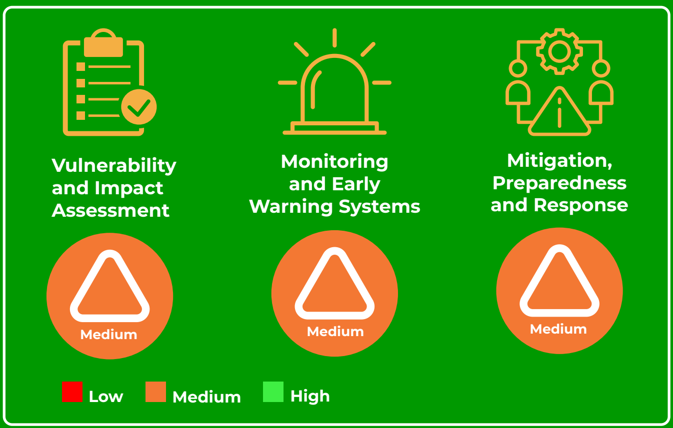
COUNTRY OVERVIEW

Floods and droughts pose the most significant and recurring risks to Malawi. On average, droughts affect 1.1 million people in Malawi each year and this number can be substantially higher in dry years. Droughts have also contributed to severe food crises in the country, particularly in 2005, 2012 and 2015/16. Malawi experienced a 1-in-500 year flood in 2015 which impacted more than 1.1 million people and was followed by a devastating drought in 2016 that left at least 6.5 million people food insecure. This recurring pattern of heavy flooding followed by drought episodes is becoming increasingly common in Malawi and other southern African countries. In terms of sector impacts, agriculture is central to Malawi's economy, contributing nearly 40% of GDP and roughly 90% of the country's export earnings. The majority of agriculture production is rainfed and focused on maize. Erratic rainfall poses a challenge to maize productivity, as do higher temperatures and droughts, as well as dry spells during the rainy season. In 2015, maize production declined by over 40% and put 17% of the population at risk of food insecurity and depressed macroeconomic growth. Droughts and floods, along with higher temperatures, also negatively impact fisheries, wildlife and forests, which provide food, income, fuel and other environmental services to vulnerable populations.



The Integrated Drought Risk Management Framework highlights a three-pillar approach centered around interconnected, multi-disciplinary, multi-institutional activities. These are 1) Vulnerability and impact assessment; 2) Monitoring and early warning systems; and 3) Mitigation, preparedness and response. This country Drought Resilience Profile contains drought information based on these three pillars.

This profile provides a background of Malawi's drought resilience capacity in the three pillars. The vulnerability and impact assessment capacity of Malawi can be regarded as medium as it has institutions and arrangements that are active in conducting vulnerability assessments for drought, but which are very dependent on donor support. Strengthening local capacity is key to building long-term vulnerability and impact assessment capacity.

Drought monitoring and early warning systems (EWS) capacity is also classified as medium. The country has clear drought indicators to monitor drought has the capacity to monitor EWS messages and conduct seasonal forecasting. However, there is a need for greater integration of information systems at national and community levels, proper planning for impending emergencies and achieving a better balance between rural and urban coverage.

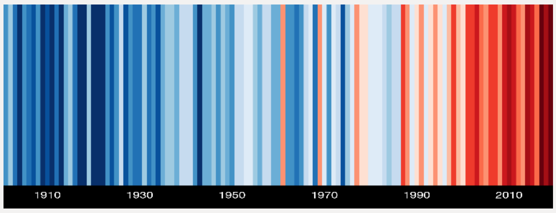
Finally, Malawi has systems in place for mitigation, preparedness and response to drought, but the approach is still largely reactive with a primary focus on emergency relief. While there is some level of coordination across different entities, there is a need to strengthen it for better functionality of the system.

This document provides a brief overview of drought risk issues. The key resources at the end of the document provide more in-depth country and sectoral analyses. The contents of this report do not necessarily reflect the views of the World Bank, CIWA, NDMC or IWMI.

Historical climate

- As illustrated in the #ShowYourStripes 'warming stripe' graphic for Malawi in Fig 1, the stripes turn from mainly blue to mainly red in more recent years, illustrating the rise in average temperature since 1901.
- Drought frequency has increased since the 1980s. There was one drought in the 1980s, two in the 1990s, and three in the 2000s (Table 1).
- Mean annual temperature has increased by 0.9°C between 1960 and 2006, an average rate of 0.2°C per decade (World Bank, 2020).
- Mean annual temperature is 22°C (1901-2016) (ibid).
- Mean annual precipitation is 1071mm (1901-2016) (ibid).

Fig 1. Temperature change in Malawi, 1901-2019



Source: Berkley Earth/#ShowYourStripes

Future climate

- Mean annual temperature is projected to increase by 1.1 to 3.0°C by the 2060s and by 1.5 to 5.0°C by the 2090s. Annually, projections indicate that 'hot' days will occur more often (World Bank, 2011).
- Annual precipitation will decrease by at least 60mm between 2040 and 2059 (RCP 8.5, Ensemble) (World Bank, 2020).
- All models consistently project increases in the proportion of rainfall that falls in heavy events of up to 19% by the 2090s (ibid).

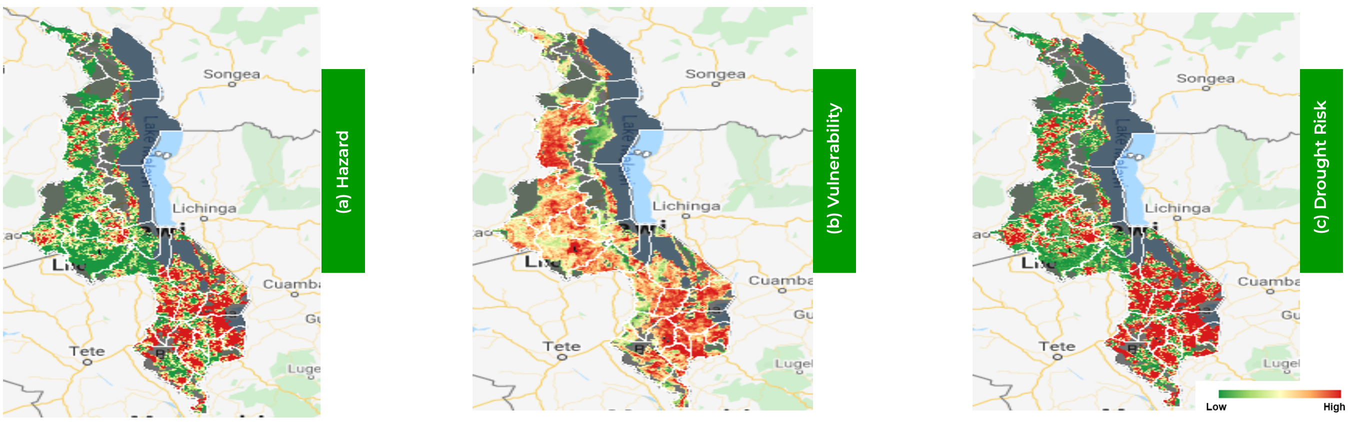
Table 1. Major droughts in Malawi (Source: EM-DAT, 2020)

Year	Location	Affected Population
1987	Southern region	1.43 million
1990	No data*	2.8 million
1992	Dedza, Dowa, Mzimba, Nkhotakota, Ntcheu, Salima districts	7 million
2002	Southern Region	2.83 million
2005	Southern Region and Central Region provinces	5.1 million
2007	Northern, Central and Southern Region Provinces	520,000
2012	Southern and Central Province	1.9 million
2015/16	Almost all provinces	6.7 million

* No data provided from source

Vulnerability and Impact Assessment

Fig 2a-c. Drought hazard, vulnerability and risk maps for Malawi



The above maps (Fig 2a-c) depict drought hazard areas (a), areas of vulnerability (b) and drought risk (c). Drought risk is defined by characterizing hazard and exposure to vulnerability and the lack of adaptive capacity, using multisource information from satellite-derived drought indices and socio-economic conditions. In terms of components, hazard is defined through meteorological and agricultural drought i.e. National Drought Risk Index (NDRI); and exposure and vulnerability expressed through population density, human modification index, water risk, and irrigated systems.

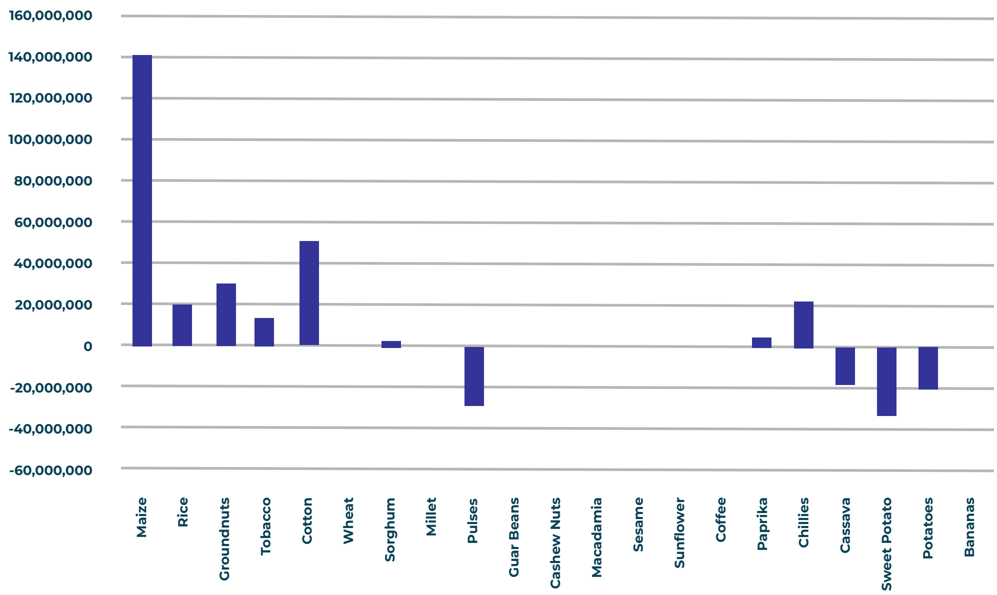
Agricultural production (agricultural practices i.e. irrigated area, food production as provided on HarvestChoice) was used to define levels of vulnerability which were finally combined with all three components to define levels of drought risk at the country level, referred to as the National Drought Risk Index (NDRI).

The drought risk profile is therefore based on the probabilistic estimation of hazard and vulnerability to assess the drought risk in the exposed areas. Among the drought prone areas in Malawi, the NDRI shows that the Southern regions and parts of the Central regions are mostly vulnerable and have high drought risk as compared to other regions (maps generated by IWMI). Salima, Zomba and the Shire Valley (Nsanje and Chikwawa) are particularly drought-prone areas.

In addition, the impacts of drought are not uniform across all regions as the colour changes from green to red. Drought conditions in both Southern and Central Regions affect agricultural production, water sources and food security, resulting in the increasing incidences of disease outbreaks such as cholera.

Droughts impact on agriculture

Fig 3. Agriculture sector losses per crop during the 2015/16 drought



Source: World Bank, UN & EU, **2016**

Malawi was hit by the 2015/16 drought at a time when the country's economy was still battling to recover from the 2015 floods.

According to the Post-Disaster Needs Assessment conducted at the time, the cumulative impact of drought directly related to GDP was roughly 5.6% of Malawi's GDP (World Bank Group, UN, & EU, 2016).

Agriculture was by far the hardest hit sector and observed the largest economic cost due to a significant loss in crop production. The sector, accounting for nearly 30% of Malawi's GDP, suffered a total loss of up to USD 240.7 million across rain-fed crops, fisheries and livestock.

Crop production accounted for 83% of these losses (USD 198.7 million) due to poor yields and production levels caused by moisture stress.

Cereals (maize, rice, sorghum and millet) accounted for nearly 60% of all crop losses, followed by 39% incurred by cash crops (tobacco, groundnuts, cotton and chilies).

The loss in value of the livestock sector accounted for 20% of the agriculture sector's losses, amounting to USD47 million (ibid). It is estimated that on average, once every 10 years, a loss of USD 380 million in agricultural income occurs in Malawi (ibid). Annually, the national agricultural income loss is USD 60 million due to drought (ibid).

To respond to the effects of drought, the country implemented several projects through government and other stakeholders as preparatory measures against drought, such as crop diversification and promotion of a wide range of food sources.

Water resources

According to Laisi (2009), Malawi has abundant water resources when compared to other African countries. Malawi receives an average annual rainfall of about 1,000mm and many perennial flows exist.

Roughly 83% of the population had access to safe, clean water in 2011 while 81% in rural areas had access to clean water (JICA, 2014). Groundwater in Malawi has been primarily used for drinking water supply for both rural and urban areas.

The country has two types of aquifers, namely the extensive but low-yielding weathered basement aquifer of the plateau area and the high-yielding alluvial aquifer of the lakeshore plains and the Lower Shire Valley.

In terms of surface water resources, Malawi has Lake Malawi and other smaller lakes such as Chilwa, Malombe and Chiuta, as well as the numerous streams and rivers (Laisi, 2009).

However, the abundant water resources are threatened by several factors such as erratic rains, extended dry periods and increased evaporation rates (combined with population growth and increased water demand), water resource degradation and pollution, over-exploitation and conflicts emerging from the lack of integrated water resources development and management.

Lake Chilwa also experiences cyclical drying with a shrinking of up to one meter between the dry and rainy season. In recent years, it dried up in 2012 and 2015 (Kambombe et al, 2021).

The drying of Lake Chilwa has negative consequences on fishing as it does not only render fishing impossible but also leads to complete loss of some species (Njaya, 2001).

Moreover, increased drought conditions are expected to continue to lower water levels in Lake Malawi and the Shire River, further reducing hydropower production (which supplies 95% of Malawi's electricity) (USAID, 2017).

Low water levels have already decreased energy production by 66% in plants along the Shire River and electricity is often rationed near the end of the dry season (October).

Both droughts and floods already significantly curtail access to safe water sources.

Fisheries

Small-scale inland fisheries account for 95% of fish production and contribute significantly to Malawians' health and livelihoods (USAID, 2017). Fish constitute 28% of animal protein intake (mainly Chambo) and support the livelihood of 10% of the population. This sector is vulnerable to various climatic changes including drought, which impacts fish biology, reproduction, productivity and habitats (ibid). The drying of many water bodies in Malawi has affected fish breeding which disturbs fish stocks with losses estimated to be in the order of USD 10.8 million and accounting for 4% losses in the agriculture sector (PDNA, 2016). Moreover, Lake Chilwa, which provides a quarter of the country's fish production, is just 5 meters deep, and surface area and water levels fluctuate with regional rainfall.

Compared to dramatic increases in the catch data for Lake Malawi, the State of Environment Report: Fisheries of Lake Chilwa reported a progressive decline in catches for Lake Chilwa as well as for Lake Malombe and Lake Chiuta over time (USAID, 2015). In Lake Chilwa, the fish catch trends indicate a gradual downward trend from 25,000 t/yr in the late 1970s to a low of 5,000 t/yr in 2014. The years 1997 and 2012 saw a collapse and recovery of species after the lake recessions due to drought. Recovery is mainly driven by the Mlamba and Matemba species, which historically have been shown to be resilient to lake drying episodes. Matemba catch are used as key indicator species of production trends (ibid). Lake Chilwa, a notable wetland area, is also home to 5,000 plant and animal species (USAID, 2017).

Forests and ecosystems

Droughts have an impact on Malawi's forestry sector because they lead to land degradation and loss of soil fertility, reduce vegetation and increase the risk of forest fires.

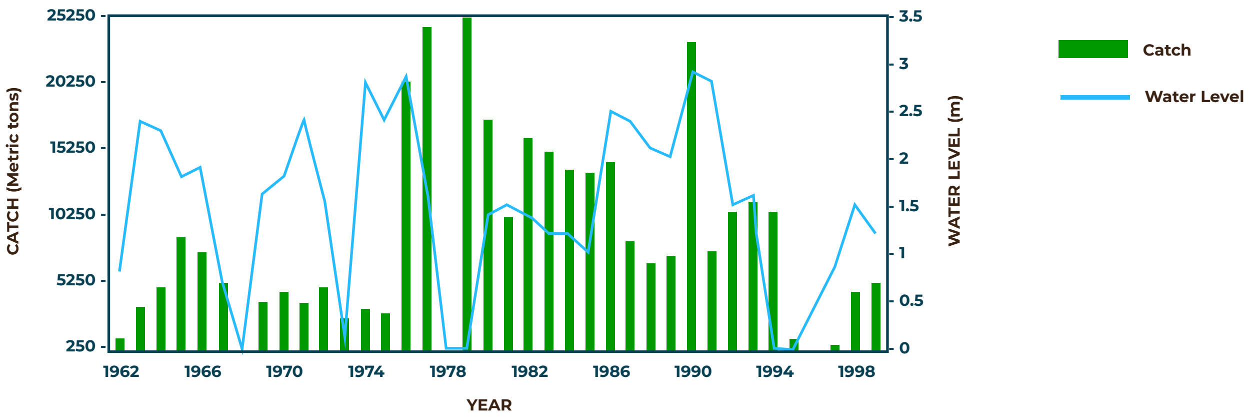
For example, during the drought of 1995, some 5,550 ha (or 36%) of Chongoni forest were destroyed by forest fires caused by human activities such as hunting resulting in smoke haze, loss of seedlings and biodiversity.

Forest degradation can in turn increase the impacts of drought by affecting carbon, energy and water balances at large geographical scales, as well as modifying plant communities and populations dynamics.

Such impacts are challenging because they are likely to be big, fast and patchy, pervasively affecting ecosystem goods and services (Breshears et al, 2011). Forest cover has declined significantly since the 1970s mainly due to charcoal production and agricultural expansion.

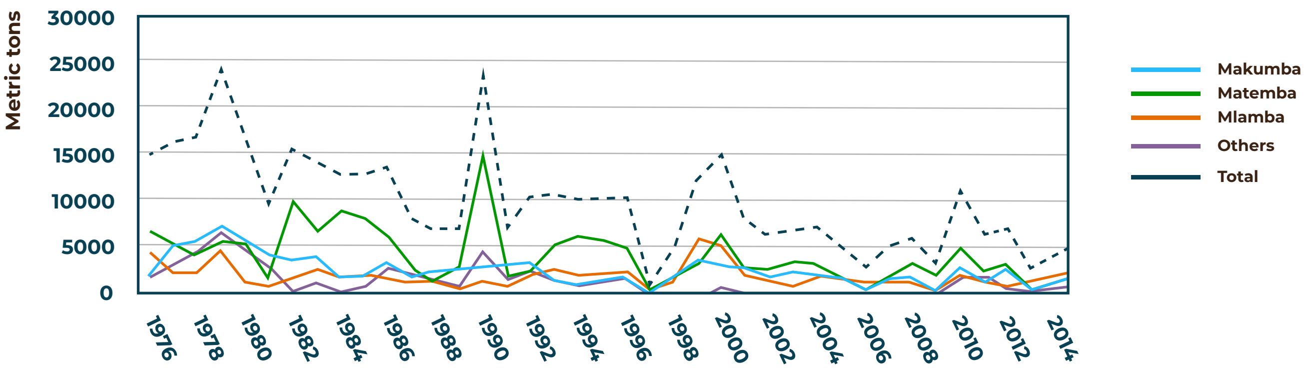
Wildlife is also under threat from poaching in addition to climate factors such as drought, as evidenced by recurring droughts in Lengwe National Park that resulted in migration and increased mortality of animals.

Fig 4. Variation in fish catch in Lake Chilwa compared to changes in lake levels changes at Kachulu. Major recessions in 1968, 1995, minor recession in 1973, and high water levels seen between 1974-1976, 1986-87 and 1990-91



Sources: Njaya **2001**; USAID **2015**

Fig 5. Lake Chilwa fish species catch (1976-2014)



Source: Chiwaula et al. **2012**

Vulnerability and impact assessment capacity

The Vulnerability Assessment and Analysis (VAA) is conducted annually by the Malawi Vulnerability Assessment Committee (MVAC), a coalition of government and non-government organizations that provide regular drought vulnerability updates in order to coordinate relief efforts in the country.

The vulnerability assessment data are obtained through a collaborative method, integrating both primary and secondary data for its food security analysis.

Several surveys are typically used including: the Household Food Security Survey (HHFSS), the Household Food Economy Approach (HEA) and a Market Survey.

A number of secondary datasets are also used in the final analysis and these include: the Agricultural Production Estimates Survey (APES), as well as data from the Ministry of Agriculture (MoA), FEWSNET, and WFP (mVAM) price data, NSO inflation and population census figures and District Agriculture Office (DAO) reports among others.

Overall, data analysis is done through a rigorous technical consensus-building process using the Integrated Food Security Phase Classification (IPC) Analytical Framework. Overall classification into the five food insecurity phases is based on several indicators: key drivers of food insecurity (indirect indicators: risks, hazards and vulnerability, food availability, food access, food utilization and food stability) and IPC outcome elements (direct indicators, thus: food consumption; livelihood change, mortality and nutritional status).

Populations are classified into the five IPC Phases namely: Minimal, Stressed, Crisis, Emergency and Catastrophe/Famine. Each phase has recommended response objectives to be addressed.

While MVAC is the most prominent institution involved with conducting timely applied research on household vulnerability, MoA plays an important indirect role in vulnerability assessment due to its responsibility for annually conducting the three rounds of the Agricultural Production Estimates Survey (APES).

This is used by government and its partners to determine whether domestic production of food crops will be sufficient each year to meet the food needs of the population.

Vulnerability and Impact Assessment

MoA is responsible for computing the annual food balance sheet (FBS) for the country based in part on the crop production estimates. MoA also monitors staple food prices in markets across the country, which are also a valuable indicator of food security conditions.

Continuous effort to strengthen the institutional and human resource capacity of MVAC is notable.

Further capacity strengthening needs include the need for greater integration of MVAC information systems at national and community levels, proper planning for impending emergencies, achieving a better balance between rural and urban coverage, and the complexities of the use of MVAC assessment in conjunction with the other vulnerability assessments (Babu et al, 2018).

Finally, for the MVAC process to be sustainable, it should be integrated into the national early warning system (EWS).

Given the cost of MVAC and IPC, it would be useful to institute a food security and nutrition monitoring system that manages early warning, policy advocacy, and program management and contributes to national resilience-related policy making (ibid).

Monitoring and Early Warning Systems

Monitoring and early warning systems capacity

Table 2 represents a summarized traffic light checklist to illustrate the state of monitoring and early warning system capacity in Malawi. It summarizes key aspects needed for a strong monitoring and EWS framework, most notably, whether there is an official definition of drought used in country; whether drought indicators are used, and if so, which ones; whether there is a drought early warning system (DEWS) in place; and if so how functional it is; and whether the country makes use of seasonal forecasting.

Meteorological drought refers to a lack of rainfall compared to long-term means, while hydrological drought refers to water availability deficits leading to shortages in consumable water resources. Agricultural drought is defined as soil water deficits for crops and socio-economic drought refers to consequences of water shortages that restrict access to water or to goods and services that rely on the availability of water. The declaration of a national state of disaster over drought in Malawi is often based on several sources of information, indicating the acknowledgement of these different types of droughts in the drought declaration process. In the 2016 declaration by the President, sources of information included weather data from the Department of Climate Change and Meteorological Services (DCCMS), food supply and demand information from the second-round APES crop production estimates, which MoA undertook in late-February and March 2016, and the national food balance sheet (FBS) for Malawi.

Although there is scarce literature available on the drought warning communication and dissemination process in Malawi, recent studies reveal that there is a mostly top-down system in place for the dissemination of drought warning information (Calvel et al, 2020; Streefkerk, 2020) from the national level to the local level, though most authorities involved in the design of drought warnings remain at the national level.

The DEWS consists of the provision of a seasonal forecast, first agreed upon at the Southern African Regional Climate Outlook Forum (SARCOF) and by the DCCMS in Malawi. SARCOF leads a regional climate outlook prediction process embraced by the Southern African Development Community (SADC). This community is composed of sixteen countries, including Malawi (WMO, nd). The seasonal forecast showing the rainfall predictions for the season is then downscaled to national level and disseminated by DCCMS through mainly the agricultural and disaster management departments to local communities. Early warnings are then disseminated via different channels including posters, organized gatherings, bulletins, radio programs, text messages, the use of loud-hailer via car or van around the village and word of mouth. Several of these early warnings are issued in different local languages. Additional to the long-range seasonal forecasts (3-6 months every year), 10-day agro-meteorological bulletins, weekly weather statements, 5-day forecasts, daily forecasts and real-time (up to 3 hours) alerts, providing updates on rainfall and wind are disseminated through various channels, including radio, text-messages, newspaper, e-mails, WhatsApp groups and on the DCCMS website.

Table 2. Summarized checklist of monitoring and EWS capacity

Official definition of drought	Yes
Drought indicators used	Yes
Existence of a DEWS	Yes
Capacity to tailor EWS messages to end-user needs	Limited
Effective communication of early warnings with built-in feedback mechanisms	Limited
Use of most salient communication channels to reach women/youth/disenfranchised communities	Yes
Use of community relays, extensions services, local media to communicate EWS and reach at risk communities promptly	Limited
Seasonal forecasting	Yes

Yes | No | Limited

DCCMS therefore aims to provide reliable, responsive and high-quality weather and climate services to meet national, regional and international obligations through timely dissemination of accurate and up-to-date data information. In addition, the DoDMA is mandated with coordinating disaster risk reduction, relief and disseminating early warning information in the country once they have been generated by DCCMS. DoDMA acts as the mouthpiece through which weather-related early warning messages are announced by the Department of Water Resources (DWR) (hydrometeorological data) and DCCMS (climate information).

In addition, Malawi has both traditional and scientifically-based drought monitoring and EWS. Traditional systems use behavior of plants or animals, whereas scientific systems are based on indicators derived from variables such as climate, soil moisture and stream-flow. The common scientific indicators used to characterize severity of drought include the Water Requirement Satisfactory Index (WRSI), Standard Precipitation Index (SPI), Normalized Difference Vegetation Index (NDVI) and standard weather/seasonal rainfall forecasts (Chabvungma, Mawenda and Kambauwa, 2014).

Another significant development in Malawi has been the development of the Drought Seasonal Warning System, developed as part of the Shire Basin Operational Decision Support System (ODSS). This system allows the calculation of relevant drought indices by using free Earth Observation products available in near-real time. The ODSS drought monitoring system is used to disseminate up-to-date drought related information at the national level. Short-term and seasonal weather forecast information is available to predict the trend of any drought event occurring in the country. Identification of drought impacted areas is carried out with different types of drought impacts:

- Climate impact based on the available TRMM-based indices
- Soil moisture impact based on the available SWI-based indices
- Vegetation impact based on the available NDVI-based indices

In terms of the policy framework guiding DEWS, Malawi's National Disaster Risk Management Policy outlines the importance of effective EWS, where one of the priority areas is the development and strengthening of a people-centered EWS. Also, the key global agreements that are recognized by the country are the Paris Agreement, the Sendai Framework for Disaster Risk Reduction (DRR) and the SDGs, all of which speak to the importance of EWS (Wood & Moriniere, 2013).

In terms of weather station infrastructure, the DCCMS is responsible for meteorological stations, while the DWR oversees hydrological stations. DWR receives rainfall values for station locations from DCCMS. Hydrometeorological stations in Malawi are sparsely and unevenly distributed, and, like several other southern African countries, the number of stations has seen a steady decline over the years. DCCMS has reported 28 synoptic stations but 21 have data earlier than 1980. Although they are in the process of being improved and rebuilt, they are still in a state which limits the ability to accurately monitor current conditions and produce tailored information and forecasts.

While improvements toward a people-centered approach for DEWS are underway in Malawi, a high dependency on financial support from donors and lack of available funds at local levels for such initiatives is a major challenge (Calvel et al, 2020). Although further introduction of digital communication methods could help reduce costs, other key elements such as training of agricultural extension officers and logistics also depend on donor funding. This is problematic for the further development and sustainability of these systems. Financial sustainability is currently not strongly embedded in the EWS framework in Malawi (ibid).

In addition, the lack of staff capacity and the limited access by the population to mobile phones, radio sets or internet limits the accessibility to drought warning information (ibid). Not all early warning information provides messages that are specific to the geographic context and the farming activities and decision-making needs of the farmers. This has a significant bearing on the extent to which farmers are able to utilize that information.

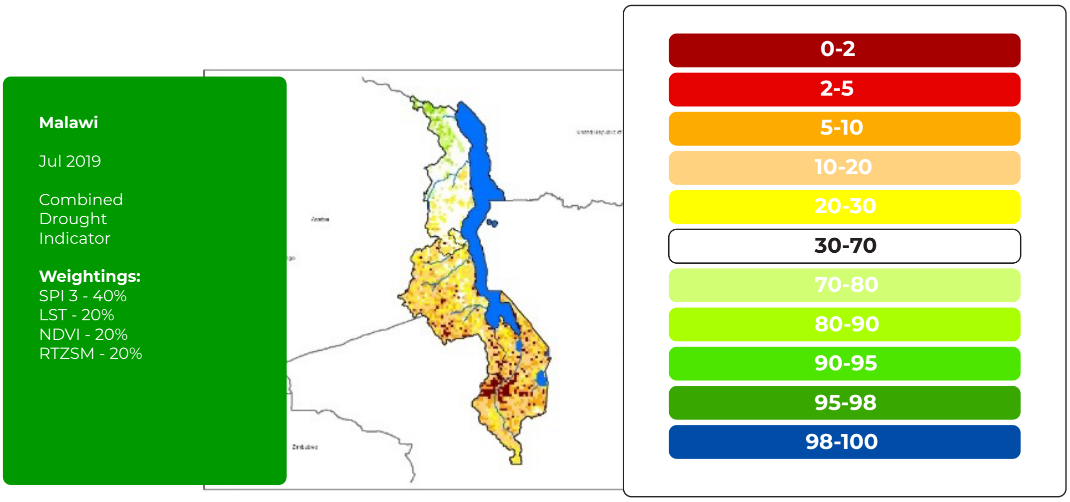
To address these challenges, stakeholders have emphasized the need to integrate indigenous knowledge available within local communities into the existing scientifically grounded EWS. There is also a need to strengthen capacity of department officials across all responsible departments, most notably in the translation of climate information in a user-friendly manner to next-users. Further, there is a need to improve the technological infrastructure to ensure that the information that is sent to end-users reaches them on time (there have been concerns about the lack of internet or mobile connection and lack of access to television and radios). The EWS still needs to be tailored to users and translated into more local languages. Finally, existing EWS and sources of climate information in Malawi are under-utilized and can be improved. This has to do with tailored information provided in a timely manner to next users, but also the level of trust users place in such information, both because of the extent to which the information is context-specific and because of their perceptions of the information generators and providers associated with it (Calvel et al, 2020). Whilst the number of active information channels might provide a useful indicator of the extent to which information reaches end users, effectively evaluating EWS requires a more nuanced analysis of both accessibility and trust in information.

Combined Drought Indicator (CDI)

Using a combined drought indicator (CDI) approach, the National Drought Mitigation Center (NDMC) at the University of Nebraska-Lincoln, in partnership with the World Bank, has developed a Drought Monitor that represents a consolidation of indices and indicators into one comprehensive drought map. The CDI map for Malawi was created using a weighted combination of four indicators of drought: precipitation, vegetation stress, land-surface temperature and soil moisture. January 2016 was selected to depict the severity of the 2015/16 drought. January, being the peak of the rainy season when more rain is expected, provides an assessment of the drought's magnitude (duration and intensity), spatial extent, probability of occurrence and impacts. The January 2016 CDI map shows the south and central part of the country moderately impacted by some degree of drought.

Without an effective drought monitoring and EWS to deliver timely information for early action, such as the CDI, effective impact assessment procedures, proactive risk management measures, preparedness plans aimed at increasing the coping capacity and effective emergency response programs directed at reducing the impacts of drought, the country will continue to respond to drought in a reactive, crisis management mode.

Fig 6. Combined Drought Indicator for Malawi, January 2016



Source: NDMC, **2020**

Mitigation, Preparedness and Response

Drought policy framework

Malawi has strategies and policies which have aspects of drought management embedded in them, but there is no single policy/strategy that wholly focuses on integrated drought management:

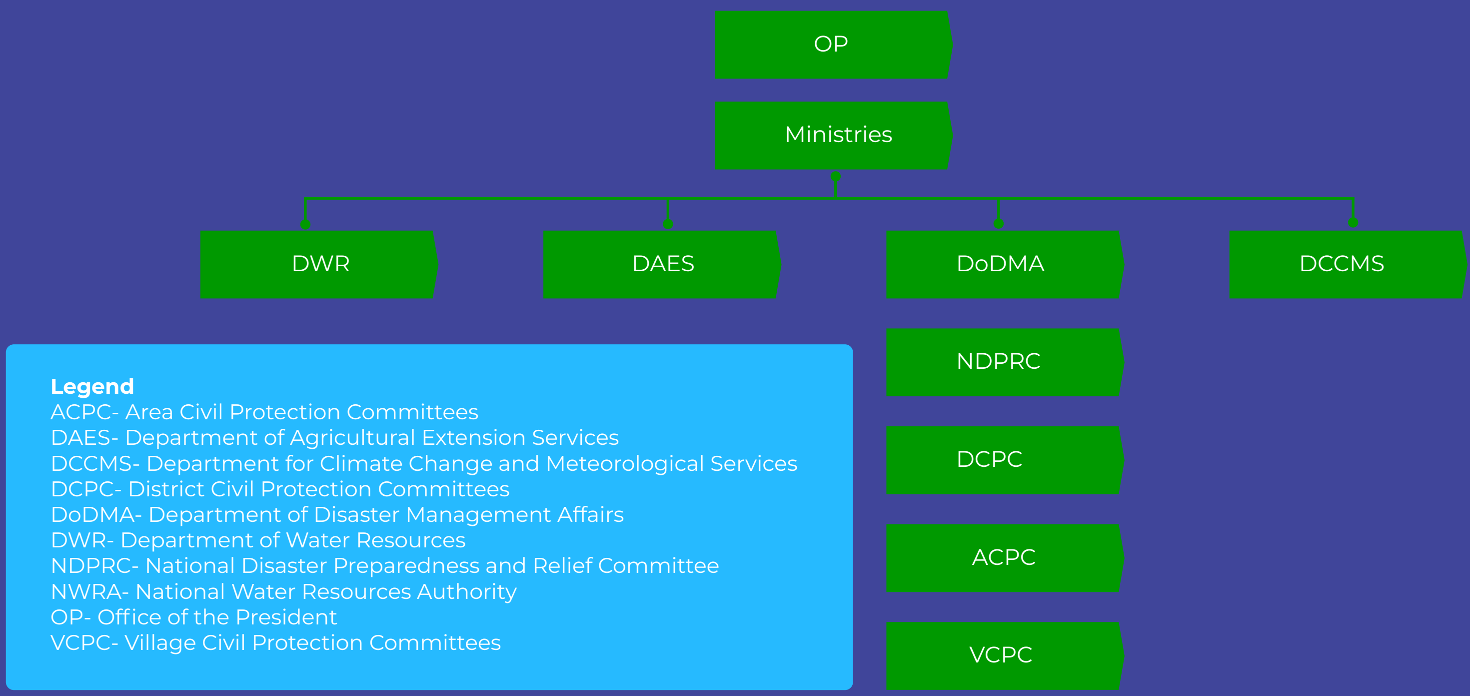
- **Malawi Constitution, 1995**
- **Water Works Act (No.17 of 1995)**
- **Environment Management Act, 1996**
- **Forestry Act, 1997**
- **National Irrigation and Development Strategy, 2000**
- **Irrigation Policy Act, 2001**
- **National Land Policy, 2002**
- **Growth and Development Strategy, 2011-16**
- **National Water Resources Act, 2012**
- **Water Resources Act, 2012**
- **National Climate Change Invest-ment Plan, 2013-2018**
- **National Disaster Risk Management Policy, 2015**
- **National Disaster Recovery Frame-work Volume II: Drought, 2017**
- **Malawi Growth Development Strategy (MGDS III), 2017-2022**
- **National Energy Policy, 2000 and 2018**
- **National Resilience Strategy (2018 – 2030)**

These policies are jointly implemented to support climate mitigation and adaptation, reduce climate change impacts on food security, drought management, water availability and quality and energy which have affected sustainable livelihoods, especially for rural communities.

These policies have been useful but had not effectively addressed drought challenges until 2015, when the National Disaster Risk Management Policy was developed. Similarly, the National Disaster Recovery Framework (NDRF) Volume II: Drought, is specifically focused on drought and aims to sustainably improve the resilience of communities, support prolonged food security of vulnerable populations and restore the livelihoods of disaster-affected communities.

The Framework, developed after the 2015/16 drought, serves as a guide for government and other implementing stakeholders in guiding recovery investment and resource allocations across short-term humanitarian needs and medium- to long-term reconstruction.

Fig 7. Malawi's drought institutional framework



Institutions and coordination

Malawi has institutions tasked with the various aspects of managing natural disasters. First, the country has the Office of the President (OP) and Cabinet, that acts as an umbrella unit for drought management coordination. The DoDMA, as previously mentioned, is mandated with coordinating disaster risk reduction, relief and dissemination of EWS in the country.

The National Disaster Preparedness and Relief Committee (NDPRC) provides policy level guidance to DoDMA and is responsible for coordinating the implementation of measures to alleviate disasters, while the Civil Protection Committees (CPCs) constitute the frontline decentralized institutions at the District, Area and Village levels (DCPC, ACPC and VCPC), providing community level coordination of preliminary disaster impact assessments in the affected communities before any relief operations are initiated. These institutions also serve as entry points for any dissemination of disaster early warning information at the community level.

MoA is responsible for agriculture in light of drought and other natural disasters. The ministry helps to increase agricultural production and enhance food security through relevant strategies like irrigation development; achieving sustainable, integrated and equitable water resources development; empowerment of user communities to own, manage and invest in water resources development and promoting public and private sector participation in water resources management, development, supply and conservation.

The National Water Resources Authority (NWRA) is responsible for the provision of water and maintaining all water-related works and contracts relating to water supply for domestic, public and business purposes including agricultural water in the form of irrigation. Malawi also has Water Users Associations (WUA) to manage, distribute, operate and maintain any water-related works for the purposes of management of the water resource in its area of operation, even during dry seasons.

The Department of Agricultural Extension Services (DAES) within the MoA is focused on providing extension services to farmers in all districts of Malawi. In this regard, providing relevant and timely information for extension workers is a key requirement. One of their key decisions where climate information plays a role is to know when to promote irrigation farming and what types of crops to plant in a particular year. Presently farmers tend to use indigenous knowledge for making farm management decisions – there is currently limited use/awareness of seasonal forecasts. The monitoring information provided by automatic weather stations can be very useful, but currently these data are not effectively shared with DAES, which restricts their ability to identify areas facing high risks.

As highlighted in the NDRF, coordination challenges between Government, District Councils, development partners, and civil society oftentimes results in duplication of recovery efforts and use of resources for non-prioritized recovery activities.

Undefined communication and coordination mechanisms create awareness gaps and exclude stakeholders that are important for recovery processes.

This is often most pronounced in recovery efforts between the Government and NGOs, but also remains an internal challenge between ministries, departments and agencies (MDAs).

At the district level, there is limited capacity to track recovery activities, especially when implemented through organizations that fail to register or communicate operations with DoDMA and the District Council. Without an updated database of recovery activities, including interventions implemented by NGOs, MDAs are unable to clearly identify recovery needs and direct recovery support.

In addition, ad hoc requests for information often take time and provide incomplete information. These challenges are further compounded in situations where disasters strike in consecutive years.

Recovery responses to the 2015 floods and 2015/16 drought emphasize the importance of ensuring co-ordination between MDAs, districts, DPs, and CSOs and NGOs, because both disasters affected similar districts and sectors. Without clear co-ordination mechanisms and implementation arrangements there is a greater likelihood of duplicating efforts and creating recovery gaps. These challenges have become more prioritized to be addressed since highlighted in the NDRF.

It is important that the NDRF be used as the primary framework for drought management among multiple partners, and integrated with flood responses to effectively communicate recovery priorities. Sensitization could be strengthened to ensure recovery activities and work plans are aligned with the NDRF and that interventions are tracked and communicated at all levels. Districts offices should also improve regular communication on recovery interventions to MDAs and DoDMA, and should enhance oversight to ensure that recovery agencies are registered and that they report on recovery activities and financing (NDRF, 2017).

Mitigation, preparedness and response capacity

The Government of Malawi (GoM), and other supporting institutions have put in place measures and practices to alleviate drought impacts prior to or during drought, however, they are still **primarily oriented towards emergency relief**. Malawi has however developed a **National Contingency Plan (NCP)** that is updated annually.

The NCP process has the ability of bringing many humanitarian players together and acts as a framework for raising resources for disaster response.

The plan also acts as a link between local disaster risk reduction measures and international disaster risk reduction efforts through international organizations such as United Nations (UN) agencies (like WFP, UNICEF and UNFPA) and NGOs.

On the other hand, the development of the contingent plan was a starting point for Malawi to partner with the **African Risk Capacity (ARC).** This early planning process assists the country to mobilize ARC's funds efficiently and faster in case of emergencies including during weather shocks.

For the most recent droughts, the GoM implemented a comprehensive **Post-Disaster Needs Assessment (PDNA)** to assess the impact of the drought and identify a multi-sectoral recovery strategy aimed at building long-term resilience to future risks.

The country also has a **recovery strategy for water supply** and sanitation that revolves primarily around medium to long-term measures that help to increase water supply for both rural and urban areas and is in full alignment with the Malawi Rural Water Supply Investment plan for 2014-2020.

This strategy also helps with the sustainable development of water supply infrastructure through rehabilitation or construction of new gravity-fed water supply systems, especially in the rural areas during extremely dry season.

A key drought management strategy in the water sector is the drilling of boreholes, both in rural and urban areas, to augment water supply. The government also works to strengthen community capacity through the formation of community management structures to oversee recovery and reconstruction at the district level.

During the **drought of 2016/2017**, the President of Malawi made an appeal for humanitarian relief assistance from the international donor community, the UN, non-governmental organizations (NGOs), the private sector as well as individuals. The total amount of financial assistance mobilized by the government and international partners was USD 149.36 million.

The funds were used to support food security, agriculture, nutrition, protection and education in 24 districts of the country. Also in response to the 2016/2017 drought, the DoDMA led the development of a Food Insecurity Response Plan (FIRP) for 2016/2017 on behalf of the government under the cluster system and in collaboration with key UN agencies.

The main strategic objective of the FIRP was to provide immediate life-saving and life-sustaining assistance to the drought-affected population. However, several challenges were experienced in its roll-out, most notably, the lack of capacity in the clusters by government agencies not only to operate within an emergency context but also to be prepared for emergencies to come (Babu et al, 2018).

In addition, even with high-level political support for and ownership of FIRP, the GoM stil depended on donors and other development partners to design and implement the FIRP both operationally and financially.

As a result, although the government was in the "driver's seat," development partners took the initiative in most areas of FIRP design, financing and implementation.

In addition to these drought response measures, the GoM, with funding from the World Bank, developed an **index-based weather insurance scheme** aimed at helping the government to manage the financial impact of drought-related national maize production shortfalls. The scheme was designed to provide compensation to farmers when rainfall during a crop growing cycle is insufficient, and promoted climate smart agriculture to mitigate effects of drought (Syroka et al, 2010).

Over the years, the GoM has also implemented a **green belt initiative and conservation agriculture farming**; partnerships with NGOs such as the Red Cross Society to **disseminate early warnings to communities, the expansion of the hydro-meteorological station network** and **cash transfers to poor households**. The government has also promoted **efficiency and effectiveness in energy supply industries**, and established institutions such as the Malawi Energy Regulatory Authority (MERA).

The 2015-16 drought affected electricity generation, as Malawi's electricity is largely generated by hydropower, so a shortage of water has serious implications for the supply of energy. In conclusion, there is much scope for improved DEWS and monitoring as well as a more proactive drought management approach. Pilots to create and/or improve EWS have been carried out successfully, but remain geographically limited. Community-based EWS (CBEWS) projects, largely implemented by NGOs, are on-going in several communities across Malawi. CBEWS have been successful by disseminating information from upstream to downstream communities, through school and faith-based organizations and using locally relevant communication methods.

Other international organizations, including the World Bank, World Meteorological Organization (WMO) and UNDP through its Least Developed Country Fund (LDCF)-funded EWS project in Malawi, have focused on building forecasting infrastructure and piloting technology, such as the use of information and communications Technology (ICT) in information dissemination. All of these projects demonstrate potential for scaling.

It is therefore recommended that Malawi continues to improve its comprehensive approach to increasing resilience through scaling up current efforts, that may include:

- Tailored products and services, including ICT, to disseminate early warnings and climate information to vulnerable communities, including farmers and fishers. These products should be demand-based and focus on stimulating a private market for information services.

- Improved coordination and accountability – better transparency is needed in how drought response funds from donors are mobilized, how much of pledged resources are received and how those resources are spent by the implementing agencies. Better reporting between the implementing agencies and the government may partly address this. However, more transparency and accountability is also needed from the implementing partner (Babu et al, 2018).

- Scaling up of community-based EWS to provide "last-mile" access to information and improve disaster preparedness.

- Capacity strengthening including increasing funding in general and, in particular, for staff training during non-emergency periods and increasing incentives to prevent excessive staff turnover (ibid).

Recent drought resilience efforts by the international community

Table 3. Selected projects focused on drought, or some aspect of it, in Malawi.

World Bank

Malawi Watershed Services Improvement Project
Budget (USD): 160M
Time Period: 2020-2026

Malawi Resilience and Disaster Risk Management Project
Budget (USD): 80M
Time Period: 2020-

Shire River Basin Management Program (Phase 1)
Budget (USD): 136M
Time Period: 2012-2018

Malawi Drought Recovery and Resilience Project
Budget (USD): 104M
Time Period: 2016-2021

Malawi Floods Emergency Recovery
Budget (USD): 80M
Time Period: 2015-2019

Policy Grant with a Catastrophe Deferred Drawdown Option (Cat DDO)
Budget (USD): 25M
Time Period: 2019

GEF/UNDP

Implementing Urgent Adaptation Priorities Through Strengthened Decentralized and National Development Plans
Budget (USD): 4.5M
Time Period: 2014–2019

Strengthening Climate Information and Early Warning Systems in Malawi to Support Climate Resilient Development and Adaptation to Climate Change
Budget (USD): 4M
Time Period: 2013–2016

Climate Proofing Local Development Gains in Rural and Urban Areas of Machinga and Mangochi Districts
Budget (USD): 5.3M
Time Period: 2014-

Building Climate Change Resilience in the Fisheries Sector in Malawi
Budget (USD): 5.4M
Time Period: 2016–2019

AfDB

Shire Valley Irrigation Project (SVIP)
Budget (USD): 1.47M
Time Period: 2014-2018

USAID

Africa Research in Sustainable Intensification for the Next Generation
Budget (USD): 2M
Time Period: 2016-2018

Feed the Future Malawi Agriculture Diversification Activity
Budget (USD): 48M
Time Period: 2016-2021

Feed the Future Malawi Agriculture Diversification Activity
Budget (USD): 15M
Time Period: 2014-2019

GCF

Scaling up of Modernized Climate Information and Early Warning Systems
Budget (USD): 12.3M
Time Period: 2016-2022

Scaling up the use of Modernized Climate information and Early Warning Systems
Budget (USD): 16.3M
Time Period: 2015-2023

NDF

Mainstreaming Climate-Smart Agriculture in Solar Irrigation Schemes for Sustainable Local Business Development
Budget (USD): 10.2M
Time Period: 2013-2015

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Data Sources:
Climate Data: CHIRPS
Drought Risk : International Water Management Institute (IWMI)
CDI: National Drought Mitigation Center at the University of Nebraska-Lincoln
Population Data: WorldPop
Livestock, GDP: FAO, World Bank

About the Southern Africa Drought Resilience Initiative (SADRI)

SADRI is a World Bank initiative supported by the Cooperation in International Waters in Africa Program (CIWA) that integrates across the energy-water-food-environment nexus to help lay the foundations for making southern African countries more resilient to the multi-sectoral impacts of drought. Its main objectives are to generate tools and dialogue for enhancing partnerships and capacity across Member States and to inform future national and regional investments in drought-related activities.