WEATHERING RISK

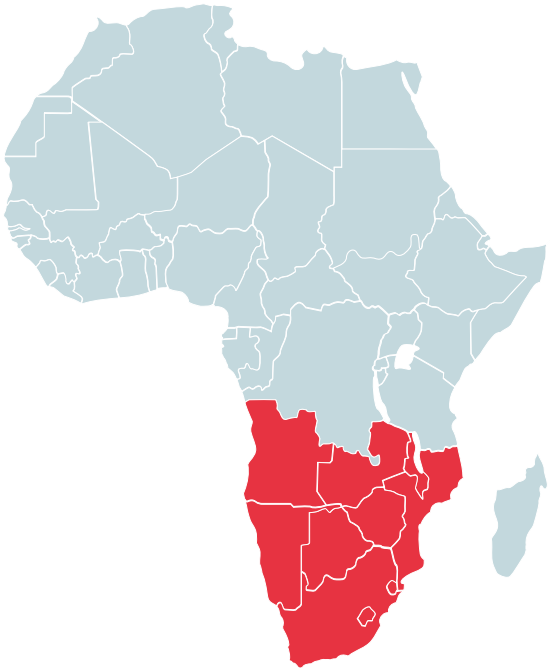
Africa Climate Security Risk Assessment

Southern Africa

adelphi

African Union

Southern Africa



Summary

KEY CLIMATE IMPACTS

Temperature: The air temperature over Southern Africa is projected to rise with high certainty by between 1.9°C and 2.2°C under a low emissions scenario (RCP2.6), and between 2.9°C and 4.1°C under a high emissions scenario (RCP6) by 2080 relative to 1876. The highest values are projected for Botswana, eastern Namibia and the north of South Africa. The Kalahari region will experience the highest rises, while coastal areas will be less affected.

Precipitation*: Overall mean annual rainfall has decreased in the Western Cape and areas of South Africa, while increasing in Namibia, Botswana and southern Angola. Future precipitation projections for Southern Africa show a high degree of uncertainty and vary across the region depending on the emissions scenario. However, southwest and central regions, as well as areas of Zimbabwe and Mozambique, are expected to become drier. Meanwhile, there will be increased precipitation in the southeast.

Sea level rise: Between 1993 and 2021, sea levels rose faster than the global average along Southern Africa's coasts. Projections indicate higher rises under RCP6.0, threatening Mozambique in particular. It is estimated the median increase in sea level rise across the entire coastline of Southern Africa will be around 35.9 cm under RCP2.6 and over 43 cm under RCP6.0 by 2080. However, the uncertainty around the magnitude increases with time.

Flooding*: Exposure to flooding in Mozambique, Botswana and Malawi has increased. At the same time, droughts, both agricultural and meteorological, have become more frequent. Projections of flooding are subject to high modelling uncertainty due to the uncertainty of future precipitation projections. However, median projections for Southern Africa indicate an increased exposure of national roads to river flooding at least once a year under RCP6.0, with the range likely widening from 0.08–0.16 per cent in 2000 to 0.10–0.24 per cent in 2080.

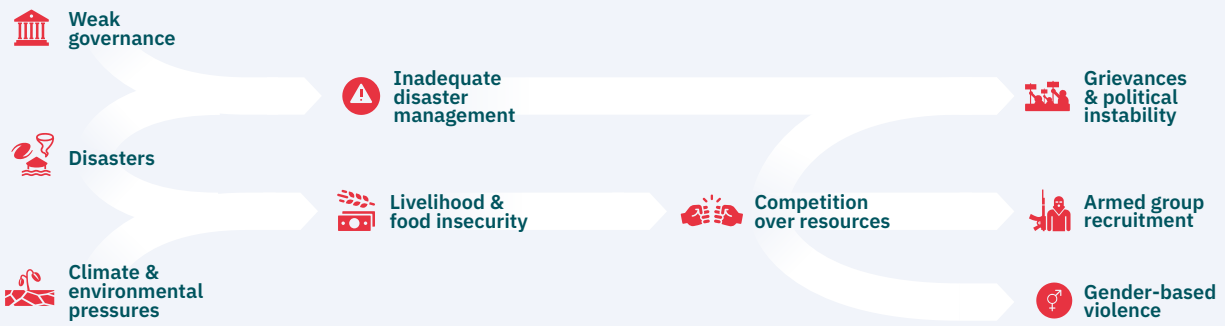
Droughts*: Drought projections for Southern Africa are subject to significant uncertainties, but indicate a general increase in drought conditions. Soil moisture and potential evapotranspiration are two important indicators for measuring drought conditions. Annual mean soil moisture for a soil depth up to 1 m shows a decrease of 3.2 per cent under RCP2.6 and 3.8 per cent under RCP6.0 by 2080, compared to the year 2000. Under RCP6.0, potential evapotranspiration is projected to increase by 8.3 per cent in 2080, compared to the year 2000. Albeit with large year-to-year variability and modelling uncertainty.

Cyclones: Tropical cyclones regularly hit southeastern Africa, causing rainfall and flooding. Rising ocean temperatures have intensified cyclones. While quantifying future impacts remain challenging, cyclones that make landfall are projected to increase in intensity, potentially causing significant damage, particularly in central and northern Mozambique.

* Climate projections with high uncertainty need to be interpreted with great caution. Please refer to the Annex for an explanation of uncertainty in climate projections.

CLIMATE SECURITY PATHWAYS IN SOUTHERN AFRICA

Pathway 1: More frequent weather induced disasters compound root causes of instability



Southern Africa is one of Africa's most disaster-prone regions and the frequency of natural hazard-induced disasters is increasing due to climate change. Population growth, unplanned urbanisation, inadequate governance and infrastructure, and uncoordinated early warning systems make the region more vulnerable to weather-related disasters. In turn, this increases the risk of livelihood and food insecurity, which drives social unrest, political instability and violent competition over resources. Disasters decrease social cohesion as state services are strained, development is hindered and health conditions worsen without effective state responses. In addition, there is an increase in GBV, which is a particular risk for women and girls in the aftermath of disasters.

Pathway 2: Climate risks and conflict impact human mobility

Climate change will increasingly affect human mobility in Southern Africa. Climate impacts are accelerating economic migration from rural to urban areas as well as rural-rural migration. At the same time, climate impacts drive displacement, with particularly larger-scale, unregulated and unmanaged movements exacerbating security risks. For example, the influx of rural young migrants into fragile urban areas strains resources, exacerbating poverty, inequality and social instability. Moreover, discrimination, xenophobia and violence against migrants are growing concerns in the region.

Pathway 3: Land and water access and use conflicts

Land tenure and use, and water management conflicts have long existed in Southern Africa, and climate change is increasingly affecting existing conflict dynamics and contributing to new ones. These conflicts are driven by various socioeconomic and governance-related factors, such as colonial legacies and disputes over land ownership. Land use conflicts exist between conservation, extractive activities, industrialised food production and communal subsistence agriculture. Similarly, population growth, climate-induced water scarcity and poor law enforcement of industrial activities that cause pollution exacerbate regional, national and local water conflicts. In urban areas, corruption and inadequate infrastructure contribute to social tensions and protests.

Pathway 4: Weak governance of high-value natural resources

Southern Africa's natural resource wealth presents economic opportunities but also poses risks. Weak governance, climate impacts and the transition to a low-carbon economy can escalate conflicts around mining. Abundant mineral deposits promise a green energy transition, but corruption, unequal distribution and ecosystem degradation fuel social tensions. Southern Africa's transition to a low-carbon economy entails risks such as job losses and governance challenges. Increased demand for minerals may compromise protected areas, while the governance of natural resources requires clarity to manage climate security risks effectively. Stranded assets and financial losses are also concerning, as the world moves away from fossil fuels, potentially impacting oil and gas projects and investments.

Context

GEOGRAPHY

The Southern Africa region comprises 10 countries: Angola, Botswana, Eswatini, Lesotho, Malawi, Mozambique, Namibia, South Africa, Zambia and Zimbabwe.[56] Southern Africa is a region rich in biodiversity and natural resources. The region extends south of the extensive Congo River Basin and comprises a narrow coastal plain along the South Atlantic Ocean to the west and the Indian Ocean to the east. A steeply rising inland plateau, the Great Escarpment, extends in a horseshoe shape from Angola to the Mozambique-Zimbabwe border, separating the coastal areas from the interior highlands. The highest peak in the region (3,482 m above sea level) is Thabana Ntlenyana in the Drakensberg Mountains in Lesotho. The interior of Southern Africa mainly consists of hilly plateaus. In the north of Namibia, on the border with Angola, lies the extremely dry Namib Desert, which in the south merges into the dry Kalahari Savanna (Binder 2023).

The region comprises several diverse agroecological zones with specific temperature and moisture regimes. These divide most of the region along different latitudes, which move in a north-south direction from a tropical sub-humid to a sub-tropic arid climate. A significant area of Zimbabwe, northern Zambia and Malawi, and the north of Angola are characterised by sub-humid, warm conditions. Southwards, aridity increases along the regions of the hot Namib Desert and the Kalahari, covering large areas of Namibia, Botswana, and the border areas between Zimbabwe, Mozambique and South Africa. An arid sub-tropical climate prevails across most of South Africa,

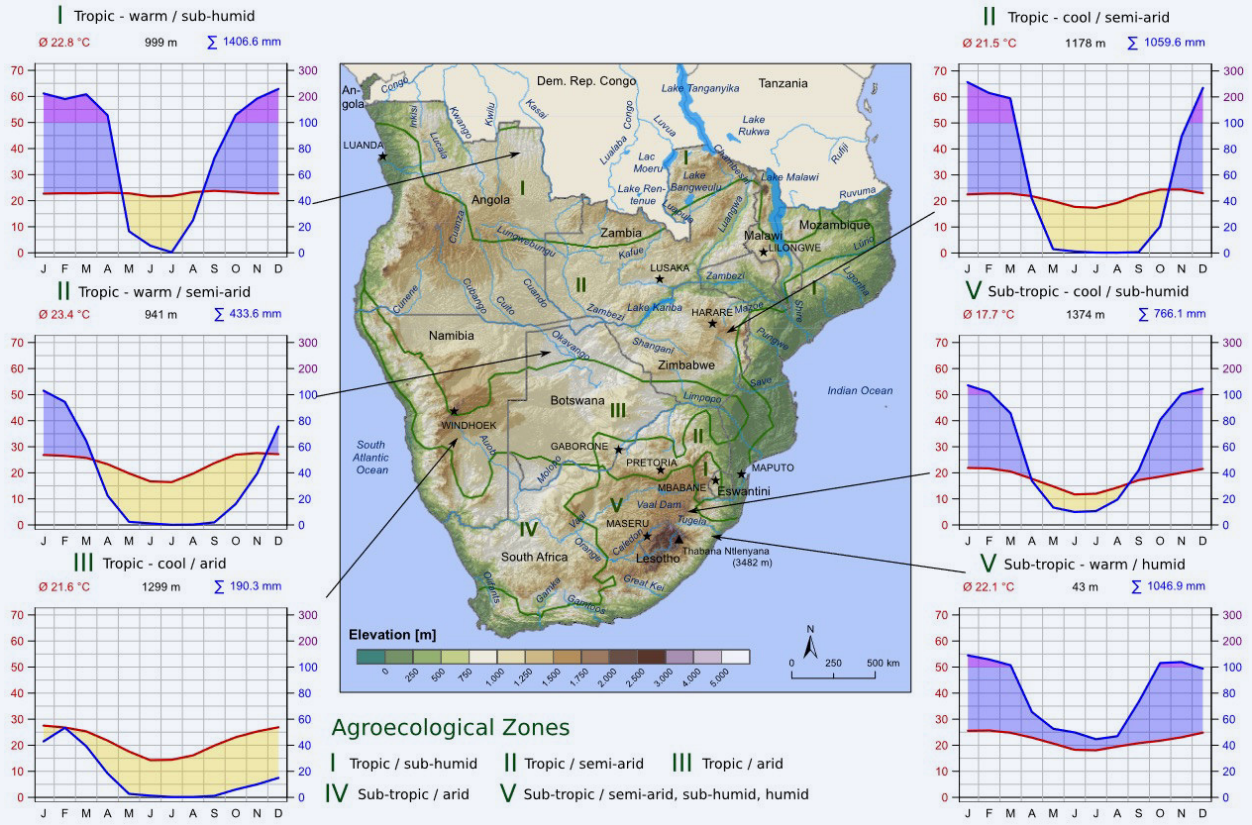


Figure 25: Topographic map of Southern Africa with existing precipitation regimes and agroecological zones (Binder 2023)

56 This report uses the African Union's classification system for geographic regions (https://au.int/en/member_states/countryprofiles2).

and in southern Namibia and Botswana, with humidity increasing towards the south. The south of South Africa, including the Western Cape, is characterised by sub-tropical semi-arid to sub-humid zones. Exceptions to these changes along the latitude are in the east, where average annual precipitation is much higher and regions of high elevation predominate. While a tropical semi-arid climate prevails in northeastern South Africa and the very southeast of Botswana, including Pretoria and Gaborone, a sub-tropic semi-arid to humid climate can be found in the mountainous southeast (Binder 2023).

The southern plateau covers much of Southern Africa. Most of the plateau is flat or rolling grassland, and used for crops and pastures. Southern Africa is home to several river systems, with the Zambezi River the most prominent. The 3,500 km Zambezi River plays a critical role for socio-economic life in Southern African. There are 128 million people living in the eight countries surrounding the Zambezi River Basin. They rely on the river as a vital source of food and water, both directly and indirectly (Swain et al. 2011).

SOCIOECONOMIC CONTEXT

Between 1990 and 2019, the combined GDP of Southern African countries more than doubled from USD 324 billion to USD 678 billion (ISS 2023a). In 2019, Southern Africa had the third highest regional GDP on the continent, behind Northern Africa with a regional GDP of USD 900.3 billion and Western Africa with a regional GDP of USD 816.4 billion. In 2043, Southern Africa is forecast to have the second lowest regional GDP on the continent (USD 1,257.9 billion), almost twice as large as in 2019. Within Southern Africa, the sizes of the economies are heterogeneous (AfDB 2019b).

The service sector is the main economic driver in Southern Africa, contributing to about 60 per cent of GDP in most economies in the region. South Africa is the largest contributor to this sector accounting for 67 per cent, followed by Angola and Zambia with 14 per cent and four per cent, respectively. Mining and quarrying constitute the second most significant sector, accounting for 14.4 per cent of the region's combined GDP (AfDB 2019b). This sector includes extracting minerals, precious metals, oil and gas. Angola, South Africa and Botswana significantly contribute to this sector with substantial oil, gold and diamond production. Zimbabwe is a significant producer of platinum and Mozambique exports gas. Agriculture, manufacturing, transport and tourism comprise 35 per cent of the regions' economy (UNCTAD 2021; AfDB 2023b).

South Africa is the region's largest economy, valued at USD 503.7 billion, and accounts for 74.2 per cent of the regional economy. Nevertheless, South Africa's economy has struggled since 2022 with sluggish growth, surging inflation and soaring unemployment. These difficulties have been exacerbated by devastating floods, which claimed many lives and caused extensive damage, including to Durban's largest port (Sheefeni 2022). The next largest, even if significantly smaller, economies are Zambia at USD 35.4 billion, Mozambique at USD 23.5 billion and Botswana at USD 23 billion (ISS 2023a). These countries are classified as low or medium in terms of human development, with Mozambique, Malawi and Lesotho considered the lowest in the region (UNDP 2022a). Nonetheless, poverty and economic inequality within and between Southern African countries remain the biggest challenge in the region. Almost 60 per cent of the region's residents live below the poverty line of USD 1.90 per day. Women, young people, and social and ethnic minorities are especially at risk of exclusion and poverty (Swain et al. 2011).

In terms of gender inequality, many Southern African countries score low in global comparisons, with particularly Malawi and Angola among the worst performers globally. However, some countries perform very well, such as Namibia, which ranks sixth. Other countries perform better in certain sub-indexes. For example, Botswana and Zambia have reduced the gender gap for workers in senior positions and achieved greater parity in estimated earned income. Lesotho, Botswana and Namibia are the region's highest-ranked countries for educational attainment (WEF 2023).

POLITICAL INTEGRATION

The most important regional mechanism is the SADC, which was founded in 1980. It is one of eight regional organisations in Africa under the umbrella of the African Union. Following the end of apartheid and the emergence of a new democratic state in South Africa, new common objectives were defined with the establishment of the SADC in 1992. Currently, the SADC has 16 member states,[57] which comprise almost 300 million people. Its objectives include monitoring political, economic, social and cultural developments in the member states.[58]

Another important organisation is the Common Market for Eastern and Southern Africa (COMESA), established in December 1994. COMESA comprises 21 member states, with a combined population of over 583 million, a combined GDP of USD 805 billion and global trade in goods value of USD 324 billion. Its primary goal is to create a robust economic trading bloc to surmount individual state barriers, emphasising regional integration for economic prosperity. In addition, COMESA places importance on fostering peace and security in the region (COMESA 2023). Similarly, the Southern African Customs Union (SACU) is a group of five countries in Southern Africa: Botswana, Eswatini, Lesotho, Namibia and South Africa. The primary aim of the SACU is to maintain the free flow of goods among its member states. To achieve this, the SACU has established a common external and excise tariff within its customs area (SACU 2023).

DEMOGRAPHICS AND MOBILITY

Southern Africa is a multi-ethnic region, with more than 16 ethnic groups predominately speaking Bantu languages (Silverstein 1968; Sengupta et al. 2021). As of mid-2020, the region had an estimated population of 363.2 million people and 6.4 million international migrants. A few countries serve as the economic pillars of the region, which explains high-level mobility defined by an array of trajectories, which encompasses short-term cross-border movements, circular movements and permanent migration (UNDESA 2022b). Southern African countries are both sources and destinations for migrants. In 2017, 53 per cent of out-migrants lived outside the region (UNCTAD 2018).

In Southern Africa, migration is predominantly motivated by the pursuit of employment and economic prosperity. Studies reveal that the majority of skilled migrants originate from countries outside the region, specifically Kenya and Uganda. South Africa's industries that require specialised skills, including finance, education, and information technology, are particularly attractive to migrants, and the country has the largest migrant population in the region. Additionally, highly skilled labourers from neighbouring countries, particularly Zimbabwe and Zambia, relocate to South Africa to work in education and information technology (Carciotto 2020). The country affected the most by forced displacement is Mozambique, which hosts more than 30,000 refugees, while more than one million people remain internally displaced due to violence and the devastating impacts of climate change (UNHCR 2022).

PEACE AND SECURITY

Southern Africa is regarded as the most peaceful and stable region in Africa. Nevertheless, the region continues to be affected by various forms of violence driven by racial and cultural polarisation, and different trends of marginalisation (Piccolino 2016). Many of the present challenges are related to past wars and conflicts. More than 20 years after the resolution of these conflicts, politics in South Africa, Mozambique, Zimbabwe, Angola and Namibia are still dominated by the liberation movement organisations that were the protagonists of past conflicts (Southall 2013).

The biggest ongoing conflict in the region began in Mozambique in 2017. The violent insurgency in the north threatens the lives and livelihoods of vulnerable populations, forcing people to flee to the neighbouring countries of South Africa and Malawi. The conflict is situated in the region of Cabo Delgado. The main drivers of which are inequities between areas in the country and weak natural resource governance. The armed extremist insurgents have exploited the lack of economic opportunities for vulnerable populations and their local grievances (Pirio et al. 2019). Two regional multi-lateral operations have been launched in Mozambique to support the government. First, on 23 June 2021, the SADC established the SADC Mission in Mozambique (SADC 2021). Second, since July 2021, around 1,000 troops from Rwanda have entered Cabo Delgado, operating under a bilateral agreement with Maputo, Mozambique, to secure the Afungi peninsula (ICG 2022).

57 Angola, Botswana, Comoros, the DRC, Eswatini (Swaziland), Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, the United Republic of Tanzania, Zambia and Zimbabwe.
58 The SADC extends beyond the AU definition of Southern Africa to include the DRC, Madagascar, Comoros, Mauritius, Seychelles and Tanzania.

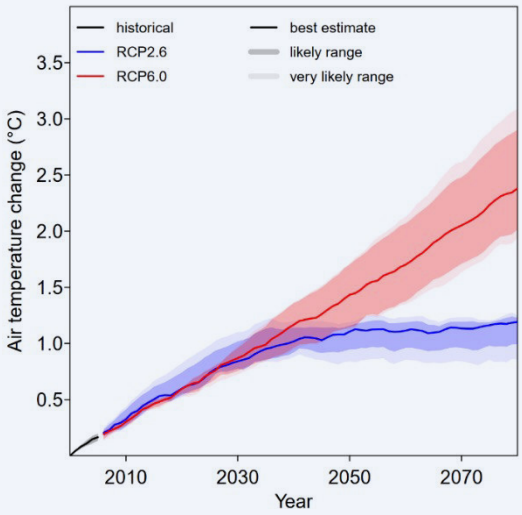


Figure 26: Air temperature projections for Southern Africa for different GHG emissions scenarios compared to the year 2000 (Binder 2023)

Climate change and impacts[59,60]

AIR TEMPERATURE

Between 1961 and 2015, mean annual air temperatures over Southern Africa increased by between 1.04°C and 1.44°C. A rise in very hot days has been observed over the last four decades, while cold extremes have declined in frequency (IPCC 2022).

Compared to the year 2000, future air temperature increases will affect the entire region with high certainty. According to the low emissions scenario RCP2.6, the air temperature will very likely increase by 1.8–2.1°C by 2030 and 1.9–2.2°C by 2080, compared to pre-industrial levels. The median temperature increase will be approximately 1.9°C by 2030, 2.1°C by 2050 and 2.2°C by 2080. On the other hand, under RCP6.0, the air temperature will increase by 1.7–1.9°C by 2030 and 2.9–4.1°C by 2080 (very likely range) (Binder 2023). The median temperature increase will be

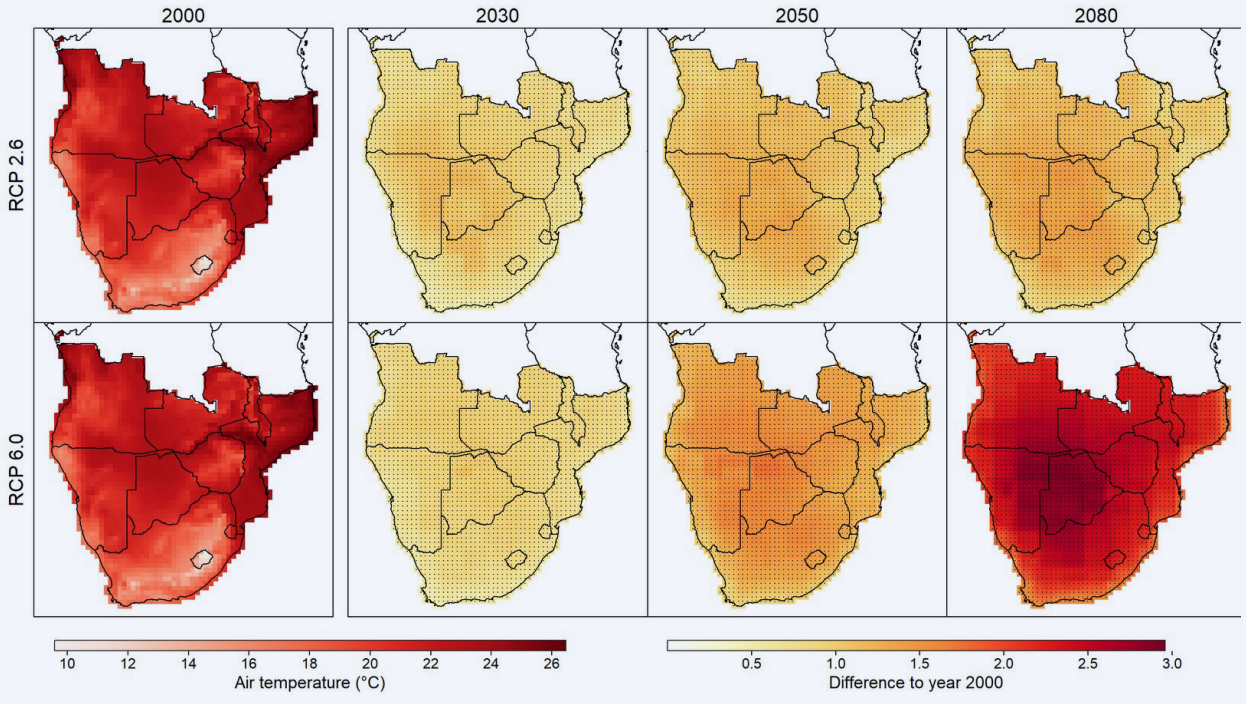


Figure 27: Air temperature projections for Southern Africa for different GHG emissions scenarios (regional variations) (Binder 2023)

1.9°C by 2030, 2.4°C by 2050 and 3.4°C by 2080 (see Figure 27). The magnitude compared to the year 2000 will vary, with the highest long-term rises in the dry Kalahari Savanna. According to the projections, Botswana is expected to experience the highest increase in average temperatures under RCP6.0, with temperatures rising to 2.9°C by 2080. In addition, eastern Namibia and the northern region of South Africa are likely to experience similar temperature increases. However, coastal regions are expected to have comparatively smaller temperature increases (see Figure 27).

In line with rising mean annual temperatures, the annual number of very hot days (with a daily maximum temperature above 35°C) is also projected to rise (see Figure 28). In some regions, especially in the Kalahari, but also in northern Angola, and on the border between Zimbabwe and Botswana, where very hot days are already common, a sharp increase is expected. In contrast, many mountainous regions, including those of Lesotho, Angola, Mozambique, Malawi, Namibia, South Africa and Zimbabwe, and coastal regions will be much less affected. Very hot days will rise substantially more under RCP6.0 than under RCP2.6 in the long run. The strongest increases are again expected in the north of Angola, assuming medium-to-high future emissions, with up to 122 additional very hot days expected by 2080 (Binder 2023).

Higher heat stress poses a risk to the population's ability to live and work (Andrews et al. 2018). Research has found that even under a 1.5°C compatible pathway, children born in 2000 in Southern Africa will be exposed to three to four times more heatwaves than people born in 1960. A 2.4°C warming increases this exposure to five to nine times more heatwaves. At the same time, cold-related mortality rates in some higher altitude regions such as Lesotho are expected to decline as temperatures rise (IPCC 2022).

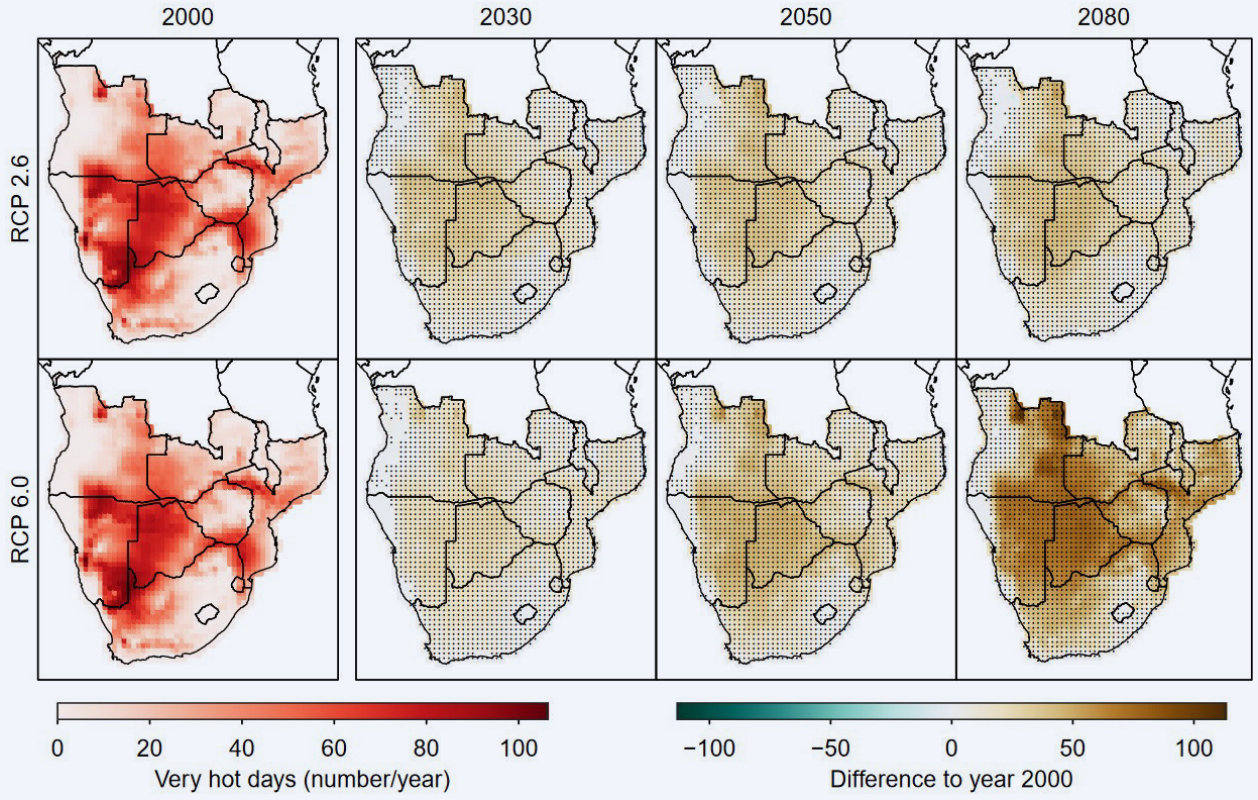


Figure 28: Projection of very hot days for Southern Africa for different GHG emissions scenarios (regional variations) (Binder 2023)

59 Please refer to the Annex for guidance on how to read the plots and an explanation of the concept of uncertainty in climate projections.
60 The summary of the key climate impacts in this section is based on: Binder L. 2022. Current and future climate impacts Southern Africa. Berlin: Potsdam Institute for Climate Impact Research.

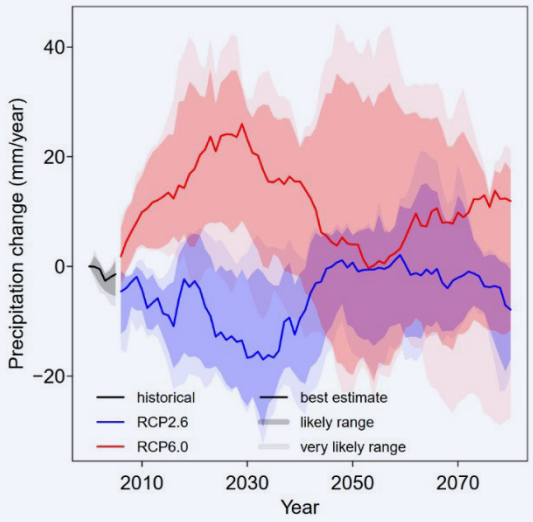


Figure 29: Annual mean precipitation projections for Southern Africa for different GHG emissions scenarios, compared to the year 2000 (Binder 2023)

PRECIPITATION

Since the 1960s, mean annual rainfall has decreased over the Western Cape and in the far east of South Africa. In contrast, in areas of Namibia, Botswana and southern Angola, precipitation increased from 128 mm to 256 mm between 1980 and 2015. At the same time, heavy precipitation events have intensified (Binder 2023).

Precipitation projections for Southern Africa are highly uncertain and differ significantly depending on the emissions scenarios, which show opposing trends (Binder 2023). Under RCP6.0, median precipitation changes amount to an increase of 23 mm by 2030 and 12 mm by 2080 (best estimates), compared to the year 2000. As the map plot shows, regionally explicit precipitation projections are subject to high uncertainties, and vary widely by scenario and time scale (see Figure 30). Overall, the already dry southwest and the central region are projected to become drier under all scenarios, with the same projected for most of Zimbabwe and Mozambique. An extreme decrease in precipitation is projected over the Western Cape of South Africa. In contrast, precipitation will increase over the southeast, including in Lesotho, Eswatini and eastern South Africa. The other regions show a mixed picture.

SEA LEVEL RISE

Between 1993 and 2021, sea levels have been rising at a rate of almost 3.8 mm per year along the

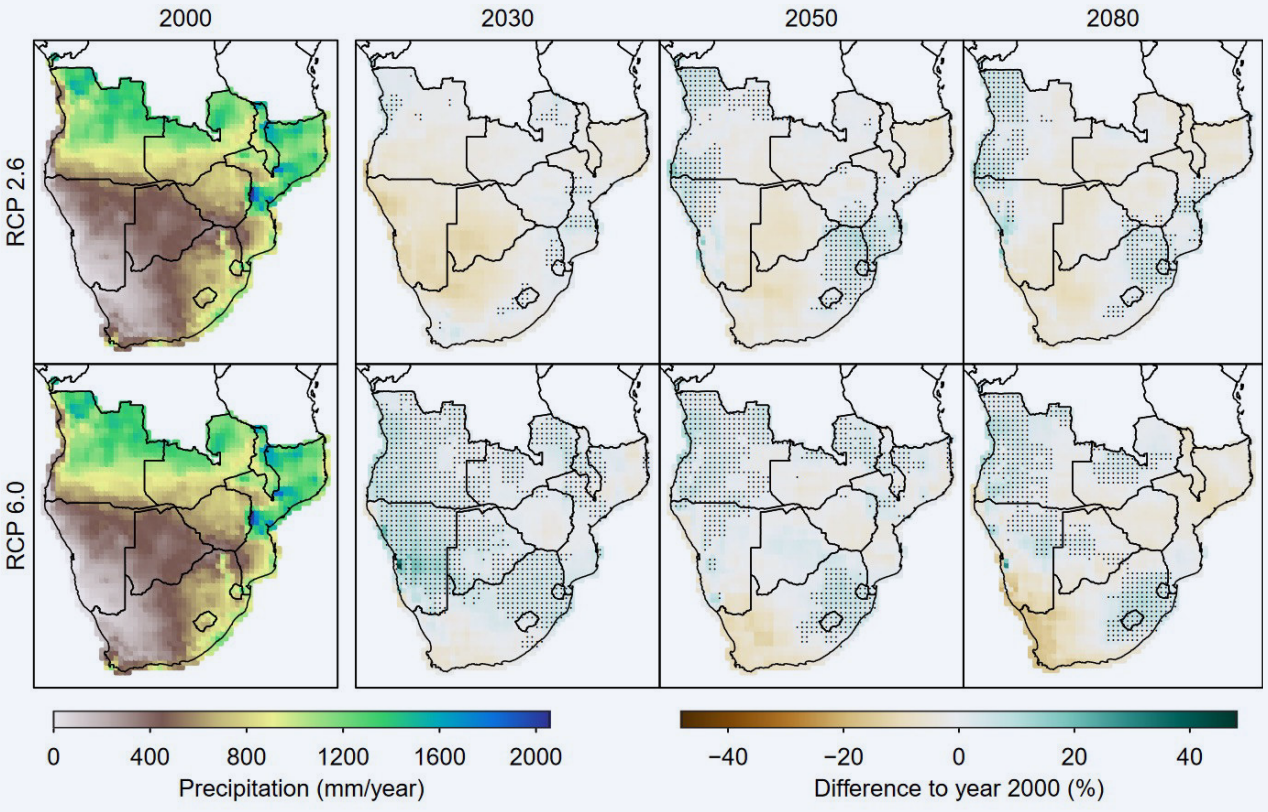


Figure 30: Precipitation projections for Southern Africa for different GHG emissions scenarios (regional variations) (Binder 2023)

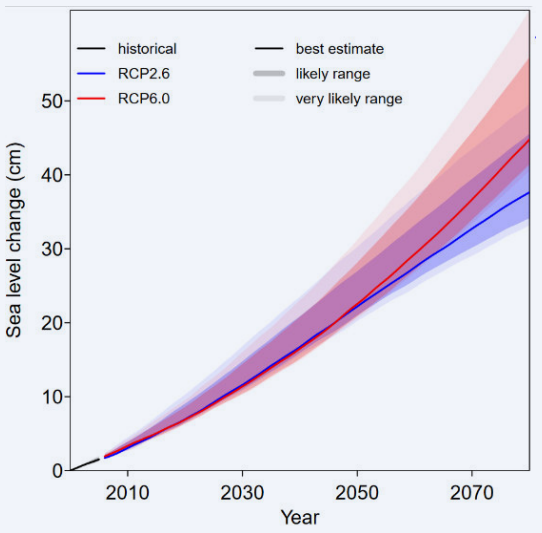


Figure 31: Annual mean sea level change projections around Southern Africa for different GHG emissions scenarios, compared to the year 2000 (Binder 2023)

western coasts of South Africa and over 3.9 mm per year in the southern Indian Ocean (along the eastern shores of Mozambique and South Africa). These rates exceed the global mean sea level rise of 3.3 mm per year (WMO 2021).

Projected sea level rise is a major concern for Southern Africa's coastline. According to the data, the median increase in sea level rise is expected to be around 11.4 cm by 2030 and 35.9 cm by 2080 under RCP2.6, compared to the year 2000 (Binder 2023) (see Figure 31). The median sea level rise under RCP6.0 will increase to around 11 cm by 2030. However, over the long term, the median increase will be much higher under RCP6.0, amounting to over 43 cm by 2080. It is important to note that the uncertainty around the magnitude of these increases grows with time. The rise in sea levels significantly threatens coastal communities and economies. It can cause saline intrusion in coastal waterways and groundwater reservoirs, rendering water unusable for domestic use and harming biodiversity (Binder 2023).

FLOODING AND DROUGHTS

In Mozambique, Botswana and Malawi, people's exposure to flooding is estimated to have increased by more than 50 per cent between 2000 and 2015 (IFAB 2022). Agricultural and meteorological droughts have increased by 2.5 to three events per decade between 1961 and 2016 (Spinoni et al. 2019). In Southern Africa, according to median estimates, there is an expected rise in the likelihood of national roads being affected by river floods under RCP6.0 (Binder 2023).

Projections for river flooding in the region are limited. For the Middle Zambezi River Basin on the border of Zimbabwe, Zambia and Mozambique, an area prone to flooding, projections indicate that peak flows will decrease under various climate change scenarios compared to the baseline period of 1988–2018, consistent with the projected decrease in rainfall (GFDRR n.d.).

In addition, Southern Africa will become a global drought hotspot under 1.5°C and 2°C global warming scenarios (Liu W et al. 2018). There is an increasing trend in potential evapotranspiration throughout Southern Africa. Under RCP6.0, potential evapotranspiration is projected to increase by 2.7 per cent in 2030 and 8.3 per cent in 2080, compared to the year 2000. Countries such as Botswana, Namibia and South Africa, which already have high rates of potential evapotranspiration, will have the highest absolute rates by the end of the century. Malawi and Mozambique will experience the highest percentage increases. The increase in evapotranspiration will impact the supply of water and the amount of surface water available for agriculture (Binder 2023). Under a high emissions scenario (RCP8.5), the duration of meteorological droughts is projected to double from around two months between 1950 and 2014 to around four months in the second half of the 21st century (Ukkola et al. 2020).

TROPICAL CYCLONES

The southeastern coast of Africa is regularly hit by tropical cyclones, which also bring significant rainfall and flooding to Mozambique, Zimbabwe and South Africa. Rising ocean temperatures increased the intensity and duration of cyclones over southeastern Africa between 1999 and 2016, compared to 1980–1998 (Vidya et al. 2021). Mozambique, which is particularly strongly affected, is hit by an average of 1.5 cyclones per season, with the cyclone season lasting from October to April (Mucova et al. 2021).

Due to the high degree of random variability, it is difficult to quantify the future effects of climate change on tropical cyclones (Masson-Delmotte et al. 2021). Nevertheless, cyclones that make landfall are projected to increase in intensity, with potentially highly damaging impacts. For central and northern Mozambique, where cyclones are already particularly destructive, some research suggests cyclones will not only become more intense, but also more frequent, though uncertainty regarding these projections is high (IPCC 2022).

Climate security risk pathways

MORE FREQUENT WEATHER INDUCED DISASTERS COMPOUND ROOT CAUSES OF INSTABILITY

Southern Africa is one of Africa's most disaster-prone regions, and the frequency of natural hazard-induced disasters is increasing due to climate change. Population growth, unplanned urbanisation, inadequate governance and infrastructure, and uncoordinated early warning systems make the region more vulnerable to weather-related disasters. In turn, this increases the risk of livelihood and food insecurity, which drives social unrest, political instability and violent competition over resources. Ineffective state responses to disasters also decrease social cohesion as public services are strained, development is hindered and health conditions are worsened. In addition, there is an increase in GBV, which particularly affects women and girls in the aftermath of such disasters.

Social unrest after disasters

The combined pressures of increasing weather-induced disasters, marginalisation, poverty and the costly impacts on the economy and infrastructure increase social tensions, especially when governments cannot adequately respond to humanitarian emergencies. When aid distribution is uneven or ineffective due to, for example, corruption and garnering political mileage, it can exacerbate a sense of injustice and marginalisation, contributing to grievances and social unrest.

Southern Africa is one of Africa's most disaster-prone regions and the frequency of natural hazard-induced disasters is increasing due to climate change (IPCC 2021). The southeastern coast of Africa is regularly hit by tropical cyclones, which bring significant rainfall and flooding to Mozambique, Malawi, Zimbabwe and South Africa. In Mozambique and Zimbabwe, weather-related disasters have contributed to social unrest and sparked protests. For example, following Cyclone Idai in 2019, affected populations were left without enough food, energy and water (Madurga Lopez et al. 2021). Affected communities complained that humanitarian assistance was insufficient, reconstruction efforts needed to be expedited and international aid was often held for too long in central government agencies or inadequately distributed to the local areas (Deutsche Welle 2019).

Similarly, in Malawi, international aid was affected by a financial corruption scandal, which undermined donor confidence in the government's disaster response and generated social unrest (Radha Adhikari et al. 2019). In South Africa's Bhambayi township, residents protested against being removed from temporary shelters after their homes were destroyed in floods. The government's slow response fuelled anger, with protesters demanding the restoration of services and alternative housing (Gustin 2022).

Disasters compound human security issues and root causes of conflict

Extreme weather events – together with other factors such as the COVID-19 pandemic, high international fuel prices and macroeconomic instability – affect food security in the region (SADC 2022). Food insecurity and price shocks can serve as powerful structural drivers, and triggers of instability and social unrest, particularly in communities highly dependent on agricultural livelihoods and where grievances against governments already exist (Raleigh et al. 2015; Morales-Muñoz et al. 2020).

For example, climate-induced food insecurity in Bulawayo and Matabeleland in the north of Zimbabwe has been shown to have far-reaching consequences, including an alarming rise in the likelihood of engaging in violent acts (Maphosa 2022). Matabeleland is home to a mosaic of ethnic minorities that have experienced structural marginalisation. As drought frequency and intensity increases, vulnerabilities also intensify, aggravating grievances and social unrest in the area, and pushing local communities to engage in natural resource disputes and protest (Madurga Lopez et al. 2021; Ferre Garcia et al. 2023). Similarly, in Angola in 2012, escalating food prices combined with unresolved land rights issues, corruption and rural poverty sparked widespread protests (SADC 2019). In Zambia, the interaction between climate impacts, constrained employment prospects, poverty and economic instability has contributed to an increase in crime and the vulnerability of local communities. Crimes such as sexual abuse, and the theft of livestock and crops have been found as maladaptive responses that rise due to the weakened livelihood options of pastoralist and agricultural populations (Medina and Belli et al. 2022; Caroli 2023; Medina et al. 2023).

Cyclones and droughts have exacerbated other human security issues in southern Angola, northern Namibia and southern Zambia (IFRC 2021). In southern Zambia, for example, droughts coupled with unsustainable monocultural practices have negatively affected agricultural production and

exacerbated food insecurity (Caroli 2023; Sax et al. 2023). Various studies across the region have identified increased security incidents, including the theft of stock and general insecurity on farms, during periods of drought. These incidents were closely associated with heightened unemployment, hunger and compromised livelihoods, which in turn hindered the capacity of households to cope effectively with the effects of water stress (Akpalu 2005; Kamara et al. 2018). In addition, other studies have identified a series of government failures in resilience building. These include slow responses in providing security measures to protect against farm attacks and stock theft (especially during periods of drought), poor service delivery, insufficient and delayed drought relief, a lack of training, and inadequate early warning information (van Riet 2012; Bahta et al. 2016). For example, in Zimbabwe, drought shock has been associated with an increased propensity for people to experience violence around water points, with a higher probability according to the severity of the drought (Chigusiwa et al. 2023).

Disasters put pressure on state services, and weaken the ability of public institutions to solve structural development problems and root causes of conflict, such as inequality, marginalisation and poverty. For example, northern Mozambique is structurally marginalised. Consequently, inequality, poverty, youth unemployment and political exclusion are driving recruitment into religious extremist groups (Ewi et al. 2022). These dynamics are further compounded by increased weather-induced disasters, which exacerbates the region's fragility and provides an opportunity for extremist groups to exploit the situation to gain a foothold in the area (Meek and Nene 2021). As climate hazards destroy important infrastructure, humanitarian actors face difficulties accessing affected areas and insurgent groups exploit the situation to act as alternative service providers. Furthermore, extreme weather events destroy crops, aggravating food insecurity (UNHCR 2022).

After a naturally induced disaster, governments often need to redirect funds from education and health care to support emergency responses and reconstruction efforts. In general, the cost associated with weather-induced disasters to infrastructure and economic sectors slows development pathways. According to the African Development Bank, weather-related disasters will likely reduce the combined GDP of Southern Africa by 10 per cent per year by 2050 (Baarsch et al. 2019).

Gender-based violence

GBV is a significant security risk during and after disasters. Natural hazard-induced disasters and displacement particularly affect rural young people and women. In displacement situations, women often face an increased risk of abuse (sexual and physical), GBV, trafficking and human rights violations (IOM et al. 2022). Drought shock-induced water point violence significantly affects women and girls more than men and boys (Chigusiwa et al. 2023). A comprehensive study found that women residing in Southern African regions severely affected by drought faced an elevated risk of enduring physical and sexual violence perpetrated by their intimate partners compared to women in non-drought areas (Epstein et al. 2020). Further evidence from Namibia indicates that in communities grappling with food scarcity due to drought, five out of eight women resorted to transactional sex to provide for their families (IFRC 2015). With communities frequently affected by droughts leading to food insecurity, young girls are at greater risk of sexual abuse, partner violence and teenage pregnancy. For example, in Mozambique, during periods of drought, young girls have reported instances of older men offering gifts in exchange for sex as they engage in long journeys to collect water far from their homes (CARE International 2017).

Early warning and disaster risk reduction challenges

The effectiveness of early warning action is compromised by a lack of communication channels and trust in information providers, especially the government, as well as inadequate community involvement. Rural and marginalised communities often lack access to mobile networks, excluding them from modern early warning systems. In addition, individuals' confidence in the government significantly impacts their responses and actions during crises. In certain instances, people place greater faith in traditional local authorities, such as healers and indigenous leaders, than in the government. Without trust and active community inclusion, early warning systems often fail to mobilise and engage individuals effectively, hindering timely and appropriate responses to potential hazards or emergencies, such evidenced by the recent emergency associated with Cyclone Freddy in Malawi.[61]

61 As discussed during the ACRA consultation in Southern Africa in 2023.

The differences between Mozambique and Malawi's responses to Cyclone Freddy in 2023, and their respective outcomes, illustrate the vital importance of building trust in government for early warning systems. While in Mozambique fatalities were reduced by adhering to government instructions to evacuate and take shelter, in Malawi prevention alerts were not taken sufficiently seriously, significantly increasing the death toll. In the first few weeks, Mozambique recorded 76 deaths, a relatively low toll compared to previous disasters, while at least 447 people were killed in Malawi (Phiri et al. 2023).

Lack of finance for adaptation

Finance flows targeting adaptation in Southern Africa fall billions of U.S. dollars short of even the lowest cost estimates. In 2019, Mozambique and Zimbabwe were among the 10 most affected countries in the world by climate change-related hazards, with the frequency of tropical cyclones and droughts increasing (Germanwatch 2021). Southern African countries require approximately USD 727 million annually to meet the costs of adaptation efforts. However, according to the African Development Bank, the financing gap for adaptation initiatives in the region amounts to approximately 60–70 per cent (UNEP 2013; AfDB 2019a).

CLIMATE RISKS AND CONFLICT IMPACT HUMAN MOBILITY

Climate change will increasingly affect human mobility in Southern Africa. By 2050, the region is expected to host 86 million climate change migrants, primarily due to decreased crop productivity and water shortages (WFP 2021a). Climate impacts are accelerating economic migration from rural to urban areas, as well as rural-rural migration and displacement. In particular, larger-scale, unregulated and unmanaged migration can drive security risks. For example, the influx of rural young migrants to fragile urban areas strains resources, exacerbating poverty, inequality and social instability. Moreover, discrimination, xenophobia and violence against migrants are growing concerns in the region. As women primarily carry the burden of responsibility for agricultural livelihoods and family caregiving, climate security risks disproportionately affect displaced women and girls.

Migration as adaptation

Economic opportunities are the main driver of migration in Southern Africa. People are primarily migrating within countries and within the region in search of better access to education, employment and basic services (Ncube 2010; Maviza 2020). This kind of migration is partly driven by climate change impacts. For example, the migration of farmers and youngsters to cities is often used as an adaptation strategy to cope with increasing climate impacts and livelihood insecurity in rural areas. It can lead to better access to education, health care and income-generating activities (Ncube and Gómez 2015), as well as open new economic prospects and networking opportunities (Simatele D and Simatele M 2015).

Within the region, South Africa, Botswana and Namibia are the main destinations of choice (Moyo 2020). The region has some of Africa's most significant bilateral migration corridors, with the Zimbabwe-South Africa corridor (1.3 million people per year) and the Mozambique-South Africa corridor (1.2 million people per year) among the oldest and most frequented (UN OCHA 2022). Both corridors are characterised by irregular mobility (Mlambo 2010; Maviza 2020; Ndlovu and Landau 2020). South Africa has historically been the main migration destination in the region, particularly for skilled and unskilled Africans looking for work in the mining, farming and service sectors. Oil-rich Angola is also a hub for international migrants, particularly from countries with similar cultural links, such as Cabo Verde, and São Tomé and Príncipe. In Mozambique, skilled migrants are employed in extractive industries and education (IOM Migration Data Portal 2023).

According to the Africa Climate Mobility initiative, cross-border mobility between neighbouring countries in the SADC region will significantly increase due to climate change. By 2050, between 200,000 to 800,000 individuals in total are projected to migrate between neighbouring countries in the SADC region. At the country level, based on climate impacts, Zimbabwe, Malawi and Zambia may experience the most significant rise in out-migration. At the same time, South Africa, Zimbabwe, Mozambique and Botswana are forecast to experience the most significant increase in climate-induced in-migration. For example, Zimbabwe, which is expected to have better weather conditions, may become a significant country of origin. In the region, better crop production conditions are linked to increased outward mobility from the countries involved. Higher crop yields enable individuals to gather the necessary resources for longer-distance, cross-border migration (Amakrane et al. 2023) (see Figure 32).

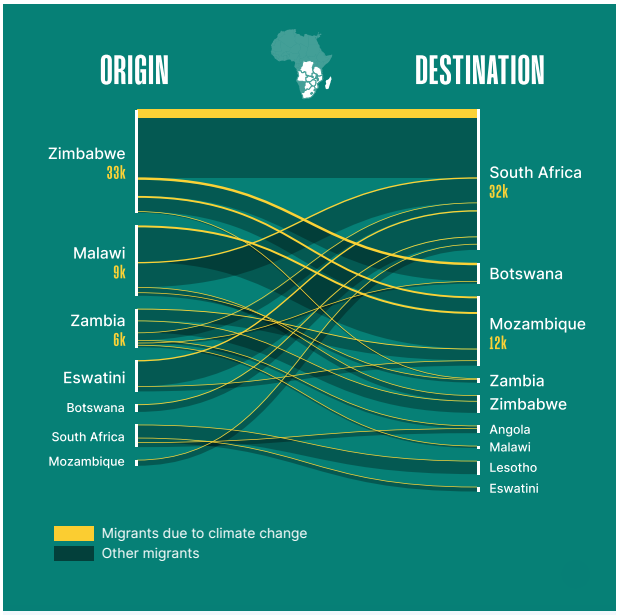


Figure 32: Number of migrants by origin and destination in Southern Africa (Amakrane et al. 2023)

Climate-driven displacement

Climate change impacts have driven the displacement of people through weather-related disasters. Recent data reveals that more than half a million people in Southern Africa had been displaced due to climate-related factors by 2022 and this trend is continuing to increase (IOM 2022a). In the first quarter of 2023, Southern Africa was hit by three tropical cyclones and two tropical storms, resulting in the loss of over 890 lives and forcing 696,000 people to flee their homes. The most significant impact was caused by Tropical Storm Ana, which struck Madagascar, Malawi, Mozambique and Zimbabwe in January 2023. Malawi was the hardest hit by these consecutive storms, with Storm Ana causing significant damage to homes and displacing more than 196,000 people across 16 districts in southern areas of the country (UN OCHA 2022).

Conflict-driven displacement and climate impacts compound security risks

Conflict is a significant driver of displacement in the region, particularly in northern Mozambique, where over a million people were internally displaced as of 2022. Most recently, violence in Cabo Delgado and the neighbouring province of Nampula reignited in the second half of 2022, triggering 283,000 people to move (IDMC 2022). In terms of security risks, mismanaged migration can contribute to tensions in receiving areas, sparking competition over livelihoods and natural resources. This situation is further exacerbated by climate change impacts, which creates a vicious cycle (Ndlovu and Landau 2020).

In northern Mozambique, a prolonged crisis coupled with mismanagement of displacement caused by conflicts and climate impacts has led to conflicts over land tenure. This is particularly evident when the land of displaced individuals is occupied by others or when displaced individuals move onto land belonging to another host community that is struggling with existing livelihood insecurities caused by extreme weather (Julian Quan and Natalie Rose Dyer 2008; Sturridge et al. 2022; Nhamirre et al. 2023). In Mozambique, fishers who now live as IDPs around Macomia often try to fish in their former areas of Quissanga, Mucojo or Quiterajo. This has led to clashes between IDPs, new occupants and host communities (Institute for Justice and Reconciliation 2021).

The insecurity caused by climate change impacts and the fears of terrorist attacks in the region complicate the situation, posing further challenges in dealing with humanitarian assistance for IDPs (Ewi et al. 2022) These vulnerable populations with pressing humanitarian needs, often work illegally or participate in informal economic activities and their settlements are typically the most severely impacted when natural hazard-induced disasters occur (IFRC 2020).

Southern Africa hosts a significant number of refugees and other migrants under the category of stateless persons displaced due to conflict or the adverse effects of climate change. For example, Zambia, Zimbabwe and South Africa, among other countries in the region, host refugees and stateless persons with the majority being from Mozambique, the CAR, the DRC, Burundi, Angola and Rwanda (United Nations South Africa 2023). Statelessness is a prevalent challenge for migrants in the region, largely influenced by historical colonial legacies, alterations in borders, migratory patterns, inadequate civil registration infrastructure, and biases rooted in gender, ethnic, and religious discrimination (Manby 2012). In Southern Africa, camps still persist, especially refugee camps, despite a professed move away from encampment policies towards settlement. Refugees and those with a stateless status are among the most vulnerable to climate impacts, which affects the natural resource-based livelihoods of people in refugee camps and exposes many to secondary displacement (Mbiyozo 2019).

Gender shapes risks

Natural hazard-induced disasters and violent displacement particularly affect rural young people

and women, who often face greater risk of abuse, GBV, trafficking and human rights violations in situations of displacement (IOM et al. 2022). Climate-related security risks affect women in Southern Africa more than men, as women are primary caregivers, and responsible for food and fuel. Climate-induced resource scarcity makes their duties harder and many resort to irregular migration (Mwaba 2023). Female migrants using irregular routes between Zimbabwe and Botswana, for example, face greater risks, as the men who assist them may violate their rights (Matose et al. 2022).

As displaced families move to unfamiliar areas, young people often experience educational disruptions, social isolation and loss of opportunities. Gender also intersects with norms, race and power relations further shaping the experiences of women, young people and sexually diverse people in migrant communities (Mbiyozo 2022). During flooding and drought in Mozambique, Malawi and Zimbabwe, displaced women and girls reported higher levels of GBV (IFRC 2015). Migrants are often compelled to work in irregular economies. This is especially true for women who are forced to work in roles that are below their skill-levels and training, concentrated in unregulated, unskilled and undervalued sectors. In many cases, women are left to shoulder household duties and family care responsibilities. Similarly, sexually diverse people in situations of displacement are often pressured to take up sex work or are victims of targeted attacks (Mbiyozo 2022).

Rural-urban migration

Rural-urban migration is by far the largest mobility pattern in Southern Africa. Climate change impacts are intensifying these movements, further straining rural livelihoods. At the same time, cities pull people and especially young people with the promise of better access to education, employment and basic services. In addition, there has been a significant rise in the number of refugees and irregular, economic migrants arriving in Southern African cities from the Horn of Africa. These migrants often face challenges meeting basic needs and accessing essential services during their journeys (IFRC 2022b). Moreover, they often settle in densely populated areas on the outskirts of cities and struggle to integrate into the formal economy, creating tensions with already impoverished host communities (Mbiyozo 2022).

Pressures in cities are increasing as urban populations increase. It is estimated that an additional 24 million people will live in urban areas by 2050 (Le Roux 2021). Much of this growth will occur informally on unregulated and highly risk-exposed vacant land (Le Roux and Napier 2022). The lack of comprehensive urban planning and limited capacities to absorb growing population pressures contribute to more vulnerable infrastructure and communities exposed to climate change impacts. Capital cities in Southern Africa are highly vulnerable to climate change. Half of the region's cities are projected to experience increased flooding by mid-century (Engelbrecht 2022). Among the biggest threats is the collapse of water provisions and sanitation in urban areas, as exemplified by water insecurity in Cape Town, Johannesburg and Durban (Prins et al. 2022). A three-year drought in Cape Metropole, which started in 2015, and peaked between mid-2017 and mid-2018 when dam levels hovered between 15 per cent and 30 per cent of total capacity, resulted in severe water restrictions (City of Cape Town 2018; ISS 2023b).

The increase in informal economic activities and non-traditional employment in urban areas has increased security concerns. This has contributed to existing inequalities in urban spaces, with limited resources such as housing, water and electricity, and economic opportunities becoming more competitive (Carciotto 2020). As cities grow, governments struggle to provide public services, and challenges around inequality and exclusion increase. These dynamics often mirror and intersect with histories of exclusion and segregation. For example, in South Africa, townships are the primary receptors of migrant populations. Following apartheid, the government started public housing programmes, and expanded clean water and electricity infrastructure. However, the only available land for housing programmes was on the outskirts of cities, unintentionally reproducing the particular dynamics of segregation, exacerbating poverty and marginalisation, and contributing to high crime rates (Turok et al. 2021).

Xenophobia and discrimination

The increasing demographic pressure caused by augmented migration has led to the rise of urban social movements embracing nationalism, which sometimes turn into protests and violence (Engelbrecht 2022; Mongale 2022). In this context, migrants are often seen as competitors for scarce jobs, health care and housing, which contributes to xenophobia, discrimination and, in some cases, violence against migrants (Mbiyozo 2022). There have been xenophobic attacks in South Africa since

2008, mainly targeting foreign nationals from Bangladesh, Pakistan, Somalia, Ethiopia, Nigeria, Zimbabwe and Mozambique (Norman and Collin 2022).

More recently, in Angola and South Africa, there is an emerging trend of violent anti-migrant campaigns, sometimes reinforced by senior politicians, which have resulted in shop lootings, vandalism, mob justice meted out against alleged criminals and the murder of immigrants (Cinini and Mkhize 2021). An illustration of this phenomenon is the so-called Operation Dudula in Durban, South Africa, a breakaway faction of the Put South Africans First movement. Initially, the movement's main objective was to prioritise the needs of ordinary South Africans in response to public dissatisfaction with a faltering government (Myeni 2022). However, the campaign has been used to mobilise violent protests, vigilante violence, target migrant-owned homes and businesses, and murder foreign nationals. The primary targets are low-income Africans, southeast Asians, women, sexually diverse people and low-skilled workers (UN 2022b).

Rural to rural migration

Various factors, including the impact of climate change, drive rural-rural migration dynamics in Southern Africa. Climate hazards such as droughts, flash floods and unpredictable rainfall patterns have reduced crop yields. This has resulted in food insecurity and high unemployment in rural Southern African communities. These communities are often pushed to migrate with their livestock to neighbouring regions with sufficient grasslands and water or seek employment opportunities in the mining sector (Mpandeli et al. 2020).

Traditionally perceived as a potential source of income and employment, the mining sector attracts migrants from rural areas looking to escape livelihood insecurity and climate change impacts. In Zimbabwe, prolonged droughts and hotter temperatures increase the migration of young and single women from large families to nearby localities (Mudefi et al. 2019). In Zambia, climate impacts in the southern province, where the effects of climate change on agricultural production are most profound, have led to rural-rural migration as farmers seek new fertile land in northern and western areas of the country (Caroli 2023; Medina et al. 2023). Similarly, some rural groups have migrated between Zambia and Zimbabwe in search of opportunities in the mining sector, which has led to heightened vulnerability in both countries. As a result, people have resorted to seeking livelihood opportunities mainly in illegal, unregulated or abandoned small mining sites, contributing to the growth of criminal networks (Sax et al. 2023). Illegal mining is a major contributor to land degradation, and the contamination of underground and overland water sources due to the use of harmful mining chemicals such as mercury. This has polluted water, causing health issues for humans and animals, and contaminating crops (Brown et al. 2012; Ncube-Phiri et al. 2015). Moreover, climate change can further intensify the vulnerability of mining communities, as extreme weather events may disrupt mining operations and negatively impact livelihoods (Moyo and Phiri 2023).

Another climate security risk is the negative impact of rural out-migration on agricultural production and food security. When people leave rural areas, there is a decrease in agricultural labour and knowledge, resulting in lower productivity and reliance on external food sources. For example, many Zimbabweans have left their home areas due to food insecurity and migrated to the neighbouring region of Messina in South Africa to work in the agricultural sector. This has affected food production due to the lack of rural labour, and increased competition between migrants and local South African farmers working in the fields (Scheen 2011). These rural-rural migration dynamics have also contributed to an increase in the proliferation of small arms and light weapons in Zimbabwe. Zimbabwean returnees from South Africa are trafficking small arms and light weapons linked to stockpiles used by the former apartheid regime in South Africa. This connection has resulted in an increase in armed violence and robbery in Zimbabwe (Global Organized Crime Index 2023). Meanwhile, in urban areas, the demand for food is high, while agricultural resources are limited, which leads to higher food prices and food insecurity (Mpandeli et al. 2020).

LAND AND WATER ACCESS AND USE CONFLICTS

Land tenure and use, and water management conflicts have long existed in Southern Africa, and climate change is increasingly affecting existing conflicts dynamics and contributing to new ones. These conflicts are driven by various socioeconomic and governance-related factors, such as colonial legacies and disputes over land ownership. Land use conflicts exist between conservation,

extractive activities, industrialised food production and communal subsistence agriculture. Similarly, population growth, climate-induced water scarcity and poor law enforcement of industrial activities that cause pollution exacerbate regional, national and local water conflicts. In urban areas, corruption and inadequate infrastructure contribute to social tensions and protests.

Land tenure governance, access and use

Southern Africa has a complex history of conflicts over land. Inequalities relating to land use and access are one of the primary reasons for conflicts in the region. These inequalities are often the legacy of colonial policies, with land reform remaining a central challenge that has compounded political tensions and conflicts between white, land-owning elites and majority black populations with limited land ownership (Ngubane 2018). Climate change amplifies these challenges through its negative impacts on natural resources. Competing development visions put pressure on land, leading to desertification, displacement and unsustainable practices (IPCC 2019). Furthermore, insecure land tenure, ineffective governance, unequal access and a lack of community involvement worsen environmental degradation and climate vulnerability, fuelling land access and use conflicts.

Land tenure and use conflicts can be tracked in Zimbabwe, South Africa and Namibia following independence, where land reform gained prominence, challenging land tenure governance systems. Two separate systems of land tenure, shaped by colonial legacies of race, have emerged. These systems divide land administration along racial lines, perpetuating privilege for white and emerging black elites, while leaving vulnerable farmers behind. The mainly white-owned, commercial, large-scale farms received minimum regulation because of the power contained in the freehold title to land. In contrast, in communal areas declared as state land, stronger regulations were imposed with tighter land use restrictions for small holder farmers. This has resulted in different environmental and land use standards between large-scale commercial farms and small holdings, affecting the way climate change has impacted vulnerability in the region (Moyo 2005).

Land occupations in Zimbabwe led to the initiation of a land reform programme in 2000. The reform resulted in conflicts between commercial farmers and rural communities over land, which led to environmental degradation and soil erosion. The land reform programme involved the government redistributing land from commercial, predominantly white, farmers to rural, predominantly black, communities in an attempt to address historical inequalities. Although the land reform expanded the base of economic participation, the lack of proper planning and support for the new landowners, coupled with political and economic instability, led to inadequate farming practices, an increase in poaching in private farms that the owners abandoned, overgrazing of the newly acquired land and a decline in environmental stewardship. In turn, this led to environmental degradation and soil erosion (Moyo 2005). The changing climate and extreme weather events, including droughts and flooding, have exacerbated the situation, affecting the food security and livelihoods of communities, and challenging sustainable climate adaptation strategies (Mkodzongi and Lawrence 2019; Scoones et al. 2019; Spierenburg 2021; Mambondiyani 2022).

Climate change and disasters have led to land tenure conflicts in rural KwaZulu-Natal, South Africa. These conflicts involve local organisations that manage land, and disputes between locals and displaced individuals affected by climate change (Majeke 2005). Farm dwellers are especially vulnerable to the impacts of climate change, which affects the commercial farm enterprises they depend on for both wage labour and residence rights. This creates a complex scenario that is mediated by post-apartheid agrarian dynamics (Hornby et al. 2018).

Insufficient community involvement in decision-making processes related to land and resource management and climate adaptation can lead to grievances and conflicts. When communities are marginalised and excluded from decision-making, their rights and interests are often disregarded, resulting in a lack of incentives to invest in sustainable land use practices (Clover and Eriksen 2009). This further exacerbates environmental degradation and can fuel conflicts over access to and control over valuable land and resources (Msangi 2007; Scoones et al. 2019). For example, in the Zambezia province of Mozambique, disputes have arisen from policies labelled as climate-smart, which some critics see as a form of land grabbing. These policies allow foreign investors to acquire land for conservation efforts, forest plantations and biofuel production. However, some people fear that these top-down policies, designed by international organisations,

may not consider the needs of Mozambique's rural communities, which rely heavily on access to forest resources and arable land (Bruna and Mbanze 2023).

Similarly, maladaptation practices put rural landscapes at risk as they are often associated with negative environmental impacts such as deforestation that further stress ecosystems and reduce resilience to climate change. In Zambia, for example, deforestation is a main factor affecting climate conditions, agricultural production, heat stress and flooding (Caroli 2023). A livelihood diversification strategy that is a common maladaptation practice is excessive deforestation for charcoal production. Felling trees for charcoal production accelerates soil erosion and desertification, further compounding the loss of livelihood and jeopardising the human security of Zambian communities (Medina et al. 2023). In Matabeleland South in Zimbabwe, there is a concerning trend towards dense woodland cover loss. This loss is attributable to a combination of increased human activities, such as small-scale and illegal gold mining, and the adverse effects of climate change and variability (Maviza and Ahmed 2020). Although there are no violent conflicts in these countries, without immediate remedial action to reverse the observed negative trends in land use/land cover, adverse socioeconomic, hydrological and ecological consequences may be experienced, with the potential for conflict over scarce land resources.

Land use conflicts from conservation efforts

Land conflicts arise in the context of conservation efforts. The region has significant biodiversity-rich ecosystems, woodlands and grasslands, and is home to wildlife that attract visitors from around the world and support an industry of land-based ecotourism. Conflicts often emerge around protected areas over the traditional use of natural resources, such as fishing and hunting. In Mozambique, a national wildlife policy has been adopted, which aims to "conserve, utilise and develop forest and wildlife resources to gain social, ecological and economic benefits for present and future generations of Mozambicans." However, in practice, local communities have received only a small proportion of the revenues generated by protected areas (Musavengane and Leonard 2022). Moreover, in the Gilé National Reserve in Mozambique, although the reserve has implemented environmental projects without expropriating land, tensions have arisen around land use as some rural households have limited access to the reserve. These households derive up to 50 per cent of their food and income from forest resources, and some claim that they have not been adequately compensated for their losses (Neef et al. 2023). This has created tensions between local communities and national authorities.

Southern Africa has experienced a surge in conflicts between humans and wildlife, which the effects of climate change have exacerbated. Due to the lack of adequate grazing land and water sources, animals have been forced to migrate closer to human settlements. For example, this is an issue in the Namibian portion of the Kavango-Zambezi Transfrontier Conservation Area, impacting local communities' livelihoods. A study of selected mammal species reveals that conflicts have intensified due to population growth and large mammal species' re-colonising previously uninhabited areas. Although conservation efforts have helped increase specific animal populations, their distribution is now more limited than when wildlife numbers were lower, which could negatively impact ecosystem resilience (Stoldt et al. 2020). Similarly, human-wildlife conflicts have been observed in Zimbabwe's Save Valley Conservancy, particularly between farmers resettled in protected areas, and lions, hyenas, elephants and crocodiles. Changing land use from wildlife ranching to farming and disputes over land ownership are the main drivers of conflict. More established inhabitants have shown greater inclination towards peaceful co-existence with species than more recent settlers (Makumbe et al. 2022).

Regional water conflicts

Water disputes over shared rivers are rising due to climate change affecting freshwater availability, weak governance and inadequate management practices (Zikhali 2019). Water is central to Southern Africa's development. Yet, water availability is under pressure from climate impacts, industrial pollution, and increased demand driven by population growth and agricultural expansion. Furthermore, water scarcity is a particular challenge given Southern Africa's is mainly arid or semi-arid (Zikhali 2019). Countries such as South Africa, Namibia, Zimbabwe and Angola are experiencing severe water stress issues. As a result, water conflicts are on the rise in Southern Africa (Zikhali 2019).

Around 70 per cent of available freshwater resources in the region are shared. The distribution of water resources in Southern Africa exhibits

spatial and temporal disparities, with ample water availability observed in northern and eastern areas of the region, while limited water resources are found in southwestern areas (Binder 2023). The challenges related to the management of the Zambezi River Basin exemplify conflicts that may emanate from cooperative water management (Petersen-Perlman 2016). When examining the spatial distribution of water resources between the riparian countries of the Zambezi River Basin, it is apparent that Zambia possesses a significantly larger share compared to other neighbouring countries. The disparities in water availability can impact the economic, social and environmental development, and an asymmetry in resource allocation can give rise to tensions between riparian countries (Zikhali 2019; Ferre Garcia et al. 2023; Sax et al. 2023).

Although water has historically been a source of cooperation rather than conflict in Southern Africa (Southern Africa Consultation in Climate Security 2023),[62] the increasing frequency and severity of droughts have sparked tensions. Transboundary disputes over shared rivers and lakes have been recorded along the Zambezi, Chobe, Orange and Limpopo rivers. Countries such as Zambia, Zimbabwe, Mozambique and Angola often conflict over fair water distribution for agriculture, energy production and domestic use (Seyuba and Ferré Garcia 2022). These disputes have sometimes escalated into diplomatic tensions. For example, the Chobe River, which flows through Botswana, Namibia and Zambia, has been a source of conflict between these countries. Despite Botswana being recognised as the owner of Sedudu Island, located in the middle of the river, declining water levels caused by droughts have forced Namibian fishers to cross into Botswanan territory. This has resulted in rising tensions and even shootings (Kings 2016).

Another case is the Orange-Senqu Basin, which is shared between the four Southern African countries of Lesotho, South Africa, Namibia and Botswana (Blumstein 2017). South Africa uses over 90 per cent of the water resources in upstream areas for agricultural production, and industrial and domestic consumption. Meanwhile, Namibia and Lesotho rely on the Orange-Senqu River's water resources for irrigated crop production, mining (Namibia), hydropower and water sales (Lesotho). The conflict arises from Namibia's concerns about the transboundary water management project's negative impact on water flow in the basin. The disapproval echoes the sentiment that South Africa disproportionately benefits from the current management of the Orange-Senqu system, disadvantaging downstream countries. Climatic change threatens livelihood opportunities and the river ecosystem, with crop and livestock water requirements increasing due to rising temperatures and evapotranspiration. Small farmers with limited resources are vulnerable to yield and financial losses. Flooding may worsen soil erosion and lead to loss of agricultural land and siltation of dams (Blumstein 2017).

At the national level, industrial and commercial activities significantly contribute to water conflicts. Mining operations, for instance, require substantial water resources, putting them in direct competition with local communities and the agricultural sector. The pollution and contamination of water sources from industrial activities further worsen conflicts and pose environmental risks. These conflicts not only threaten the availability of water for various sectors, but also undermine the overall sustainability of water resources. An illustrative example is the Muene River in Mozambique. The country has complained to the SADC about contaminated water flowing downstream from mining operations in South Africa, which is harming biodiversity and reducing fish stocks. Moreover, droughts have aggravated the situation by concentrating pollution levels in rivers, leading to health problems such as cholera for local populations. The polluted water has also harmed wildlife in Kruger National Park in South Africa, one of the largest wildlife sanctuaries in Africa (Kings 2016).

Local water conflicts

At the local level, water conflicts emerge due to competing needs within communities and economic sectors. In rural areas, tensions frequently arise between rural communities, who require access to water resources for irrigation, food production, livestock watering or mining. The combination of limited water sources and climate change-induced droughts exacerbates these conflicts, contributing to water rights and usage disputes. In some cases, these disputes escalate into violence and displace people, compounding the social and economic hardships affected communities face.

In Zambia, for example, water-related competition is common (Zikhali 2019; Sax et al. 2023). Tensions within and between communities primarily emerge in relation to access to water sources. During drought periods, when existing water

sources are scarce and many dry out, the pressure on remaining water sources intensifies. Access to water points is frequently controlled by local elites who impose restrictions on the utilisation of water, which intensifies the vulnerability of marginalised groups. It is crucial to note that conflicts can also arise at newly constructed boreholes, where local power relations are contested (Sax et al. 2023).

In Zimbabwe, water scarcity and quality pose risks to climate security, with Bulawayo and Matabeleland North the most affected areas due to extreme climate variability. The pollution of water resources, including sediments from artisanal mining and agriculture, as well as pathogens from wastewater and industrial discharges, exacerbate water quality problems in the country (Davis and Hirji 2014; Madurga Lopez et al. 2021). The lack of water supply in Bulawayo is a major concern, with government inaction and disputes with local authorities over water supply exacerbating the situation (Swain et al. 2011).

In urban areas of Southern Africa, water conflicts persist due to climate impacts, increased demand and inadequate water infrastructure. These issues disproportionately affect marginalised communities (Rusca et al. 2023). Furthermore, the unequal distribution of water resources generates social tensions, and can even trigger protests and civil unrest as communities strive to secure their water needs. For example, deficiencies in the flood management systems of townships in the Durban area have led to protests against the municipality's perceived failure to restore power and water services quickly after flooding in 2022 (Africa News 2022). In addition, the recent cholera outbreak in the region and particularly in South Africa has highlighted government failures in ensuring access to clean water, proper waste management and safe sanitation practices (World Health Organization 2022).

WEAK GOVERNANCE OF HIGH-VALUE NATURAL RESOURCES

Southern Africa possesses abundant high-value natural resources that present both opportunities and risks. Weak governance of natural resources in the region, in combination with climate change impacts and the development of a low-carbon economy, may drive conflict dynamics. The region's mineral deposits, including platinum, lithium, nickel and cobalt, hold the potential for economic growth and supply critical minerals for the green energy transition. However, corruption, ecosystem deterioration and insufficient benefit-sharing have led to social conflicts, while climate change affects mining sites and exacerbates competition for water and land resources. Conflicts between mining companies and communities, as well as disputes over water access are already common. Transitioning to a low-carbon economy introduces risks such as job losses, social tensions and governance challenges. Increased demand for minerals may compromise protected areas, while the governance of natural resources requires clarity to manage climate security risks effectively. Stranded assets and financial losses are also concerns, as the world moves away from fossil fuels potentially impacting oil and gas projects and investments.

Abundant valuable resources

Southern Africa has an impressive array of mineral deposits. Southern Africa is home to the most extensive platinum reserves globally, alongside other highly prized minerals like gold, copper, and diamonds. Given the quality and scale of these reserves, the region has substantial potential for economic growth and can provide the minerals that are needed for the low-carbon transition (Butts and Thomas 2019). However, to date, the extraction of natural resources has in most countries in the region negatively impacted fragile ecosystems and has yet to result in wealth distribution among citizens that would enable sustainable development (Musavengane and Leonard 2022).

As the industry expands and climate impacts increase, these compounding pressures are likely to increase conflict risks around mining. Today, conflicts between mining companies and communities, and between states and communities around various issues – including negative environmental impacts, land tenure disputes, labour rights, water scarcity and compensation for damages – are common.

Climate change impacts exacerbate mining conflicts

Increased temperatures and fluctuating rainfall patterns pose increasing risks to water security in Southern Africa, with water essential for mining operations. At the same time, many local communities rely on water access for their livelihoods, such as agriculture or ecotourism based on biodiverse ecosystems. Today, disputes and conflicts

62 As discussed during the ACRA Southern Africa regional consultation in 2023.

around water are common in the region. One example of a water-related conflict in Southern Africa concerns the Okavango Delta in Botswana, where mining activities have led to increased water consumption and pollution, impacting the region's ecosystem and the livelihoods of local communities (Darkoh and Mbaiwa 2014; Mosepele et al. 2018). In South Africa, the Waterberg Coalfield has been the site of a protracted conflict between mining companies and local communities over water use and pollution (Ololade 2018; Simpson et al. 2019).

There are concerns about mineral resource extraction in many countries in Southern Africa, including Zimbabwe, Mozambique and Angola, particularly over the violation of indigenous people's rights and mining companies' disregard for environmental regulations, leading to protests and court cases against companies. In Zimbabwe, for example, there have been conflicts around diamond mining in the Marange region, with reports of human rights abuses, environmental degradation and corruption leading to the displacement of thousands of people and the loss of traditional livelihoods (Bruffaerts 2015; Ntlhakana 2015; Howard 2016). Labour conditions are also a flashpoint of conflict. For example, in 2012, workers at the Marikana platinum mine in South Africa went on strike to demand better working conditions and higher wages. The strike turned violent and led to the death of miners, which triggered widespread public outrage and demands for accountability (Onyebukwa 2021).

Mining contributes to larger conflict dynamics
Mining issues can contribute to larger conflict dynamics. Cabo Delgado in Mozambique is the most prominent armed conflict in the region. The conflict demonstrates how weak governance of natural resources provides an opportunity for radical groups to attract impoverished populations by channelling their grievances. Among the root causes of the conflict in northern Mozambique are the discovery of rubies and liquified gas. The government's initiatives aimed at facilitating resource extraction in regions of northern Mozambique, coupled with lingering inequality and the perception of unjust resource distribution, have been exploited by the extremist group Ahlu Sunnah wa-I-Jama'ah (ASWJ) to legitimise its presence. Particularly among the young people, ASWJ has capitalised on this discontent by attempting to provide its own religious education, leading to a surge in the number of young individuals willing to join the Islamist group. Some believed the narrative that adherence to Islamic law would bring about improvements in their circumstances (Pirio et al. 2019; Hamming 2021).

Mozambique aims to become a significant global gas producer and has attracted substantial investment in LNG projects. However, this comes with inherent risks. First, there are concerns about corruption, transparency and due diligence regarding climate change, environmental and social impacts, and human rights (Pirio et al. 2019). Gas projects significantly impact the environment and communities living in areas where gas extraction companies build their LNG plants and related infrastructure. To construct the onshore Afungi LNG park, the industry will relocate 557 households, leaving behind their homes and livelihoods, mainly farming, fishing and tourism. There have been complaints about the lack of opportunities for community participation in previous consultations. Furthermore, local communities are unlikely to benefit from any possible economic gains due to tax evasion, weak governance and corruption (Wensing 2022).

The risks of the green transition
While the green transition offers a lot of opportunities, there are also risks. First, a significant increase in demand for crucial minerals can increase conflicts around mining. Moreover, the green transition can result in a loss of revenue fort countries dependent on the extractive industries, particularly countries that rely on fossil fuels.

One of the risks associated with the green transition is the increasing demand for critical minerals, which – if not appropriately managed – contribute to conflicts around mining. For example, in northern Mozambique, an area rich in graphite, an essential element in manufacturing batteries, there is concern that – following the announcement of investments in Balam – the risks of violence and recruitment may increase. Among other things, there are fears that radical groups may demand a share of the revenue, which may lead to new conflicts (Ewi et al. 2022).

Similarly, concerns have been raised about the potential impact on protected areas and conservation efforts as the demand for minerals for renewable energies rises. South Africa has made commendable efforts to advance environmental protection and conservation. However, the fragmented and uncoordinated implementation of laws

– such as the National Environmental Management Act, and the Mineral Petroleum and Resources Development Act (MPRDA) – has been a significant obstacle. The MPRDA could potentially harm pristine natural areas, while promoting optimal exploitation of environmental resources. Achieving a balance between exploitation and conservation is essential in effectively addressing climate security risks in Southern Africa (Leonard 2020).

Zimbabwe presents an interesting case highlighting the risks of critical mineral extraction. The country has significant lithium reserves, which have attracted miners, including irregular migrants, who target abandoned mines (Diene et al. 2022). There has been an increase in the smuggling of lithium to other countries, which has undermined tax revenues for Zimbabwe (Dana 2023). In addition, previous experiences have shown that extractive industries often generate little economic benefit for local communities, leading to discontent. In turn, this has influenced people's perceptions and attitudes towards new mining enterprises. Recently, protests against mining companies' lack of prior consultation occurred in Kanyandura village in Mudzi District in Mashonaland East province of Zimbabwe, where lithium exploration and extraction activities are planned (All Africa 2023).

In response to the illegal mining of critical minerals such as lithium, a recent law in Zimbabwe requires special permission to export raw lithium ore. The law encourages local processing to generate more revenue and added value for the country, with the government urging foreign companies to establish local processing plants, creating an opportunity for local development. This law is meant to discourage Zimbabwe's small-scale, informal mining activities. Exporters must demonstrate that they have established local manufacturing facilities; otherwise, they must show exceptional circumstances before exporting the commodity. Foreign companies can only export concentrates created by processing the ore. The government of Zimbabwe is urging foreign companies to establish local processing plants, with Chinese companies already doing so to bypass the export ban (Diene et al. 2022; Dana 2023). This has the potential to create opportunities for a more equitable model of distributing added value within the value chain, ensuring that economic benefits from sustainable resource mining for the green transition reach the local communities. However, the law does not include the necessary arrangements to enable local companies to start processing the ore. Furthermore, it is crucial to follow the implementation of the law to ensure efficiency, accountability and transparency within the emerging value chains.

The transition to a low-carbon economy poses challenges related to loss of revenue and stranded assets. High emissions extractive industries, such as oil and gas, have traditionally been a significant source of revenue for many economies in Southern Africa, particularly Angola, Zambia, Zimbabwe, Lesotho, Mozambique and South Africa (Ericsson and Löf 2020). However, as countries strive to reduce their carbon footprint, gas and oil prices are projected to decrease significantly (see Northern Africa chapter). There is a growing risk that new gas and oil investments and infrastructure become stranded assets. International pressure to limit financing for fossil fuel projects can lead to reduced funding for ongoing oil and gas projects (Siyobi 2021). In turn, this can lead to the loss of jobs from extractive industries and, in combination with the sudden loss of jobs created by the impacts of climate change on other sectors such as the agri-food industry, can create social tensions around increased demand for jobs, the lack of alternatives for livelihoods and even climate denialism. Moreover, the loss of revenue can affect government finances, hindering the ability of governments to finance poverty reduction initiatives and vital public services, such as health care and education.

Responses and good practices

Governments, policymakers and other key decision-makers in Southern Africa are aware of the risks caused by climate change and have put in place various strategies, policies and mechanisms to prevent and respond to climate-related security risks. This section presents interventions that seek to address climate security risks in three parts: (1) regional approaches, (2) national approaches and (3) community-level approaches.

REGIONAL APPROACHES

There are a number of regional mechanisms, institutions and initiatives in the fields of early warning for conflict prevention, resilience, disaster risk reduction and water management that are relevant and address climate-related security risks. This section presents a selection of these initiatives.

The SADC Regional Early Warning Centre (REWC) for conflict prevention, management and resolution

The overall objective of the REWC is to strengthen SADC mechanisms for conflict prevention, management and resolution. The REWC was officially launched in 2010, and its main functions are compiling strategic assessments and analysing data collected at the regional level. In addition, the REWC shares information on central issues that threaten the security and stability of Southern Africa, while proposing effective strategies to prevent, counter and manage these potential threats.

The centre focuses mainly on conflict-related data, but is beginning to incorporate information on climate-related factors and collaborate with units focused on reducing disaster risks. However, there is still a need for more detailed and comprehensive integration of climate and conflict data in the early warning centre. A way forward could be to enhance the partnership with locally driven climate security assessments conducted by the Global Partnership for the Prevention of Armed Conflict (GPPAC) local chapters (Moyo and Phiri 2023; Nhamirre et al. 2023).

Resilience and disaster risk reduction regional policies

The SADC Regional Resilience Framework 2020–2030 aligns with international, regional and national initiatives, fostering efforts to prevent climate security risks. The framework takes an integrated approach to sustainable development, disaster risk reduction and climate change adaptation. It is guided by international and regional frameworks, such as the Sendai Framework of Disaster Risk Reduction, AU Agenda 2063 and Agenda 2030. By adopting a strategic resilience-building approach, the framework aims prepare and mitigate against shocks and stressors, and minimise human suffering and economic loss. Furthermore, the framework guides stakeholders in designing and implementing resilience programmes, promoting coherence, and scaling up good practices for greater impact (SADC 2020). The framework supports the realisation of regional development goals, including integration, industrialisation, peace, stability, poverty reduction, wealth creation, and social and economic transformation. It is expected to enhance adaptive capacities, and drive sustainable and equitable development in the SADC region (SADC 2020).

Several SADC member states have introduced policies that recognise the impacts of climate change on agriculture. In addition, there are a number of promising examples of early warning systems, such as the Southern African Regional Climate Outlook Forum, the SADC Regional Vulnerability Assessment and Analysis Programme, and the SADC Disaster Risk Management and Information System. Among other things, these systems provide weather and climate information, which can improve policy planning and intervention. However, various implementation challenges persist. These include a lack of coordination, institutional capacity, financial resources, and information transmission between local, national and regional levels (SADC 2020) (Seyuba and Ferré Garcia 2022).

However, there are gaps in policy implementation including a lack of harmonising early warning indicators of climate and conflict triggers, and joint advocacy and awareness raising around areas of intersection and mutual interest between climate and conflict units. There is also still a gap in identifying and tailoring pathways linking climate change impacts, such as agriculture and livelihoods, to conflicts over natural resources, migration, crime and social unrest.[63]

Regional water management

Transboundary water management in Southern Africa is well-developed. The 14 SADC member states have shown awareness of the potential dangers associated with water issues and have initiated important measures to foster cooperation among shared river courses. In 1995, the 14 members states agreed to integrate and cooperatively manage all shared river basins through the SADC Protocol on Shared Watercourse Systems, in alignment with the SADC goal of mutual economic development through cooperation and integration. The protocol laid out the structure for cross-border water collaboration, encompassing all surface water applications for agricultural, residential, industrial, and navigational purposes. The most important follow-up to the protocol was the establishment of the distinct and dedicated Water Sector Co-ordinating Unit by Council and Summit in 1996 (Böge 2006). In 2000, after a consultation process, the Revised SADC Protocol on Shared Watercourse Systems was signed. It serves as an instrument of international water law for the region and highlights the importance attributed to water by member states through the establishment of river basin management institutions (SADC 2000).

The Regional Strategic Action Plan for Integrated Water Resources Development and Management

was adopted in 1998 by all SADC member states. The plan aims to create conducive conditions for the common management of regional water resources. The plan has since been updated, with current version focusing on the period 2021 to 2025. Subsequently, several bilateral and multilateral institutions – including river basin organisations, such as the Permanent Okavango River Basin Water Commission, the Orange-Senqu River Commission (ORASECOM), the Limpopo Watercourse Commission and the Zambezi Watercourse Commission (ZAMCOM) – have been established to manage shared watercourses (Böge 2006). These river basin organisations represent a significant step forward in transboundary cooperation.

A good practice in Southern Africa is the establishment of groundwater task forces within the framework of river basin arrangements. Countries such as Botswana, Eswatini, South Africa and Zimbabwe have implemented this approach, as evidenced by the ORASECOM and ZAMCOM. These task forces are vital in promoting transboundary water cooperation and including groundwater-related activities in joint body meetings. The river basin organisations ensure that groundwater issues are given due attention, fostering accountability and facilitating the follow-up of decisions made in these forums. This proactive approach strengthens regional collaboration and contributes to Southern Africa's sustainable management of shared water resources (UN Water 2021).

However, transboundary water management in Southern Africa faces significant challenges. Two critical challenges exist in the SADC's transboundary water management: data sharing and management, and financial arrangements. Difficulties in data exchange arise from technical, logistical, and legal and political barriers (GIZ 2016; UN Water 2021). One of the biggest obstacles to transboundary water cooperation is the lack of financial resources for newly established arrangements. For joint bodies and agreements to be successful, countries must be able to cover the basic costs of meetings, staffing and facilities, as well as any additional expenses for monitoring, planning and joint infrastructure projects. Adequate funding is crucial for initiating and supporting the creation of new transboundary water arrangements and river basin organisations (UN Water 2021). For example, at the national level, although the government of Lesotho has put forward structural arrangements for its Department of Water Affairs, which seeks greater responsibility for implementation, the department still needs additional government funding alongside support for its transboundary water management agreements (GIZ 2016).

NATIONAL APPROACHES

In Southern Africa, several countries have taken steps to tackle different drivers of climate security risks. These efforts have been created through partnerships between national governments and multilateral organisations, with the assistance of international development cooperation. This section presents a few examples of innovative national-level approaches from Southern Africa that illustrate steps towards a just energy transition, policies that aim to coordinate different sectors to support populations displaced by climate change and conflict, and national water management programmes that aim to prevent conflicts.

Renewable energy transition: The Just Energy Transition Partnership in Southern Africa advocates leaving coal in the ground

The Just Energy Transition Partnership – consisting of South Africa, France, Germany, the United Kingdom, the United States and the European Union – has announced an ambitious, long-term initiative to support South Africa's decarbonisation efforts. With an initial commitment of USD 8.5 billion, the partnership aims to accelerate the decarbonisation of South Africa's economy, particularly the electricity sector, aligning it with the country's updated emissions goals. The financing will be mobilised through grants, concessional loans, investments, risk-sharing instruments and private sector participation. The partnership is expected to prevent 1–1.5 Gt of emissions over the next 20 years and facilitate South Africa's transition to a low emission, climate-resilient economy (EC 2021).

In line with this endeavour, the Eskom Just Energy Transition Project has been approved by the World Bank. With a funding package of USD 497 million, the project will support the decommissioning of the 56-year-old Komati coal-fired power plant, repurposing the site with 220 MW of renewable energy solutions and 150 MW of batteries. The project aims to create opportunities for workers and communities and, provide a blueprint for a just energy transition in South Africa and beyond (World Bank 2023b).

63 As discussed during the ACRA Southern Africa regional consultation in 2023.

Mozambique's Comprehensive Strategy to Address Internal Displacement Caused by Climate Hazards and Conflict

The National Policy and Strategy for Internal Displacement Management approved in 2021 aims to reduce the impact of disasters and conflicts on the population, and the number of displaced people by improving aid support and coordination. To ensure widespread support, Mozambique formed a national team bringing together numerous sectors, ministries, agencies and disciplines to develop the policy. The team worked closely with displaced individuals, visited resettlement camps, engaged local disaster risk reduction teams, and gained media attention, resulting in swift political commitment and policy approval. The policy focuses on addressing prevention, assistance, protection, resilience building, reintegration and durable solutions for displaced individuals (UNHCR 2022).

At the same time, Mozambique has worked on strengthening the policy's implementation at the local level (UNDRR 2022b). Early successes were seen immediately after Cyclone Freddy hit the east coast of Southern Africa in 2023, with the early warning strategy and relocation of communities preventing a significant death toll compared to neighbouring countries such as Malawi or previous disasters such as Cyclone Idai. Nevertheless, it should be noted that the extent to which these policy actions have successfully been implemented has yet to be determined. Financial capacities and local coordination are critical challenges for policy success. Further research is required to evaluate the implementation of these actions (IFRC 2022a).

Integrated water management and nature-based solutions in Lesotho

Lesotho, known as the water tower of Southern Africa, provides a significant portion of the annual run-off for the Orange-Senqu River, supporting agriculture, industry and households in the region. However, severe land degradation in Lesotho's river catchment areas, the lack of updated regulations and climate change adverse impacts threaten water security and the livelihoods of rural populations. In response, the government of Lesotho has launched the ReNOKA We Are a River programme, which aims to integrate catchment management through a multi-stakeholder approach (Kingdom of Lesotho 2022).

The ReNOKA programme focuses on restoring degraded watersheds through emergency rehabilitation measures, nature-based solutions and catchment management plans. It tackles unsustainable land use patterns and water conflicts, promotes climate resilience, and offers livelihood opportunities for local communities (Southern Africa Consultation in Climate Security 2023). The programme equips resource users and professionals with the necessary skills and knowledge to ensure sustainable land, water and environmental management.

Public awareness and adoption of sustainable behaviours are crucial to reducing catchment degradation, and the programme employs targeted communication approaches, conflict prevention strategies and behavioural insights to promote this. In addition, data and evidence inform decision-making, learning and innovation in integrated catchment management. Providing equitable and inclusive access to clean water and sanitation contributes to the overall well-being of the population by reducing the burden of water collection, minimising the risks of water-related diseases and enhancing human security (Kingdom of Lesotho 2022).

COMMUNITY-LEVEL INITIATIVES

In Southern Africa, many community-based climate security responses have emerged to address the region's challenges. These initiatives showcase the importance of local empowerment and cooperation in fostering climate resilience, although challenges concerning unclear land rights and limited financial resources persist.

Supporting rural resilience

The World Food Programme's R4 Rural Resilience Initiative, implemented in Mozambique, Malawi, Zambia and Zimbabwe, has successfully combined risk management strategies to promote sustainable farming practices and resilience among their poorest farmers. These strategies include nature-based solutions, improved agricultural practices, access to insurance schemes, livelihood diversification, microcredits and savings instruments. Through the R4 initiative, farmers can access crop insurance by engaging in risk reduction activities, which gradually decreases their vulnerability to disasters. In the event of weather-related losses, the insurance compensation prevents farmers from having to resort to desperate measures, such as selling their assets or engaging in illegal activities, and enables faster recovery. This allows farmers to invest in more lucrative enterprises and essential agricultural resources. Monitoring and

evaluation data demonstrate that insured farmers save more and invest significantly in farming activities. The R4 initiative also positively impacts gender equality, empowering women by providing increased access to land, resources and training opportunities. Women are actively involved in decision-making processes related to insurance payouts, with most insured households in the region headed by women (WFP 2021b).

Localised climate security assessments in Zimbabwe and Mozambique

Local solutions play a crucial role in addressing climate security risks, with local ownership a key aspect. Local ownership enhances the sustainability of interventions through multi-stakeholder dialogue. In the Gwanda District, Zimbabwe, local actors – including community members, government representatives, security sector actors, peacebuilders, climate experts and development partners – co-designed an approach and mapped stakeholders, hazards, climate security risks and solutions. The risk assessment fostered open dialogue in a polarised setting. The process led to the recognition and establishment of climate change committees for knowledge transfer and a formal early warning system. Indigenous knowledge systems were integrated into data collection, informing context-specific indicators. Traditional practices such as rain-making ceremonies were recognised and incorporated by the District Development Committee. Such inclusive and participatory approaches strengthen community cohesion and the sustainability of identified solutions (GPPAC 2023; Moyo and Phiri 2023).

Similarly, in Mecufi, Mozambique, local consultation is used to address climate security risks. This practice highlights the importance of stakeholder engagement, community empowerment, and collaborative efforts to tackle climate security challenges at the local level. The approach involves inclusive and participatory design, with diverse stakeholders, such as local communities, government entities and civil society organisations, co-designing the risk assessment. The Mecufi District Government played a vital role in ensuring collaboration between local authorities and communities (Nhamirre et al. 2023).

The risk assessment aimed to strengthen the understanding of climate-related security risks in Mecufi, considering the existing climate change conditions. The engagement of community members, traditional leaders, climate experts and peacebuilders enables the collaborative identification and development of plans to address climate-related security risks. A key lesson has been the importance of integrating formal and informal local authorities. In this case, the project sought permission from not only the governor, but also traditional spiritual leaders, who hold legitimacy among the population, for space in the locality.[64]

This inclusive approach facilitates the collection of relevant information from various sources, and fosters cooperation between government entities, local authorities and communities. However, there is still a gap in the capacities of local stakeholders to integrate various variables, associate vulnerabilities with climate change impacts, and understand how they can lead to conflict (Nhamirre et al. 2023).

Community-based natural resource management in Namibia and Angola

The promising community-based Planned Grazing through Herding (PGH) project was implemented in the remote Kunene Region in Namibia, characterised by arid mountains, climate vulnerability and communal land. The project specifically focused on combining traditional and scientific methods, and gaining support from traditional leaders (UNCCD 2010). In addition to improving rangeland productivity, biodiversity, resilience and livelihood security, a key aim of the project was to improve social cohesion and prevent conflicts. Key lessons learned from the initiative include the importance of motivated herders and effective management of internal conflicts. The success of PGH depended on receiving support from stakeholders, and ensuring the approach was socially and culturally compatible (UNCCD 2010). This kind of valuable practice has been disseminated to other regions.

In southern Angola, the Restoration of Traditional Pastoral Management Forums (RETESA) project initiated by the FAO has implemented an approach to address land degradation and improve local livelihoods among transhumance pastoral communities. Traditional governance and management systems for pastoral resources was abandoned due to conflicts in the last century. Consequently, the RETESA project aimed to revive these systems to reduce land degradation. The approach involved using traditional management

64 As discussed during the ACRA Southern Africa regional consultation in 2023.

practices adapted to modern rangeland management theory (UNCCD 2017).

The project established modern discussion forums called Jangos, which included traditional authorities, community leaders, local administrations, veterinarians, church leaders, NGOs, ranchers and farmers. The Jangos were traditional in nature but adapted to include various stakeholders. The project utilised the Green Negotiated Territorial Development methodology to negotiate and implement six management plans. This approach allowed for rangeland recovery and agricultural practices in the lowlands without conflict with livestock (UNCCD 2017).

The project contributed to the involvement of local communities in decision-making processes related to natural resource management and climate adaptation, and has strengthened local and municipal institutions. Conditions that hindered the approach included unclear land and water rights, and limited financial resources. However, the project collaborated with the Angolan government to improve livestock and herder movement policies. The involvement of stakeholders – including local communities, community-based organisations, sustainable land management specialists, NGOs, private sector representatives and local government – played a crucial role in the approach (UNCCD 2017).

African Island States

African island states are particularly vulnerable to the impacts of climate change due to a combination of high exposure and low adaptive capacities. Their distinct geographies shape the specific risks they face, which stem from increased extreme weather events (in particular tropical storms and hurricanes), limited water and land resources, and vast ocean territories that are home to important yet vulnerable fish populations (e.g. tuna) and marine ecosystems such as coral reefs. The Western Indian Ocean, for example, is home to approximately five per cent of the world's coral reefs, with those around Madagascar, Comoros, Seychelles and the Mascarene islands classified as endangered or critically endangered due to predicted future warming (Obura et al. 2022).

In addition, the combined impacts of rising sea levels and extreme weather events are severely impacting the water, food and economic security of African island states in the short, medium and long term. Between 1993 and 2014, sea level rise for small islands in the Indian Ocean was estimated at 4–6 mm per year, faster than the global average, with the additional sea level rise expected to double the frequency of floods by 2050 (Mycoo et al. 2023).

Disasters

African island states face a high risk of extreme weather events and disasters. These disasters directly impact the safety of islanders, and often lead to loss of life and widespread infrastructure damage. For example, in the aftermath of tropical Cyclone Kenneth making landfall across the Comoros archipelago in April 2019, hundreds of casualties were reported, along with 20,000 displaced people and more than 10,000 houses damaged or destroyed (IFRC 2020). The estimated damage amounted to USD 150 million or 12.5 per cent of Comoros' GDP (IMF 2019). In Madagascar, more than 41,000 houses were damaged and over 299,000 people were impacted when tropical Cyclone Freddy made landfall in February/March 2023 (OCHA 2023). While projected trends for tropical cyclones making landfall across African island states come with high levels of uncertainty, the combined impact of extreme weather events and rising sea levels could raise the frequency of and damage caused by coastal flooding in the future (Mycoo et al. 2023).

Vulnerable population groups are particularly affected by disasters. Women and children often have relatively limited assets and opportunities to move out of hazard zones, while older people, and people with disabilities and chronic illnesses face physical constraints to moving (Binder et al. 2023). In addition, women often face greater risk of GBV in the aftermath of disasters. Moreover, sudden onset events such as tropical cyclones and flooding destroy island health care and judicial infrastructure, which limits people's ability to seek justice when experiencing violence (van Daalen et al. 2022).

Economic vulnerability

Both slow and rapid onset climate-related events pose economic risks, the impacts of which can already be seen today. For São Tomé and Príncipe where sea levels have continuously risen since 1993, flooding associated with a combination of heavy rainfall and sea level rise place a huge pressure on the island state's agricultural productivity, affecting approximately 1.4 per cent of GDP annually (STP 2023). Continued sea level rise also threatens the country's energy infrastructure (Ministry of Public Works, Infrastructures, Natural Resources and the Environment of São Tomé and Príncipe 2019).

Island states' geographies and specific economies shape these risks. Small island states can be understood as large ocean states owing to the fact that, while their landmass is small, they have comparatively large EEZs, which often contain important resources such as fisheries, fossil fuels and minerals. However, this feature presents a number of security challenges to small island states. Changes in the size of EEZs due to sea level rise and land disappearance could trigger legal disputes related to marine resources (Zhang and Veening 2014). At the same time, small island states generally have limited capacities to monitor and control their vast EEZs, leading to increased incursions by

foreign industrial fleets (both legal and illegal) that threaten fish populations, and overall food and livelihood security (IRIS 2023).

In addition, island states often have a narrow economic base, with fisheries and tourism typically comprising important economic sectors. Moreover, islands states are highly vulnerable to climate change impacts. In the Seychelles, the fisheries sector employs 17 per cent of the population (World Bank 2017b), and generated almost USD 400 million from the export of fish and fish products in 2021 alone (FiTI National Multi-Stakeholder Group (MSG) Seychelles 2023). However, the sector is highly vulnerable to increasing ocean temperatures and acidification, as these impacts affect the habitats of key commercial species such as tuna and may push these species outside the Seychelles EEZ after 2050 (UNFCCC 2021). Meanwhile, flooding and extreme weather events impact the Seychelles' vital tourism sector, which relies heavily on thriving and intact beaches, coral reefs, and coastal infrastructure (UNFCCC 2021). Similarly in Mauritius, tourism contributed to nearly 20 per cent of GDP in 2019. However, within 10–15 years, major tourist attractions such as the Mont Choisy beach could be submerged (Dutton 2022).

For small island developing states in general, women comprise a disproportionate share of people who are unemployed or living in poverty. This is because prevailing customary laws and traditional gender roles, such as fetching water for domestic use, impacts their educational and economic opportunities, and health (Gheuens et al. 2019). In the Comoros, women are traditionally involved in harvesting marine catch for both household consumption and for selling (Harper et al. 2013). The impacts of warming sea surface temperatures in reducing the productivity of these activities can affect the important roles women play in sustaining household food security and income.

The need to diversify economies in light of the impacts of climate change could push small island states to pursue other potentially lucrative sectors, such as deep-sea mining within their EEZs, particularly as the global energy transition is driving up demand for minerals. Mauritius, for example, has expressed interest in the sector and is developing a national bill on seabed mining. However, as many uncertainties remain over the ecological impacts of deep-sea mining, such economic pursuits could expose island states to more risks (Iqbal Ahmed Khan 2022).

Many African island states are highly dependent on external development financing to address development gaps. However, accessing such finances, particularly climate financing, is a major challenge as some island states are classified as middle or high-income countries. Hence, they are not eligible for concessional financing and ODA. Experts have highlighted the need for donors and international financial institutions to adopt a vulnerability-based criterion, such as the Multidimensional Vulnerability Index, to assess a country's eligibility for climate financing. Such needs-based approaches are an important step in broadening the scope of development finance schemes available to island states and increasing island states' eligibility for much needed climate financing (UN OHRLLS 2022).

Water, food and energy security

Water, food and energy security are key challenges for African island states. Small island states such as the Comoros often have very restricted water storage capacities due to limited land resources (UNDP 2019). Consequently, water supplies are highly vulnerable to rainfall variability and saltwater intrusion due to flooding and sea level rise. The direct impacts of climate-related sudden-onset events also pose huge risks. While some island states such as the Seychelles have installed desalination plants to cope with water shortages (Ernesta 2019), experts warn that their high energy and maintenance costs are a burden for island states' limited financial and human resources.

For the Seychelles, as with many other African island states, healthy coastal ecosystems, particularly coral reefs, are an important source of revenue for artisanal fisheries and contribute to local food security. They also provide important ecosystem services, such as coastal protection against erosion, climate regulation and water filtration. These coastal ecosystems, and the overall food security and wellbeing of island communities are threatened by both climate-related impacts such as rising sea levels and warming sea surface temperatures, as well

as human disturbances such as coastal development that aggravates coastal erosion (IRIS 2023). In Madagascar, estimates suggest that flooding resulting from tropical Cyclone Freddy affected more than 60,000 ha of cropland. The timing of the tropical cyclone's landfall coincided with the main rice planting season and secondary rice harvest, thus disrupting an important income and food source for many households, with severe repercussions for food and economic security in the longer term (FAO 2023).
At the same time, African island states are generally highly dependent on imports of basic foodstuffs to meet domestic demands. Mauritius, for example, imports approximately 77 per cent of its total food requirements, including of wheat, rice, milk and meat products (Tsakok 2023) and in Cabo Verde domestic food production, which is largely rainfed, only accounts for 10–15 per cent of domestic consumption (Brilhante M et al. 2021). This high dependence on food imports not only exposes small island states to the disruptive impacts of global supply chain shocks, but also creates major health issues. This is because many island states are heavily reliant on processed imported foodstuffs with low nutritional value, which is leading to higher rates of obesity and non-communicable diseases (WHO 2023).

Maritime security

African island states also face a range of maritime security issues that are mainly linked to their geographical location and extensive coastlines, making them attractive targets and transit points for transnational criminal activities. This includes illegal fishing, smuggling and trafficking.

These issues are especially relevant for island states in the Indian Ocean, where illegal, unreported and unregulated fishing is a major maritime security threat. In particular, illegal, unreported and unregulated fishing activities worsen the impacts of climate change on fish populations, as unauthorised fishing vessels tend to target marine reserves and protected areas where fish populations are more abundant (Camurri 2022). These activities not only threaten marine biodiversity and ecosystem resilience, but also exacerbate the economic hardships faced by local fishing populations and the overall food security of island states (Kanodia 2022).

The increase in drug trafficking has also led to a drug addiction problem in several island states. Although comparatively low compared to other continents, drug misuse is a rapidly growing issue for island states such as Cabo Verde and Mauritius (UNODC 2023). In the Seychelles, drug consumption is becoming a "worrying [...] epidemic," as a very high share of the island state's working-age population is estimated to be consuming heroin and cannabis. Evidence also suggests that Seychellois criminal networks are largely in control of drug imports (Global Initiative Against Transnational Organized Crime 2021b).

African island states lie along several transregional human trafficking routes. Mauritius is primarily used as a transit point for trafficking people from Eastern Africa to destinations such as the Middle East. Meanwhile, people trafficked within a country are often forced to work in the textile industry (Global Initiative Against Transnational Organized Crime 2021a). High unemployment rates, triggered by various socioeconomic factors including the COVID-19 pandemic, place low-income households at greater risk of exploitation (mieux+ 2021). Meanwhile, the Seychelles is a country of origin and transit, and a destination for sex and labour trafficking victims who are forced to work as domestic servants, or in the fisheries, agricultural or construction sectors. While the Seychellois government is receiving substantial international support to tackle organised crime, its monitoring and enforcement capacities are overstretched due to the vastness of its maritime territories (Global Initiative Against Transnational Organized Crime 2021b).

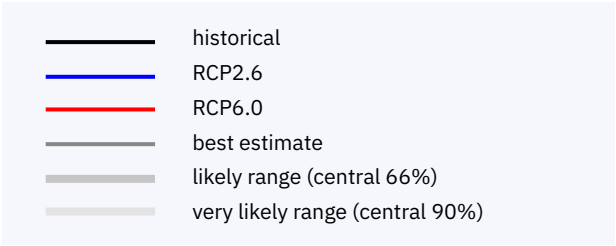
Annex

How to read the plots

The maps and plots included in this report provide an overview of projected climate change parameters and related sector-specific impacts in African regions until 2080 under two different climate change scenarios (RCPs). RCP2.6 represents a low emissions scenario that aims to keep global warming below 2°C above pre-industrial temperatures, while RCP6.0 represents a medium-to-high emissions scenario. Projections are provided up to 2080, with each year showing the mean value of a 31-year period.[65]

The **line plots** show climate impact projections averaged over the whole country, with the blue colour representing the RCP2.6 scenario and the red colour representing the RCP6.0 scenario. While the lines depict the best estimate (representing the multi-model median of 10 climate models), the shaded areas represent the likely range (strongly shaded area) and the very likely range (lightly shaded area), indicating the range of model agreement of at least 66 per cent and 90 per cent of all model projections, respectively.

How to read the plots



The **map plots** display regionally explicit climate information under RCP2.6 and RCP6.0, in a spatial resolution of approximately 50 x 50 km. While the leftmost column represents the baseline period as found in the model data, the other three columns represent future projections in comparison to that baseline period. The colour values depict the multi-model median of the underlying models at each grid cell. The presence of a dot means that at least 75 per cent of the models agree on the sign of change depicted for the specific grid cell and scenario (i.e. whether an increase or a decrease can be expected). Conversely, the absence of a dot represents the lack of model agreement on the predicted change.

UNCERTAINTIES IN CLIMATE CHANGE PROJECTIONS

It is important to acknowledge that uncertainties are always part of climate change projections. Uncertainties arise from a variety of factors, including natural variabilities, uncertainties in GHG emissions scenarios and differences in the models use. Consequently, no future (climate change) projection comes without some level of uncertainty. The levels of (un)certainties, however, differ. We present the results of 10 different global models. To indicate the (un)certainty of the projections, we consider model agreement. The more these models agree the higher the certainty, the more they disagree the lower the certainty. For example, if different models project a similar result under the same scenario, the projected changes demonstrate low levels of uncertainty. However, if the models project very different changes (in terms of range and even direction) under the same scenario, then the projections are uncertain.

Line plots and map plots depict uncertainty differently and cannot be compared. The line plots indicate the level of certainty through the shaded areas, depicting the likely (central 66 per cent) and very likely (central 90 per cent) range of all model projections. Generally, the smaller the shaded areas, the more certain the projections. The map plots depict the level of certainty through the presence or absence of dots. If dots are present, at least 75 per cent of all models agree on the direction of change or, in other words, on an increasing or a decreasing trend. If the dots are absent in a specific region or scenario, then model agreement within this specific region and scenario is below 75 per cent.

To simplify the interpretation of the projections, all line plots and map plots that are subject to high levels of uncertainty are marked with a symbol ( ).

This does not imply that these plots have no informational value, but rather draws attention to the limitations of such projections for future planning. Consequently, they should be very carefully interpreted when they are used for planning measures. In the case of high uncertainty, additional information will be provided on how to interpret the data.

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