

## 5: Malawi



**In brief:** Temperature rises which exceed global averages are set to exacerbate poverty in an already vulnerable country.

**Right Now:** 92 per cent of Malawians rely on rain-fed sources of water, which are heavily impacted by floods and droughts.

**Future climate change risks:** Rising temperatures, increased risk of drought, and late onset of rains will affect food production and increase food poverty.

**Emissions of CO<sub>2</sub> per capita:** 0.1 metric tons – approximately eighty times less than Ireland

### 5.1 Introduction

In Malawi climate change is a threat to economic growth, long-term prosperity, as well as the livelihoods of an already vulnerable population.<sup>163</sup> Ninety per cent of the population are dependent on rain-fed agriculture, 60 per cent of whom are food insecure on a year-round-basis.<sup>164</sup> Climate sensitive rain-fed agriculture is a major contributor to the national gross domestic and foreign exchange earnings and supports the livelihoods of over 80 per cent of Malawians who are involved in primary and secondary agricultural activities.<sup>165</sup>

Climate extremes and weather events severely erode the resilience and adaptive capacity of individuals and communities via declining yields and food security. UNICEF (2013) indicates that flood conditions, especially in the south of the country can result in food insecurity with significant impacts on the livelihoods of poor people in rural areas.<sup>166</sup> More than 15 per cent of the population were affected by floods in the 2012/13 rainy season. In addition to floods, in the last few decades Malawi has experienced droughts during the 1978/79, 1981/82, 1991/92 and 1993/94 crop growing seasons. Therefore Malawi is highly vulnerable to climate change under even modest temperature increases. Over the coming decades increased climate variability and extreme events, compounded by lack of human and technological capacity to mitigate and adapt to climate change will increase the vulnerability of chronically and transiently poor households, heavily dependent on rain fed agriculture.

### 5.2 Observed Climate Variability and Change

Temperature data across Malawi indicates an increase in temperatures of 0.9°C between 1960 and 2006 at an average rate of 0.21°C per decade.<sup>167</sup> The increase in temperature has been most rapid in December-February (mid-summer) and slowest during September-November (early summer).<sup>168</sup> Observations in Malawi are consistent with Sub-Saharan Africa and global trends.<sup>169</sup> In terms of temperature related extremes the frequency of hot days and hot nights has increased in all seasons. The average number of hot days increased by 30.5 days per year between 1960 and 2003, particularly in summer. The average number of hot nights increased by an additional 41 days over the same period.<sup>170</sup>

Analysis of trends in monthly rainfall across Malawi indicates that most regions have experienced decreasing but non-significant rainfall trends over the period 1960-2006. Decreases are evident for annual and seasonal rainfall and for the months of March to December, while slight increases are evident for the highest rainfall months of January and February.<sup>171</sup> Again, this points to a tendency for rain to fall more intensely, with negative impacts for food production and access to water. Decreases in annual runoff and increases in evaporation losses have also been found over the period 1971-2000<sup>172</sup> indicating that decreasing rainfall has practical significance in that Malawi has become more water limited in recent decades.

## 5.3 Projections of future climate change

Land surface warming in southern Africa is likely to exceed the global mean increase, under all greenhouse gas emissions pathways.<sup>173</sup> By the end of the century temperature increases under business as usual indicate an average warming of over 5°C across all models for southern Africa –with some models indicating a temperature increase of over 6°C. Such changes would be very difficult to adapt to. Under a best case scenario a mean temperature increase of just over 1°C is projected, with some models showing increases in excess of 2°C.

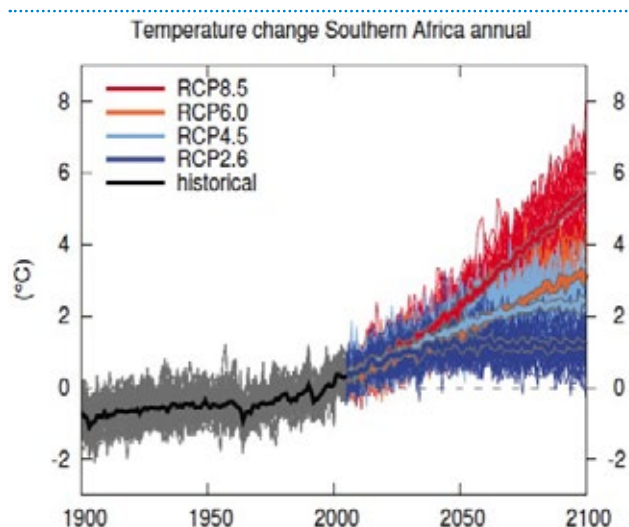


Figure 1 Projected changes in annual temperature relative to 1986-2005 under different greenhouse gas emissions pathways for southern Africa. Red is business as usual emissions (RCP8.5), dark blue represents ambitious reductions in global emissions (RCP2.6) Thin lines denote a single model projection; thick lines show the mean simulation for multiple climate models (Source; IPCC, 2014)

While there are large uncertainties in future rainfall projections, decreases in rainfall are likely, particularly by the end of the century. Greater decreases are associated with higher greenhouse gas emissions. Substantial increases in drought are expected under a business as usual scenario. Soil moisture drying is expected with increased surface temperatures so that surface drying is likely by the end of the century. Decreases in runoff and increased evaporative losses are also projected. These, combined with projected longer dry periods may have serious implications for food production. Countries with a single rainy season, such as Malawi, are expected to experience a delay in onset of precipitation with possible implications for agriculture, which will impact

negatively on maize production.<sup>174</sup>

At country level, projections indicate substantial increases in the frequency of hot days and nights. By the end of the century the number of consecutive dry days is projected to increase, as is the percentage of total rainfall falling as extreme bursts. The duration of hot events (maximum period greater than 5 days with temperatures greater than 1961-90 average) is likely to increase substantially under the higher emissions scenario. For each extreme indicator the magnitude of change is greater with higher levels of greenhouse gas emissions.<sup>175</sup>

## 5.4 Food Production and Climate Change

In southern Africa, agricultural production, including access to food, is projected to suffer negative impacts for several important crops.<sup>176</sup>

**Because of underdeveloped agriculture systems, yields in sub-Saharan Africa are projected to decrease by as much as 50 per cent over the century while crop net revenues could fall by as much as 90 per cent by 2100, with small-scale farmers being the most affected.**

This would adversely affect food security and exacerbate poverty and malnutrition.

In Malawi smallholder farmers account for 78 per cent of the cultivated land and generate about 75 per cent of Malawi's total agricultural output. Average farm size is approximately 1.12 hectares, however, more than 72 per cent of smallholders farm less than 1 hectare. The vast majority of farmers rely on rain fed production with little capacity to invest in irrigation. Small farm size is driven by a high density population with Malawi being the third most densely populated country in sub-Saharan Africa (2.3 rural people per hectare of agricultural land).<sup>177</sup> Maize is by far the dominant crop produced in Malawi, occupying more than 70 per cent of available agricultural land and is critically important to the livelihoods of the majority of Malawians. Over the last two decades, maize productivity has been erratic due to weather variability, declining soil fertility, limited use and uptake of technologies and market failures.<sup>178</sup>

## It's 5am in Kanyera village, central Malawi, and the first thing on everyone's mind is water.



Eliyeta Muyeye (32) and her daughter, Enestina (9), make the one kilometre round trip every morning to fetch water for their family of six. When they get there, there is usually up to six people waiting in line. As heat and dust sweeps over Kanyera, Eliyeta and Enestina return home two hours later, laden with their precious cargo.

***“I don't like carrying water,” says Enestina. “It's very far and it's heavy to carry. I have neck pains. When I have to get water in the morning, there is a queue so I wait and I am late for school. I love***

***school but I didn't do well in my exams. I've been failing because I didn't know how to read and write. The time I spend getting water would be better used to study.”***

Kanyera is at the epicentre of the global water crisis. Every day these women and children carry the weight of this crisis from the trickling Kamboni river to their homes, back and forth.

***“Life is hard here because we have difficulty with water,” says Stephen Muyeye (38), Eliyeta's husband. “The water we drink is contaminated. It's not clean. It's not treated. It's where animals drink and even pass waste – dogs, pigs, goats all drink from the water.***

“If we drink it we get sick. We go to the hospital and they tell us that we have dysentery from drinking the water. The hospital

gives us medication and it takes a week to work. But it's difficult to cure as we go back and drink the same water, so we can't ever say that we are cured.”

And it's not just drinking water that's affected. The water crisis has caused a perennial food crisis.

Stephen and Eliyeta farm a ½ acre of land growing sweet potatoes, maize, and tomatoes. They have no irrigation system and rely entirely on the rain and adjacent river to water the crops. Inevitably, their one annual harvest only feeds them for seven months, leaving a hungry period of five long months. “Between November and March we have no food,” says Stephen. “We work on other people's land as labourers during this time. We get paid maize, sometimes a tin, sometimes a bag. I know it's something to do with climate change. We don't have enough rain water.”

In terms of agricultural production, the most serious weather events have been dry spells, seasonal droughts, intense rainfall, riverine floods and flash floods. Each cropping season Malawian farmers experience localised dry spells which can significantly impact on food production.<sup>179</sup> With climate change, shifting planting dates will exacerbate challenges in growing maize and other crops. Seasonal dry spells and drought can occur at critical stages of crop development often during flowering.<sup>180</sup> Flooding has also severely disrupted food production in several districts of the country. The most vulnerable groups are rural communities, especially women, children, female-headed households and the elderly, for example in 2012/2013 rainy season 12 districts experienced floods which flooded smallholder farmers across the country. In addition, the 2012/13 agricultural

season was characterized by a two to three week delayed start of season in the southern and central regions, erratic rainfall, and an early cessation of rainfall in the surplus central and northern areas. During such conditions the poorest households can spend 75 per cent of their income on market purchases for food at exorbitant prices.<sup>181</sup>

In addition to direct impacts of climate change on specific crops, the impacts of climate change on food production are expected to be compounded by underlying poverty. Extreme climate events can influence poverty by affecting agricultural productivity and raising food prices that are critical to poor households.

A study assessing the consequences of extreme weather events under a medium high emissions scenario on the number of people entering

poverty, found that for the coming century Malawi has among the highest proportion of the population entering poverty in the wake of extreme events.<sup>182</sup> This study finds that following extreme climatic events under a changed climate large productivity declines of approximately 75 per cent may be expected. Such reductions in grain for Malawi with extreme events are not unrealistic as during the severe drought of 1991-92 productivity decreased by between 50 and 65 per cent.<sup>183</sup>



## 5.5 Access to water

The story above gives some insight into the real impact of Malawi's water crisis. Currently 92 per cent of Malawians rely on water sources, largely surface water sources,<sup>184</sup> which are dependent on rainfall recharge and are highly impacted by projected droughts and floods.<sup>185</sup> For example, the 2012/2013 floods in Karonga and other districts were reported to have damaged water pipe networks and boreholes. Water sources such as unprotected boreholes, springs, ponds, streams and rivers were contaminated.<sup>186</sup> In addition to droughts, soil erosion due to surface run-off is a serious environmental problem causing sedimentation.<sup>187</sup> Increases in rainfall intensity following longer dry spells are likely to increase erosion and sedimentation rates. With reductions in rainfall, reductions in surface runoff are likely to impact negatively on groundwater recharge and consequently contribute to drying of boreholes across the country. Currently Malawi is losing about MKW8.8 billion (approx. €16.5 million) due to water connected economic losses<sup>188</sup> and these losses are likely to be exacerbated by climate variability and change over the coming decades. In the future, climate change is expected to impact negatively on water resources in southern Africa through rising temperatures, associated increases in evaporation losses and changes in rainfall, together with increases in the frequency and magnitude of extremes events.<sup>189</sup> In Malawi projected water supplies are affected by increases in temperature and local variability of precipitation.<sup>190</sup> This is compounded by rapid population growth which leads to increased water demand especially in the urban areas thereby putting pressure on water supplies.

**River flows could drop by 10 per cent in the Zambezi basin by the end of 21st century which feeds major rivers in Malawi.<sup>191</sup>**

For the Shire catchment, increases in extremes of flooding and drought are likely to increase the vulnerability of river basin communities and river-based infrastructure such as hydro-electric power and drinking water plants. Droughts are expected to have greater impacts on the changing water levels on Lake Malawi and the Shire River. For Lake Malawi, it is estimated that water levels will drop in tandem with decreases in rainfall and increases in evaporation. Consequently water supply and hydro-electric power generation in southern Malawi, especially Blantyre city and surrounding districts are likely to be negatively impacted.<sup>192</sup>



## 5.6 Gender

Exposure and sensitivity to climate risks vary between men and women with men having more opportunities than women to adapt to climate change through diversifying livelihoods away from subsistence agriculture. In Malawi women represent the larger proportion of the poorest people and are highly dependent on local natural resources.<sup>193</sup> Therefore they are more likely to be vulnerable to climate variability and change than men because of social and cultural contexts that determine access to resources and the division of labour. Within agriculture, women tend to hold responsibility for growing food crops while men are more likely to grow cash crops such as cotton or tobacco. Men are also more likely to be involved in small businesses such as production and selling of charcoal. In Malawi, men and women are differently affected by climate change and climate variability related disasters because women are already considered as marginalized in socioeconomic, institutional, cultural engagements and political participation.<sup>194</sup> In addition, educational access is unequal between boys and girls with girls educated to master domestic chores while boys are encouraged to attend schools. For instance, UNICEF indicates that at secondary level, girls' enrolment remains lower than that of boys with dropout rate for girls being high because of the extra burden they take at household level.<sup>195</sup>



## 5.7 Migration

Internal migration in Malawi is primarily linked to growing land pressure due to rapid population growth. Malawi is facing social conflicts arising from the highly unequal access to land and high rural population density.<sup>196</sup> Inequality in land

distribution, land degradation, rural tensions, and land market failures which the country is facing impact heaviest on the rural poor and on women in particular. Although there is no direct study to link rural-urban migration to climate change, some studies are showing that economically active populations are migrating into urban areas in pursuit of education and developing alternative livelihoods.<sup>197</sup>

## 5.8 Health

Direct impacts of climate change on health in Malawi relate to an increased incidence of floods and droughts. Such extremes are associated with higher rates of infant mortality due to malnutrition and chronic illness associated with malaria, cholera and diarrhoea.

**The incidence of malaria is expected to increase and spread to previously cool zones as temperature increases.<sup>198</sup>**

Malawi also has a high incidence of HIV/AIDS which poses a serious threat to development. Estimates indicate that over 14 per cent of Malawians between the ages of 15-49 are HIV positive. The high incidence of HIV/AIDS increases individual and community vulnerability to climate change and extreme events and decreases agricultural productivity due to frequent and prolonged illness.

## 5.9 Economic impacts

Climate change will reduce agricultural production and output in sectors linked to agriculture. Following extreme events the number of people entering poverty as a result of impacts on agriculture is likely to increase. Climate sensitive rain-fed agriculture is a major contributor to the national gross domestic and foreign exchange earnings and is likely to be adversely affected by increasing temperatures and increased occurrence of drought.

## 5.10 Looking to the future

The challenges in Malawi are huge. Food insecurity already affects more than half of the population, and water scarcity and quality are a constant problem. Malawi's case also illustrates the urgent need to address emissions levels promptly and dramatically, as a 'business as usual' scenario would see Malawi experiencing temperature rises of up to 5°C or more.

Trócaire's programme in Malawi focuses on increasing people's food and water security, through building resilience to climate change and climate variability. Farmers are supported to engage in small scale irrigation that can triple their harvests from one to three times annually. Integrated Water Resource Management supports agricultural production, including the adoption of new technologies and the promotion of existing but under-used approaches. Currently only 23 per cent of potentially irrigable land in Malawi receives irrigation, and only 11 per cent of smallholder farming. Crop diversification using high yield and drought resistant seed varieties also help increase resilience to climate change.

The programme has also worked to influence the policy context in Malawi, in particular Disaster Risk Reduction and Climate Change policies by creating the opportunity for poor farmers to present their priorities to the decision makers through national networks and fora. Trócaire is currently working to create an opportunity for wider stakeholders to influence the contents of the Meteorological Policy, National Adaptation Programme of Action (NAPA) and National Adaptation Plans (NAP) in Malawi.



*Eliyeta Muyeye (32) watering her crops in Dedza, Malawi, 2013.*

## 5.11 Summary of Findings



Increase in temperatures of 0.9°C between 1960 and 2006 have been observed with increases most rapid in December-February (mid-summer). The number of hot days and hot nights have also increased. Decreases in rainfall have been observed but these are not significant. Reductions in annual runoff and increases in evaporation losses have been found over the period 1971-2000 indicating that decreasing rainfall has practical significance in Malawi becoming more water limited.



Increased rates of warming are associated with all greenhouse gas emissions scenarios. By the end of the century temperature increases under business as usual indicate an average warming of over 5°C, with some models indicating a temperature increase of over 6°C. Even with ambitious reductions in greenhouse gases some models show temperature increases reaching and exceeding 2°C by the end of the century. While rainfall projections are uncertain the average of change across the latest models indicates decreases in rainfall, particularly by the end of the century with simulated decreases in annual rainfall of between 0 per cent and 25 per cent.



Substantial increases in drought and heat extremes are expected under business as usual emissions. All projections indicate substantial increases in the frequency of hot days and nights along with increases in the proportion of rainfall falling as heavy events. The latter will likely result in increased incidence of flooding. Increases in extreme climate events can influence poverty by affecting agricultural productivity and raising food prices that are critical to poor households



Climate change will reduce agricultural production and output in sectors linked to agriculture. Following extreme events the number of people entering poverty as a result of impacts on agriculture is likely to increase. Climate sensitive rain-fed agriculture is a major contributor to the national gross domestic and foreign exchange earnings and is likely to be adversely affected by increasing temperatures and increased occurrence of drought.



Maize is by far the dominant crop produced in Malawi, occupying more than 70 per cent of available agricultural land and is critically important to livelihoods. Recent climate variability has seen erratic productivity and future increases in temperature and water limitations are likely to see decreases in output, especially under business as usual scenarios. The impacts of climate change on food production are expected to be confounded and complex because of underlying poverty.



There is high confidence that rising temperatures, evaporation losses and changes in rainfall, together with increases in the frequency and magnitude of extremes events will impact negatively on water resources. Increases in flooding and drought are likely to increase the vulnerability of exposed communities and river-based infrastructure such as hydro-electric power and drinking water plants. Droughts are expected to impact on water levels in Lake Malawi and the Shire River that are highly vulnerable to changes in hydrology.



Direct impacts of climate change on health relate to an increased incidence of extremes which are associated with higher rates of infant mortality due to malnutrition and chronic illness associated with malaria, cholera and diarrhoea. The high incidence of HIV/AIDS increases individual and community vulnerability and decreases agricultural productivity due to frequent and prolonged illness.



In Malawi women represent the larger proportion of the poorest people and are highly dependent on local natural resources. Therefore they are more likely to be vulnerable to climate change than men because of social and cultural contexts that determine access to resources and the division of labour.



Internal migration in Malawi is primarily linked to growing land pressure due to rapid population growth with little evidence to date of migration due to increased frequency and intensity of extreme events connected to climate variability.