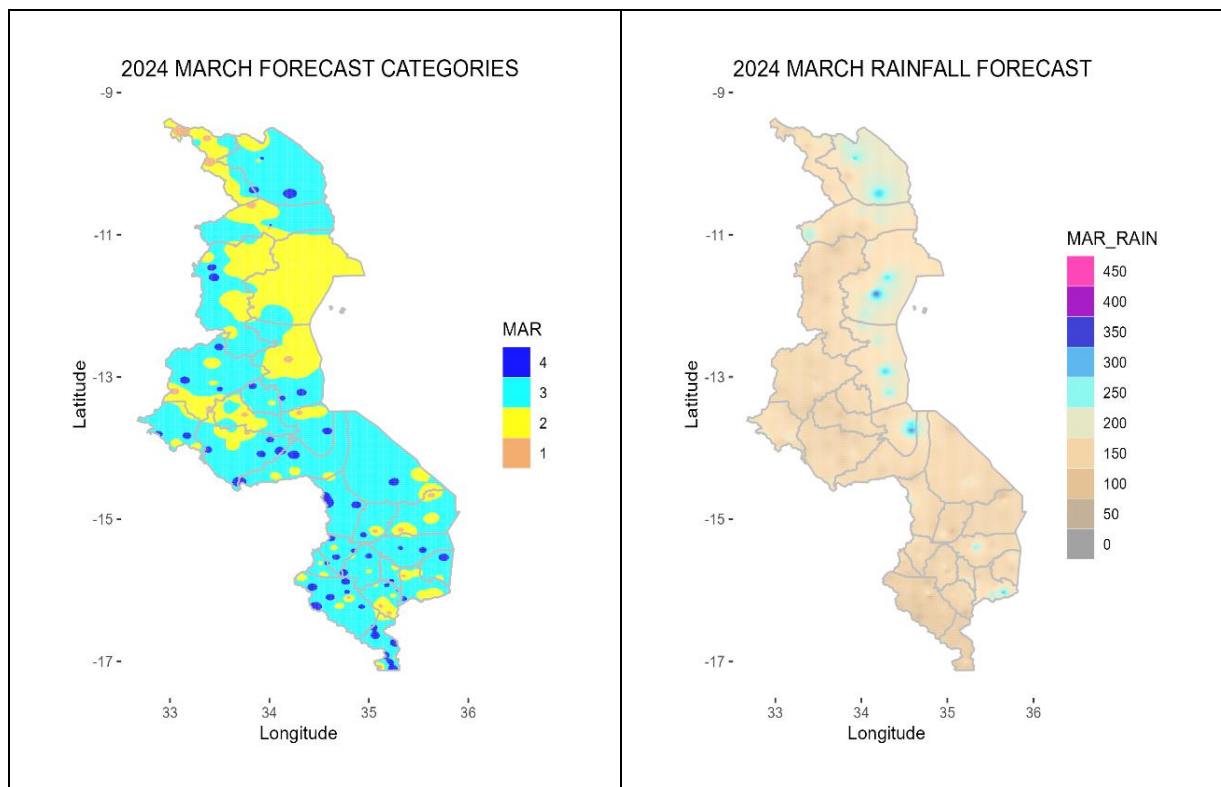


Figure 3.6 March forecast categories (left) and March forecast rainfall amounts (right)

3.7 April

Generally, normal to above-normal rainfall is expected during April, Fig 3.7-left. However, rainfall amounts expected are below 20mm and even zero over some places except northern lakeshore areas which may register between 100 and 350mm, Fig 3.7-right.

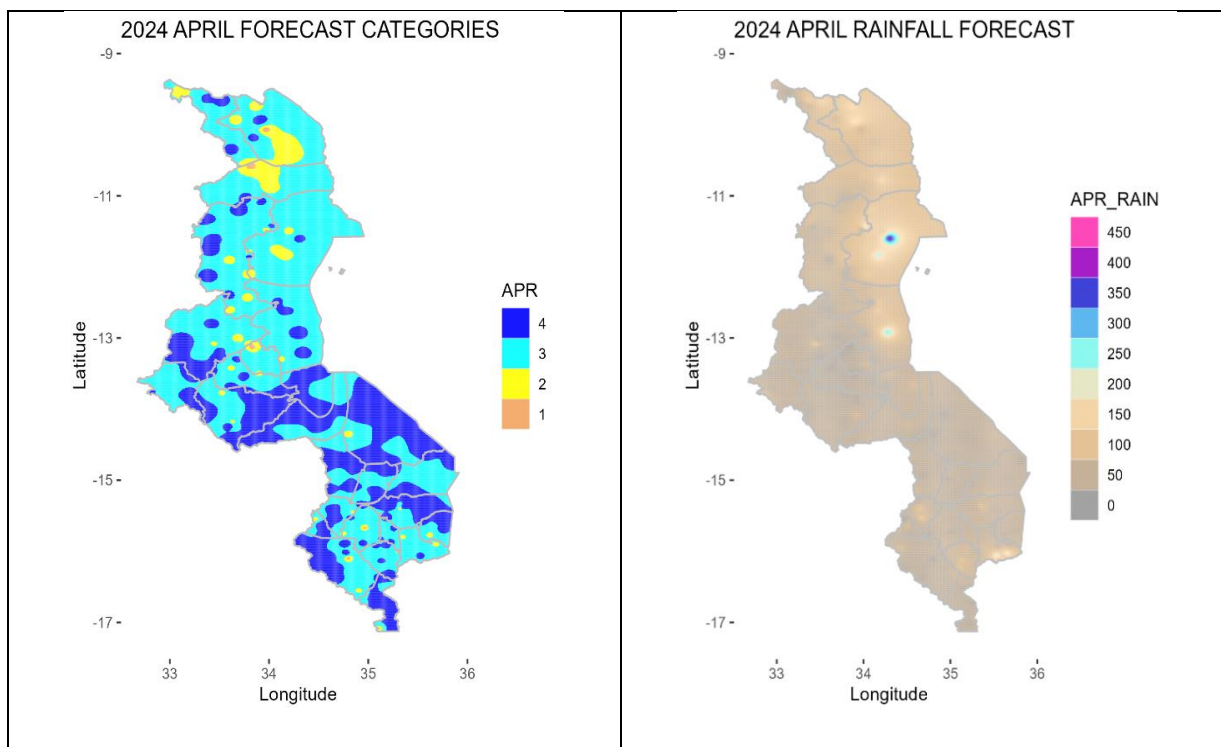


Figure 3.7 April forecast categories (left) and April forecast rainfall amounts (right)

4 SEASONAL RAINFALL CHARACTERISTICS

4.1 Onset

Climatologically, the rainfall season commences from the southern areas of Malawi and then progresses towards central and northern areas of the country. During the month of October, some areas experience Chizimalupsya rains which are a pre-cursor for the season. The normal onset of planting rains is expected from mid of November in the southern areas, from early December in the central areas and from mid-December in the northern areas, Fig 4.1-left.

However, for the 2023/2024 rainfall season, the season onset is likely to be delayed by more than 10 days, particularly affecting parts of Shire Valley, lakeshore areas, as well as central and northern parts. However, likelihood of 10-day early onset is also high in Southern Highlands, Fig 4.1-right.

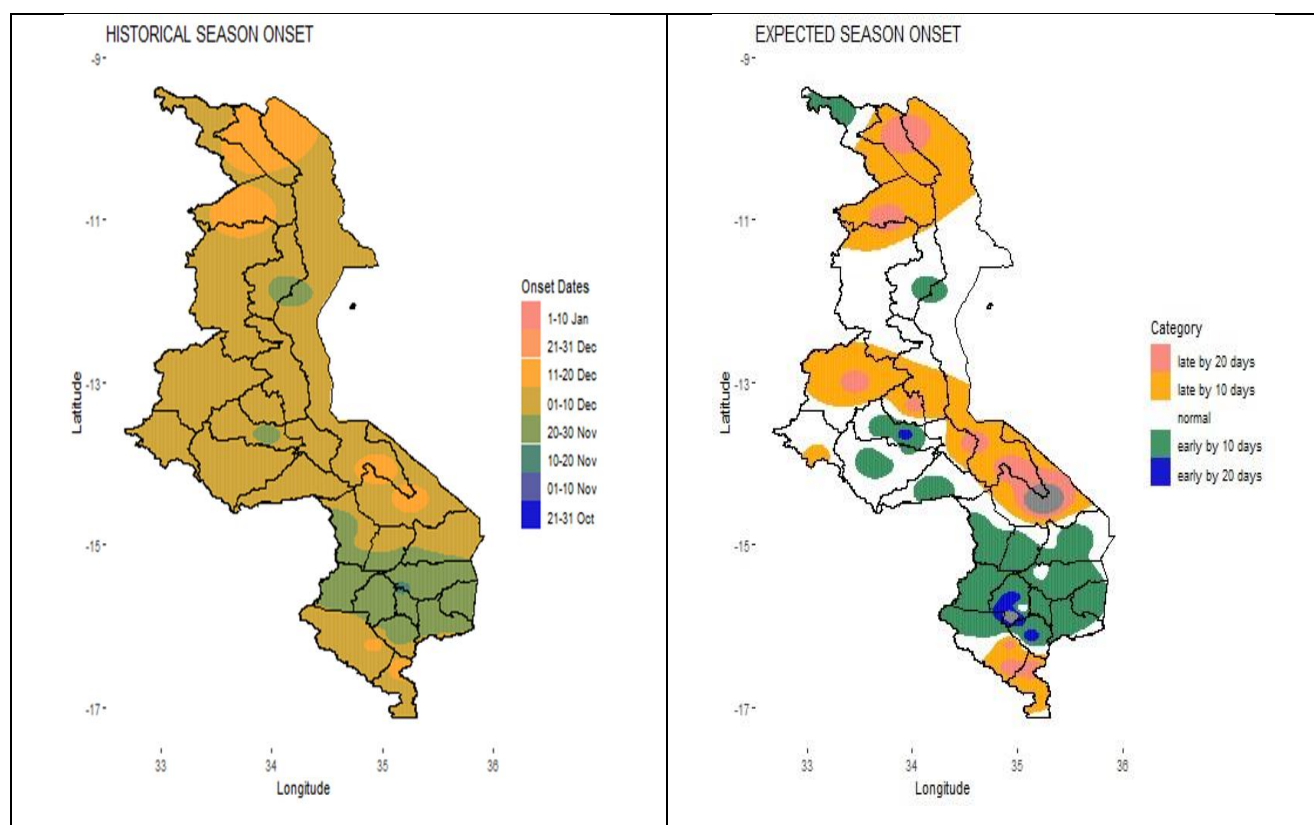


Figure 4.1 Historical season onset (left), Expected onset for 2023/2024 rainfall season (right)

4.2 Cessation

Climatologically, the rainfall season is expected to come to an end starting from first week of April over many places with plus or minus 20 days, Fig 4.2-left.

For the 2023/2024 rainfall season, early cessation is anticipated in most of the northern areas of Malawi. Late cessation is expected for some areas within central and southern regions. However, normal cessation anticipated elsewhere, Fig 4.2-right.

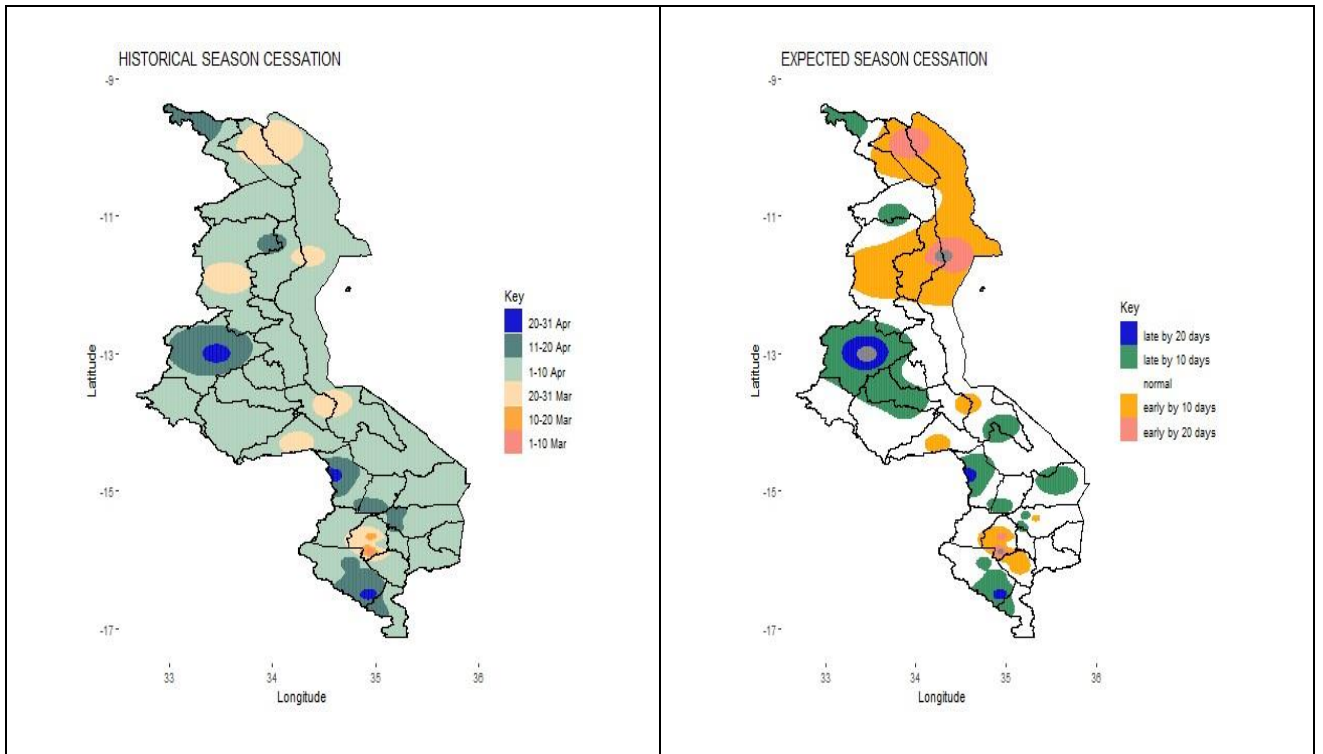


Figure 4.2 Historical seasonal cessation (left), Expected seasonal cessation for 2023/2024 rainfall season (right)

4.3 Season Length

The season length is between 100 and 120 days in many places including parts of Shire Valley, Machinga, Mangochi, central areas and parts of northern areas. However, it is around 130 days over southern highlands and can extend to 140 days around Nkhatabay, Fig 4.3-left.

During the 2023/2024 season the seasonal length is expected to be longer than normal by more than 10 days over parts of Shire Valley, Mangochi, central and northern areas. However, it's worth noting that the season may be shorter than usual in some areas of southern highlands, Lilongwe, Dedza, Nkhatabay and Mzimba, Fig 4.3-right.

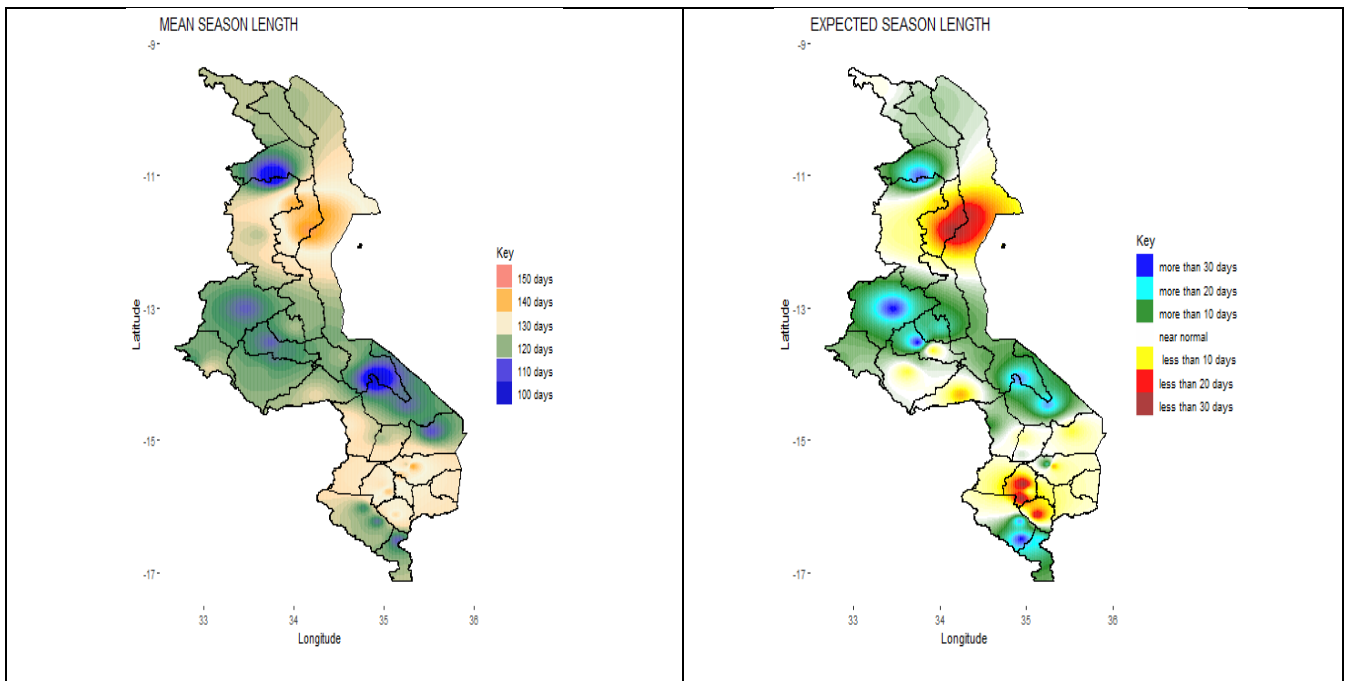


Figure 4.3 Mean seasonal length (left), Expected seasonal length for 2023/2024 rainfall season (right)

4.4 Dry Spells

This section presents information on the likelihood of occurrence of prolonged dry spells during the critical months of January and February. This is based on the analysis of analogous years and the seasonal rainfall forecast.

4.4.1 Dry Spells for January

There is a risk of dry spells lasting about 10 days in most areas of Malawi during the month of January, Fig 4.4.

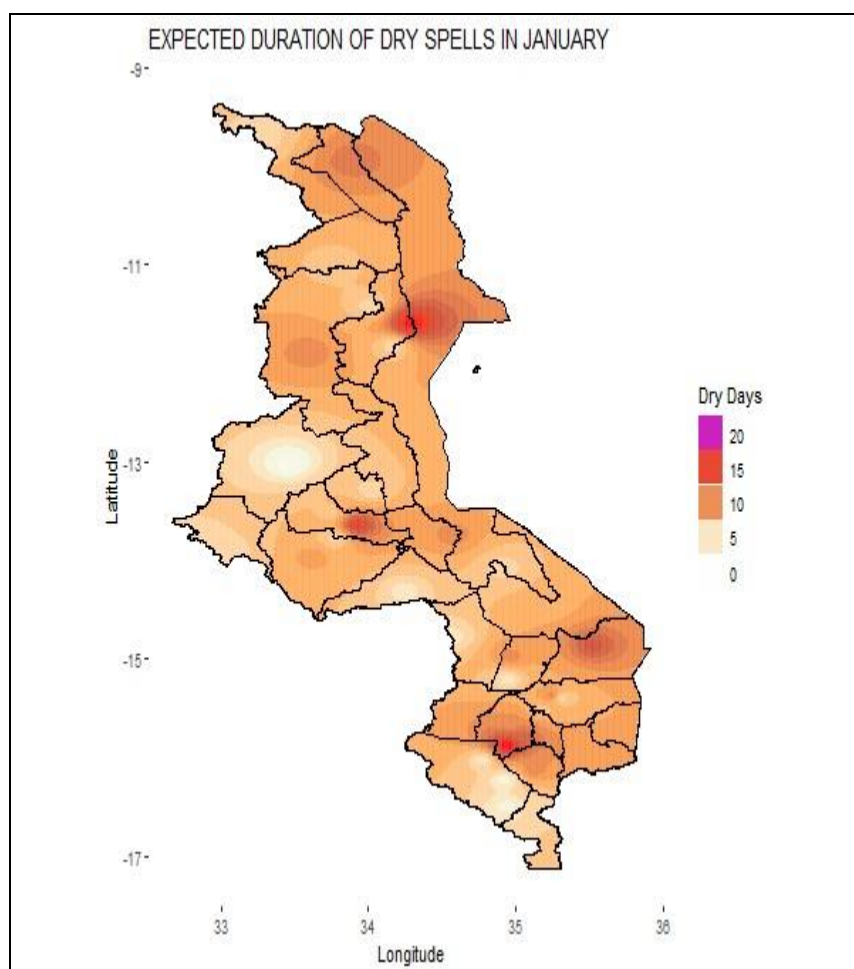


Figure 4.4 Expected duration of dry spells in January

4.4.2 Dry Spells for February

In February, the country is likely to experience normal to below-normal rainfall. At the same time, there is a high risk of prolonged dry spells lasting more than 10 to 15 days in most areas in Malawi, Fig 4.5.

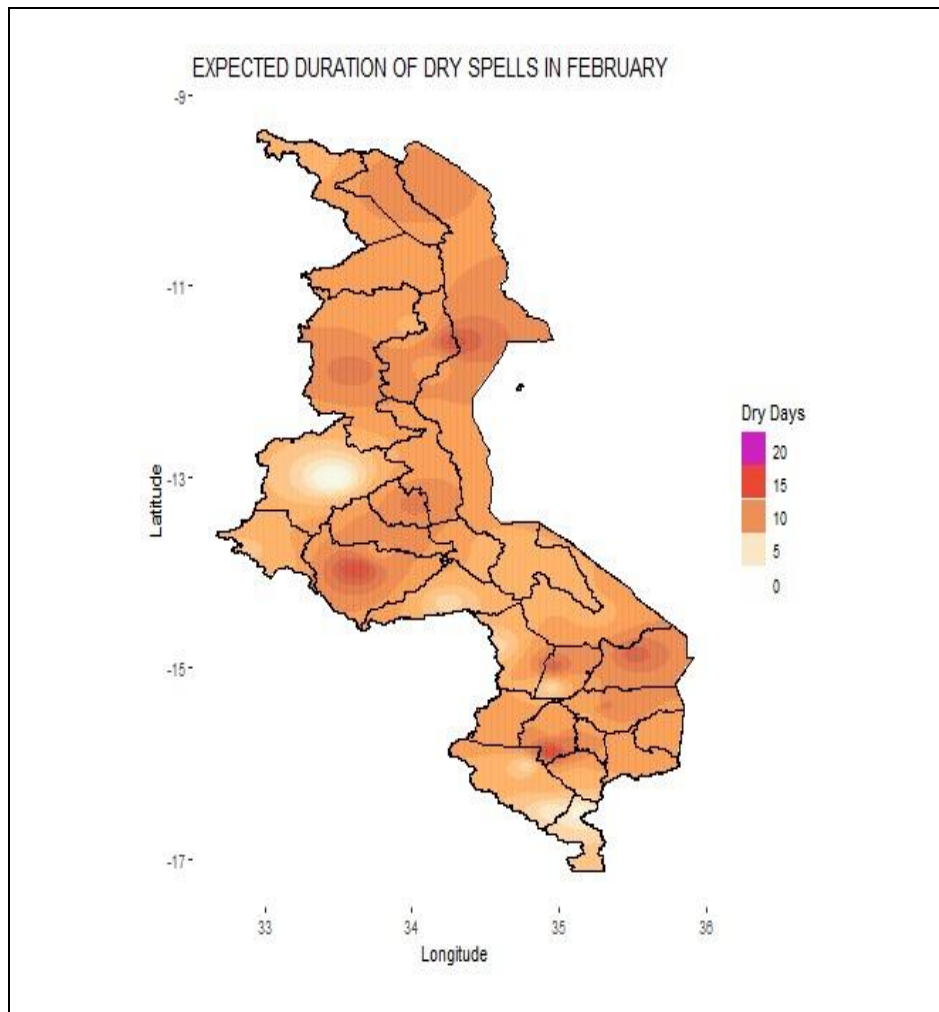


Figure 4.5 Expected duration of dry spells in February

5 MONTHLY TEMPERATURE FORECASTS

In the following section, you will find maps displaying the forecasted monthly average maximum temperatures for 2023/2024 (right maps) in degrees Celsius, and associated changes with reference to historical period (left maps). Here is the description of the colors on the maps:

- Red - Average maximum temperatures higher than normal.
- Blue - Average maximum temperatures lower than normal.
- White - No significant change in average maximum temperatures.

5.1 October

During October, Malawi is generally expected to experience a normal range of maximum temperatures. However, some areas in the northern region are forecasted to be warmer than normal, as depicted by the red spots on the left map. Conversely, lower than normal maximum temperatures are likely in certain parts of Nsanje, Fig 5.1 - left. The forecast maximum temperatures are generally ranging from 30 to 38 degrees Celsius, except parts of Rumphi, Nkhatabay where the temperatures are below 28 degrees Celsius, Fig 5.1 – right.

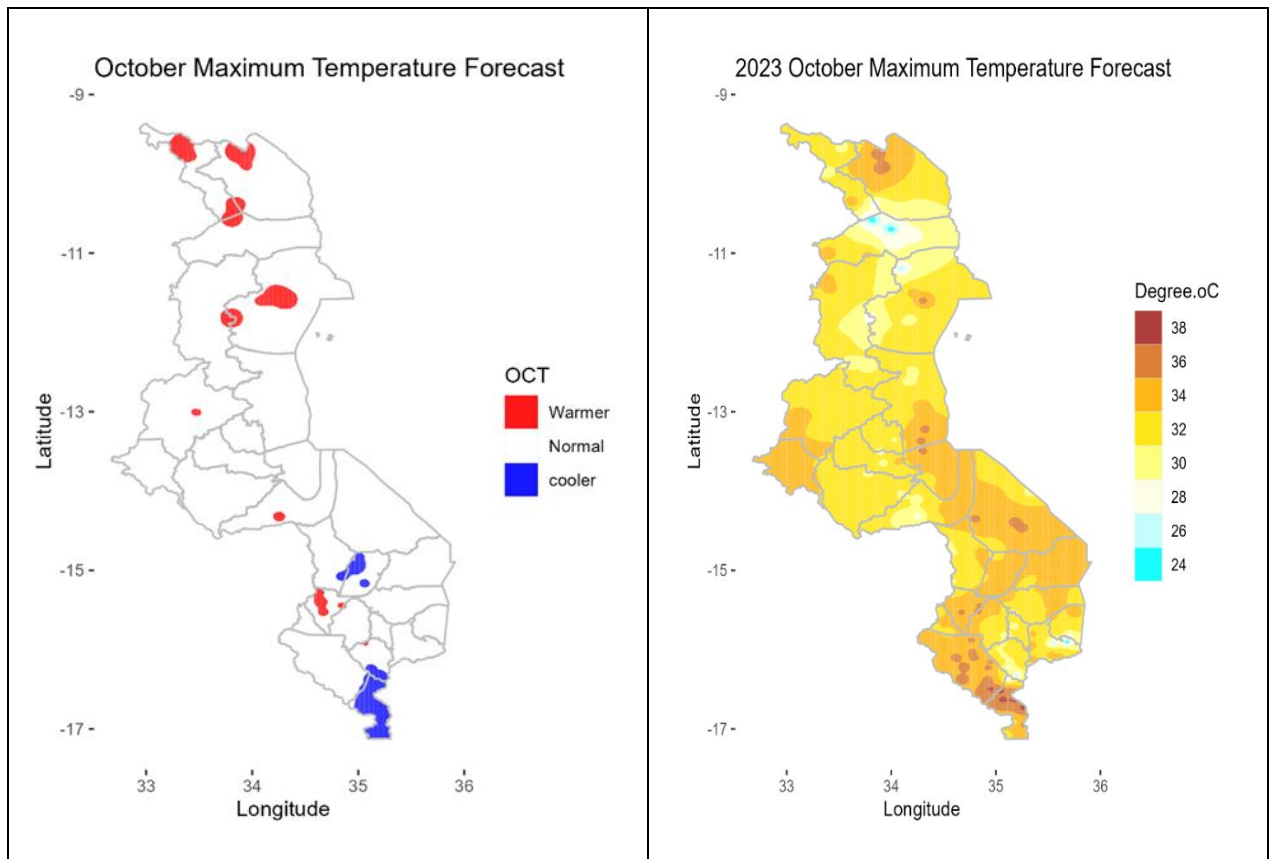


Figure 5.1 October forecast expressed as changes from average (left), October forecasted mean maximum temperature (right)

5.2 November

In November, normal temperatures are expected across Malawi, while the southern highlands are likely to be warmer than normal during this period, Fig 5.2-left. The Shire Valley is expected to experience maximum temperatures exceeding 36 degrees Celsius while the rest of the country will be in the range between 28 to 34 degrees Celsius, Fig 5.2-right.

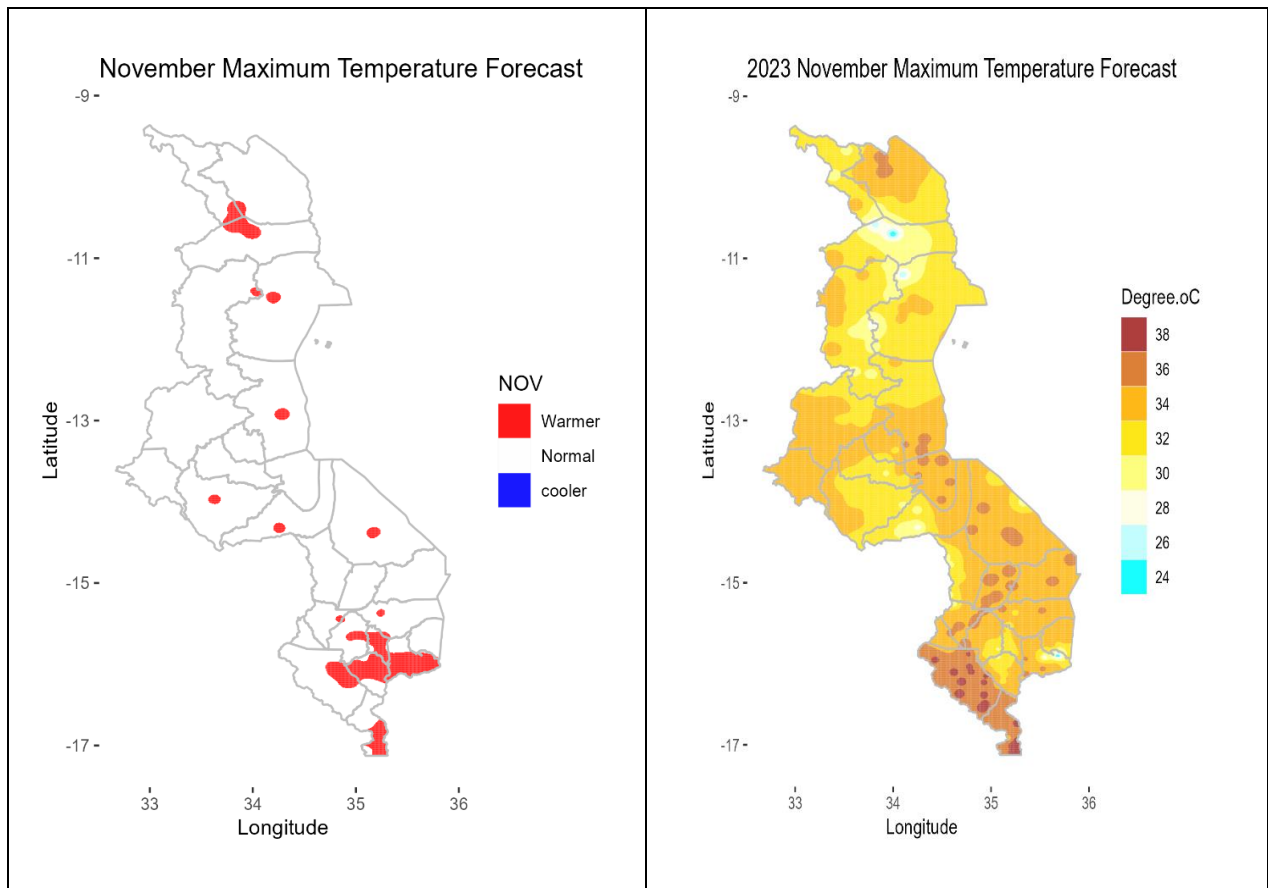


Figure 5.2 November forecast expressed as changes from average (left), November forecasted mean maximum temperature (right)

5.3 December

The forecasted maximum temperature in December is likely to be below-average over many parts of northern and central regions of the country. Otherwise, it will be normal elsewhere including southern Malawi, Fig 5.3- left. The mean maximum temperature will range from 24 to 28 degrees Celsius over many areas in Central and Northern areas, while remaining above 30 degrees Celsius over southern areas, Fig 5.3-right.

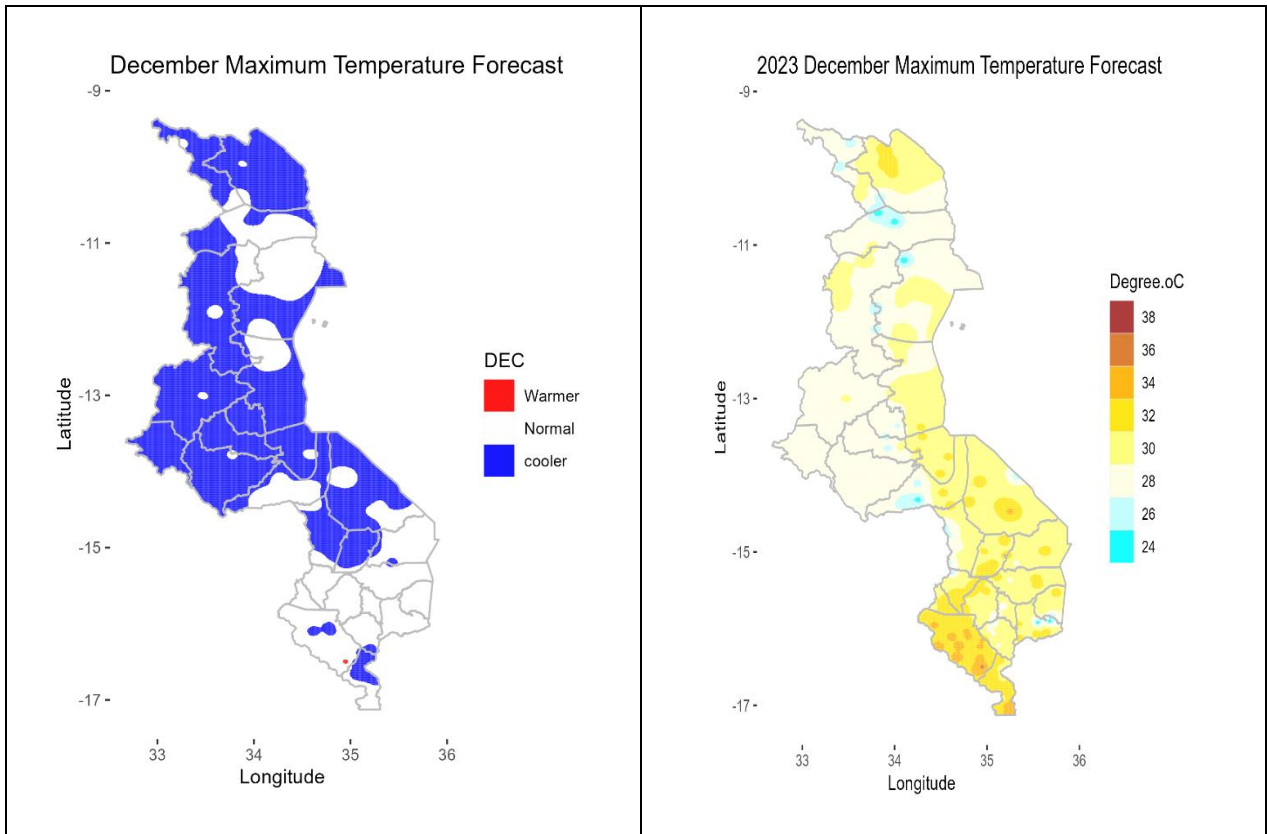


Figure 5.3 December forecast expressed as changes from average (left), December forecasted mean maximum temperature (right)

5.4 January

In January, most areas in Malawi are expected to experience normal maximum temperatures (Fig 5.3-left, with the mean maximum temperatures ranging from 24 to 34 degrees Celsius (Fig 5.3-right).

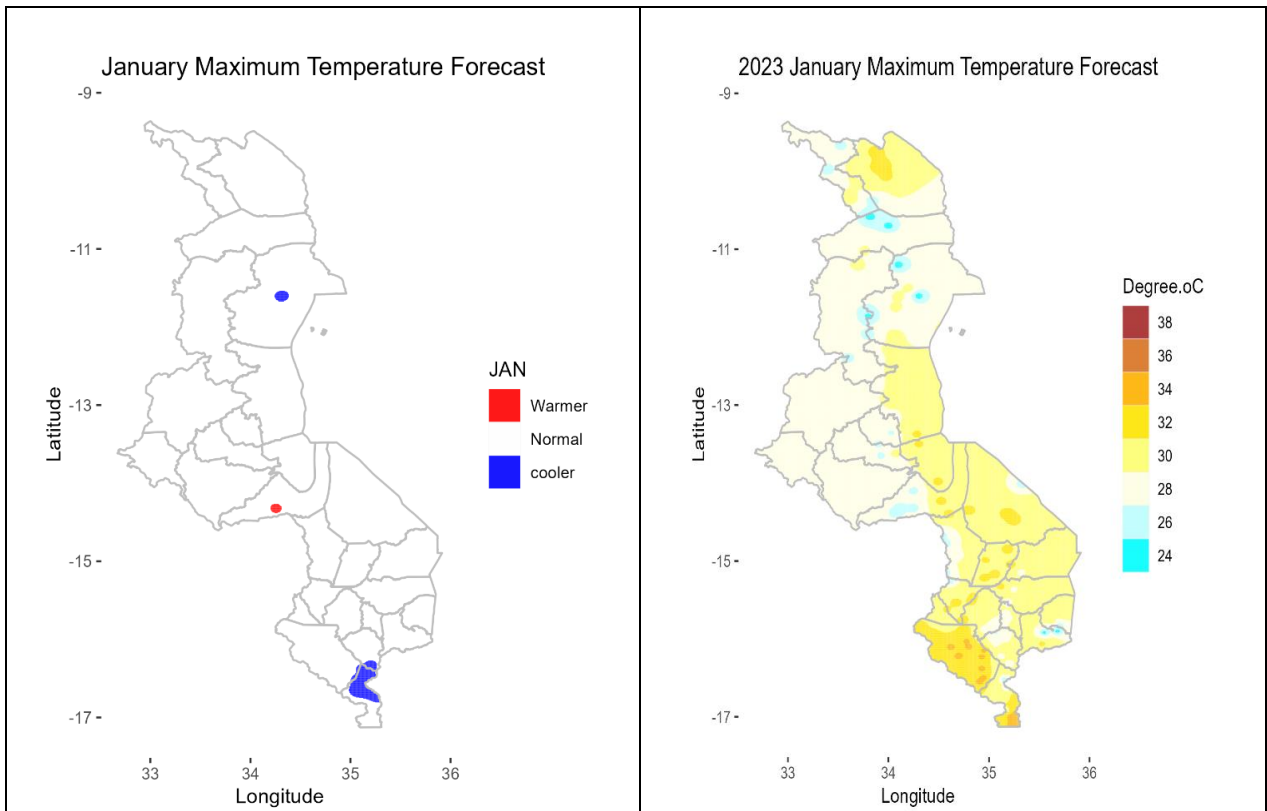


Figure 5.4 January forecast expressed as changes from average (left), January forecasted mean maximum temperature (right)

5.5 February

February mean maximum temperatures are likely to be normal except southern Malawi that may experience warmer than normal conditions, Fig 5.5-left. The mean maximum temperatures are expected to range from 24 to 34 degrees Celsius, Fig 5.5-right.

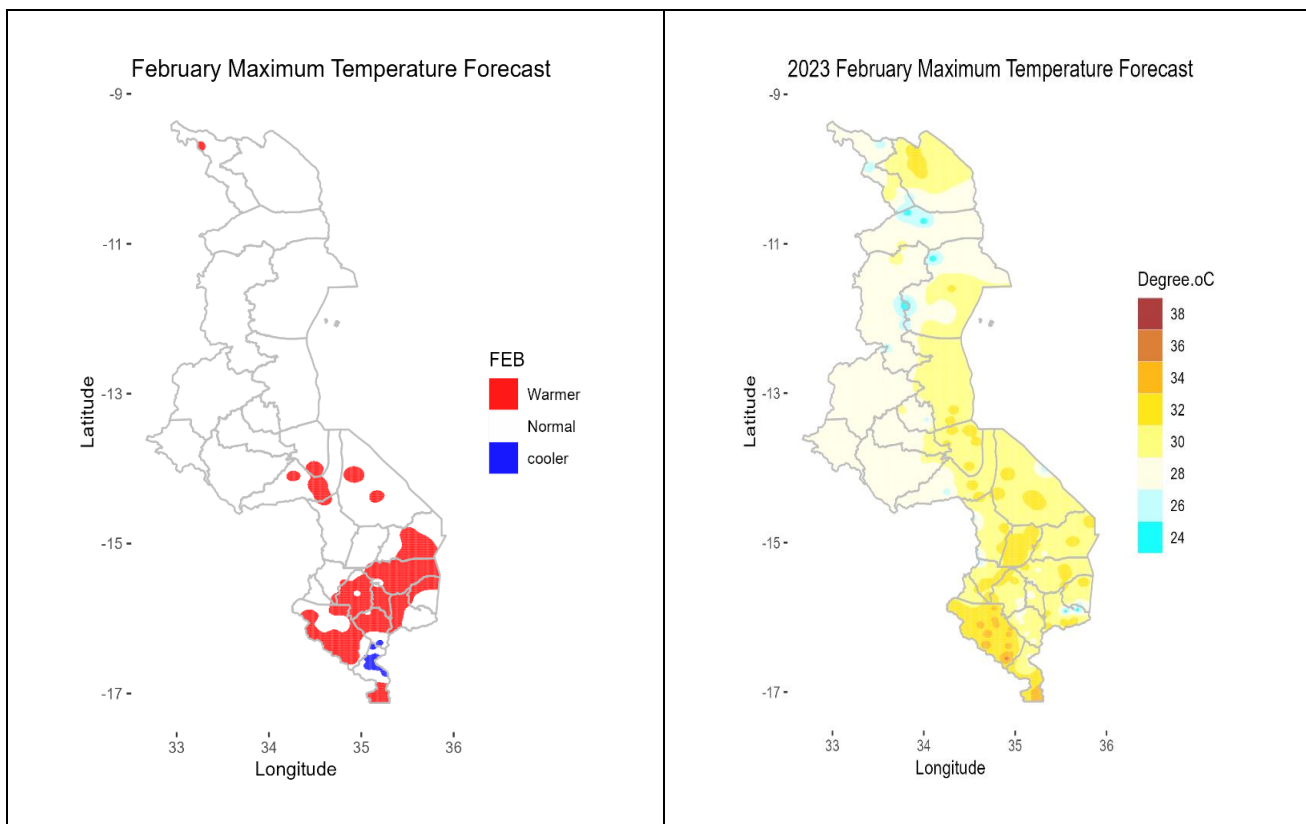


Figure 5:5 February forecast expressed as changes from average (left), February forecasted mean maximum temperature (right)

5.6 March

The better of the country will be warmer than normal in March (Fig 5.6-left), with many areas expected to observe average maximum temperatures in the range of 30-34 degrees Celsius, except parts of Mzimba, Chitipa, Bolero and Nkhatabay where the temperature will be less than 28 degrees Celsius. However, the northern part of Malawi is expected to have normal maximum temperatures during this period, Fig 8.6-right.

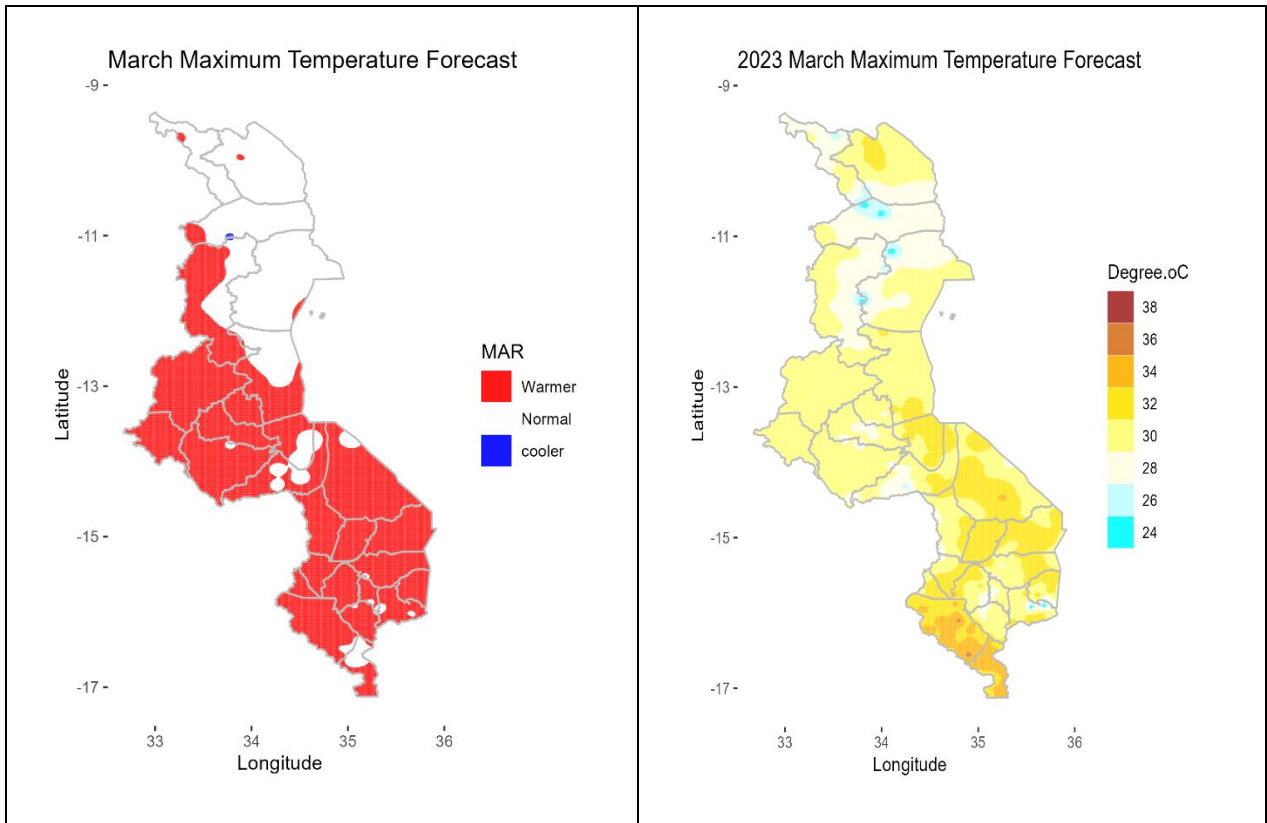


Figure 5:6 March forecast expressed as changes from average (left), March forecasted mean maximum temperature (right)

6 CONCLUSION

The seasonal forecast serves as a crucial indicator for anticipating future climate conditions. Consequently, the seasonal outlook supplies invaluable information to guide various climate-sensitive sectors. It is strongly recommended that relevant authorities be consulted for guidance when applying this forecast. Particularly, individuals within the agricultural sector are advised to seek counsel from the Ministry of Agriculture. For regions anticipated to experience dry spells, opting for drought-tolerant crops is the optimal choice. Conversely, areas expected to witness late onset and early cessation should consider fast-growing crop varieties. It's important to note that the likelihood of below-normal rainfall in November and February may have a considerable impact on crop production, and if dry spells and below normal rainfall are accompanied by high temperatures the impact may be enormous.

In areas susceptible to flooding, it is imperative to prepare and implement measures to mitigate the potential repercussions that may come due to intense and heavy rainfall. Cities and councils are strongly urged to commence the dredging of waterways to avert the risk of flash floods, which are highly probable during this season.

Furthermore, the forecasted high temperatures, particularly in February and March in the southern and central areas raise concerns about the emergence of heatwaves that can lead to health-related issues. Additionally, when warmer temperatures are coupled with high humidity, it creates an environment conducive to mosquito proliferation. Hence, it is essential to adopt measures to protect oneself from mosquito bites, thereby mitigating the risk of malaria. Furthermore, the promotion of good hygiene practices is vital in preventing waterborne diseases such as Cholera.

In conclusion, DCCMS is committed to continuously monitoring the season and providing necessary updates for this forecast. The department will consistently issue a range of forecasts, including ten-day agrometeorological bulletins, weekly forecasts, five-day forecasts, and daily forecasts. Moreover, timely warnings and advisories concerning extreme weather events, including tropical cyclones, will be disseminated throughout the season. This forecast will be updated in December 2023.

7 ANNEXES

7.1 A1: Press Statement

PRESS RELEASE



Ministry of Natural Resources and Climate Change

DEPARTMENT OF CLIMATE CHANGE AND METEOROLOGICAL SERVICES

PROSPECTS FOR THE 2023/2024 CLIMATE OUTLOOK FOR MALAWI

BOTTOM LINE: High chance of normal to below-normal rainfall over most parts of Malawi

Introduction

October to April marks the main rainfall season in Malawi. The Department of Climate Change and Meteorological Services (DCCMS) is closely monitoring the conditions that will shape the 2023/2024 rainfall season. Historically, the main rains commence from November, starting from the south and gradually spreading northwards. Pre-season rains, locally known as *Chizimalupsya*, often precede the main season.

Influential Rainfall Systems

The main drivers of rainfall in Malawi include the Inter-tropical convergence zone, Congo air mass, easterly waves, and tropical cyclones. These systems are influenced by various factors, including mean sea level pressure, upper-level winds, and sea surface temperatures in the tropical Pacific, Indian, and Atlantic Oceans.

El Niño Southern Oscillation (ENSO) Projection

Global climate models are projecting moderate to strong El Niño conditions for a significant portion of the 2023/2024 rainfall season. El Niño is characterized by unusual warming of waters in the Eastern Central Equatorial Pacific Ocean and typically leads to drier conditions over Southern Africa, potentially including southern Malawi. Historical analogue years for the upcoming 2023/2024 season include: 1982/1983, 1997/1998, 2009/2010, and 2015/2016.

Forecast Summary

The 2023/2024 rainfall seasonal forecast as produced by climate experts in Malawi is summarized and presented in two sub-seasons as below:

- **October to December 2023:** Expect normal total rainfall amounts over most areas of the country. However, there is a high likelihood of below-normal rainfall in November, particularly in southern and northern Malawi. There is possibility of delayed onset by at least two weeks in some areas.
- **January to March 2024:** Anticipate normal to below-normal total rainfall amounts over most areas with possibility of above-normal rainfall in January. There is possibility of prolonged dry spells in the month of February.

Additional Information

This forecast is relevant for relatively large areas and seasonal time scales and therefore may not account for all factors that influence localized climate variability, such as daily and weekly variations. To cater for localized climate variability and monthly variations, DCCMS has produced downscaled district forecasts. Furthermore, daily, five-day, weekly forecasts, ten-day agrometeorological bulletins and seasonal updates

will continuously be provided. DCCMS will also issue warnings and advisories regarding extreme weather events throughout the season.

Seeking Expert Guidance

Users from various sectors, including Agriculture, Disaster Management, Energy, and Water are encouraged to seek advice from the relevant ministries to better apply this forecast in their respective fields.

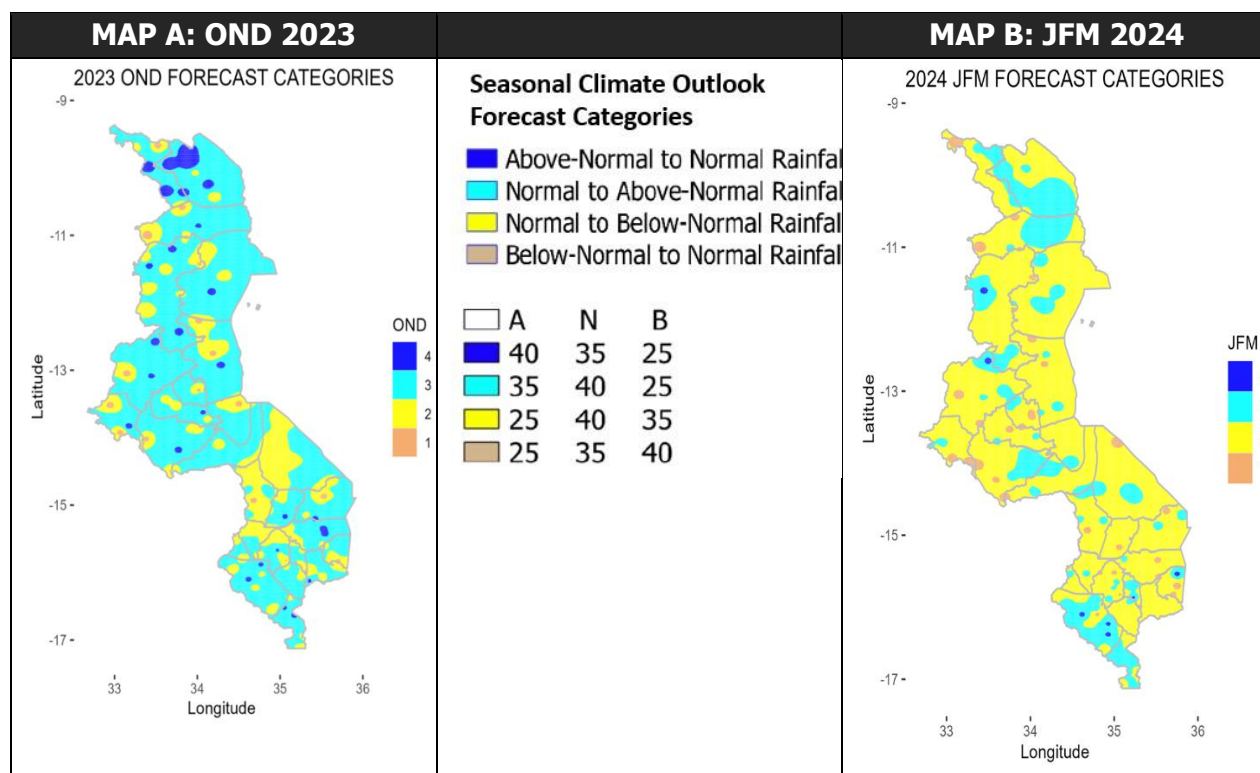
Stay informed, stay prepared, and stay safe during the upcoming rainfall season. Your safety and well-being are our top priorities.

SUBSEASON PROBABILISTIC FORECAST: OND AND JFM

Below are the forecast maps for the 2023/2024 rainfall outlook which cover the period October to December (OND) 2023, and January to March (JFM) 2024 presented in the form of probabilities of occurrence of rainfall amounts:

In Map A, cyan shade colour dominates and this means that during OND the greater part of Malawi has a 40% probability of rainfall amounts occurring in the normal category; a 35% probability in the above-normal category; and a 25% probability in the below-normal category, implying normal to above-normal total rainfall amounts are expected over most areas, with likelihood of below normal over few areas.

In Map B, yellow shade colour dominates, therefore during JFM, there is a 40% probability of rainfall amounts occurring in the normal category; a 35% probability of rainfall amounts occurring in the below-normal category and a 25% probability in the above-normal category over most areas. This implies normal to below-normal total rainfall amounts are expected over most areas.



7.2 A2: District Forecasts Posters

Follow the links to download the forecast for district(s) you are interested in:

District	Seasonal Forecast Link
	NORTHERN REGION
Chitipa	https://www.metmalawi.gov.mw/docs/district_fcsts/chitipa_2324_en.pdf
Karonga	https://www.metmalawi.gov.mw/docs/district_fcsts/karonga_2324_en.pdf
Rumphi	https://www.metmalawi.gov.mw/docs/district_fcsts/rumphi_2324_en.pdf
Nkhatabay	https://www.metmalawi.gov.mw/docs/district_fcsts/nkhatabay_2324_en.pdf
Likoma	https://www.metmalawi.gov.mw/docs/district_fcsts/likoma_2324_en.pdf
Mzimba	https://www.metmalawi.gov.mw/docs/district_fcsts/mzimba_2324_en.pdf
	CENTRAL REGION
Kasungu	https://www.metmalawi.gov.mw/docs/district_fcsts/kasungu_2324_en.pdf
Nkhotakota	https://www.metmalawi.gov.mw/docs/district_fcsts/nkhotakota_2324_en.pdf
Salima	https://www.metmalawi.gov.mw/docs/district_fcsts/salima_2324_en.pdf
Ntchisi	https://www.metmalawi.gov.mw/docs/district_fcsts/ntchisi_2324_en.pdf
Dowa	https://www.metmalawi.gov.mw/docs/district_fcsts/dowa_2324_en.pdf
Lilongwe	https://www.metmalawi.gov.mw/docs/district_fcsts/lilongwe_2324_en.pdf
Mchinji	https://www.metmalawi.gov.mw/docs/district_fcsts/mchinji_2324_en.pdf
Dedza	https://www.metmalawi.gov.mw/docs/district_fcsts/dedza_2324_en.pdf
	EASTERN REGION
Ntcheu	https://www.metmalawi.gov.mw/docs/district_fcsts/ntcheu_2324_en.pdf
Balaka	https://www.metmalawi.gov.mw/docs/district_fcsts/balaka_2324_en.pdf
Mangochi	https://www.metmalawi.gov.mw/docs/district_fcsts/mangochi_2324_en.pdf
Machinga	https://www.metmalawi.gov.mw/docs/district_fcsts/machinga_2324_en.pdf
Zomba	https://www.metmalawi.gov.mw/docs/district_fcsts/zomba_2324_en.pdf
	SOUTHERN REGION
Neno	https://www.metmalawi.gov.mw/docs/district_fcsts/neno_2324_en.pdf
Mwanza	https://www.metmalawi.gov.mw/docs/district_fcsts/mwanza_2324_en.pdf
Blantyre	https://www.metmalawi.gov.mw/docs/district_fcsts/blantyre_2324_en.pdf
Chiradzulu	https://www.metmalawi.gov.mw/docs/district_fcsts/chiradzulu_2324_en.pdf
Phalombe	https://www.metmalawi.gov.mw/docs/district_fcsts/phalombe_2324_en.pdf
Mulanje	https://www.metmalawi.gov.mw/docs/district_fcsts/mulanje_2324_en.pdf
Thyolo	https://www.metmalawi.gov.mw/docs/district_fcsts/thyolo_2324_en.pdf
Chikwawa	https://www.metmalawi.gov.mw/docs/district_fcsts/chikwawa_2324_en.pdf
Nsanje	https://www.metmalawi.gov.mw/docs/district_fcsts/nsanje_2324_en.pdf