Extractives, climate and health equity

Trends in climate, extractives and health equity in the east and southern Africa

Zimbabwe Environmental Law Association

for the Regional Network for Equity in Health in East and Southern Africa (EQUINET) [1]

May 2020

Background

This brief is produced as part of the scoping work in the Regional Network for Equity in Health in the east and southern Africa (EQUINET). Co-ordinated by TARSC, SATUCC and SEATINI, it aims to use scenario planning to explore the distributional consequences for current and future wellbeing of projected trends in the extraction of water, minerals, biodiversity and genetic materials and climate change, to promote understanding and dialogue on how different choices made today can influence these different long-term outcomes. This paper focuses on climate change and its relations to extractives and health equity and presents:

- The current situation and projected trends related to climate change in east and southern Africa (ESA).
- The implications for the health of current and future generations of these trends.
- The policy choices and alternatives to respond to these trends and the factors that influence policy design and uptake of choices.

Key messages

1. ESA contributes the least of any world region to global greenhouse gas emissions yet will be more vulnerable to the impacts of climate change than any other region
2. Deforestation for wood fuel and open cast extraction of fossil fuels for thermal power generation are major contributors to greenhouse gasses. Extractive sectors exacerbate climate change through deforestation and high emission levels of greenhouse gases.
3. Climate change is expected to cause reduced rainfall and a greater frequency of extreme events (droughts and floods) in Southern Africa. In East Africa, climate change is projected to cause an increase in floods, droughts, tropical storms and rainstorms.
4. ESA countries are vulnerable to climate change due to their economic reliance on rainfed agriculture and water resources, low adaptive capacity, low levels of technology, dysfunctional farmer support institutions and lack of financing to implement responses.
5. There is limited evidence on illnesses directly attributable to climate change, but indications that it is likely to lead to increased zoonotic, water- and vector-related diseases due to water stress, flooding, tempertatures changes, pollution and deforestation. Emergencies may cause significant mortality and income losses.
6. The region produces less carbon than it absorbs (is a net carbon sink), so with its reliance on rainfed agriculture, ESA policies on climate change are focused on the needs of smallholder farmers, climate-smart agriculture and renewable energy. The global focus on mitigation does not adequately address the policy concerns or resources for adaptation, which is the priority articulated in the region.
7. ESA countries have policies and strategies on climate change, but not all have laws and the region faces resource and other constraints to implement adaptation policies, or for key areas such as the development and production of green technologies.

[1] With acknowledgement of M Dhliwayo, R Moyo, M Matsvaire, B Zamasiya for the draft, R Machemedze for peer review and R Loewenson for peer review and edit and Training and Research Support Centre, Open Society Foundation and Medico Int. for support.

The current situation and projected trends

Climate change is a major global environmental problem constraining economic development, livelihood systems and sustainable development, particularly in developing countries. The climate is said to have changed when there is a long-term shift in the behaviour of weather elements such as rainfall, temperature and relative humidity over prolonged periods such as thirty years (Braizer,2015).

There are two major causes of climate change, that is natural variability and green house gas (GHG) emissions from fossil fuels and land-use practices (IPCC, 2007). GHGs such as carbon dioxide, methane, nitrous oxide and fluorinated gases emanate from burning fossil fuels, deforestation and increased livestock farming (IPCC, 2018). The current warming that the world is experiencing is largely a result of GHG emissions by high income countries, especially those that have industrialised throigh use of fossil fuels. While some high income countries are taking actions to reduce emisions, others, like the United States of America (USA) are denying that their emissions have caused climate change (Madzivhandila and Niyimbanira, 2016). Africa accounts for less than 7% of the global total GHG emissions from energy and industrial sources. The continent's per capita emission level is the lowest in the world at 2.7-3.9 tonnes of carbon dioxide compared with a global figure of 16.5 tonnes (Hargoth et al., 2015). However, the continent is vulnerable to extreme weather events caused by global emissions, and is experiencing floods and droughts (Reddy, 2015).

Current ESA trends: limited contribution but severe impacts

African countries generally experience a range of climate from hyper-arid to very humid conditions. ESA countries are experiencing rainfall anomalies as a result of climate change that are adversely impacting on rain-fed agriculture, industry and health and that exacerbate existing vulnerabilities (Onyutha, 2016a). Droughts have become recurrent, more frequent and more intense in ESA countries (Masik et al., 2014). Flooding in ESA countries has also become more severe, especially around the Indian Ocean coast. Mozambique is an example of a country that has been vulnerable to floods and cyclones. These floods cause huge strains on economic and social development. For example, the floods in Mozambique in 2000 displaced two million people, with 350,000 jobs lost, and the livelihoods of over 1.5 million people adversely impacted (ECDPC, 2019). In 2019, Cyclone Idai caused flooding in Mozambique, extending into Zimbabwe along the Eastern highlands and Chimanimani. This cyclone killed thousands of people in Mozambique and destroyed infrastructure in Zimbabwe and Malawi. The United Nations classified Cyclone Idai as the worst tropical cyclone to hit Southern Africa in decades, given its strong torrential winds and rain.

Africa's vulnerability to climate change largely depends on its current and future adaptive capacities (Mutasa, 2019; Brazier, 2015). This, in turn, is influenced by such factors as the level of economic development, education, access to credit and adoption of technology (World Bank 2014). Because these factors are not uniform in the region, it is difficult to make a uniform assessment of how climate is impacting on the continent. Africa's vulnerability to climate change is thus not only attributable to changes in weather patterns and other features of climate change, but to a combination of social, economic and other environmental factors that interact with climate change. It is the interaction of these multiple stressors that make the continent the most vulnerable globally to climate change (Zhakata, 2019).

Drivers of climate change in ESA

ESA has had relatively low carbon emissions due to low levels of fossil fuel driven industrialisation. However as noted earlier it is bearing the brunt of a global problem which it has least contributed to (Mutasa, 2019). Within the continent, South Africa and Nigeria are the highest contributors to GHG emissions but overall Africa contributes only 7% of the global total emissions. Deforestation caused by illegal logging, the felling of trees for firewood and for charcoal for cooking, 'slash and burn' farming practices contribiute to GHG emissions. Open cast

extraction of fossil fuels for thermal power generation, such as in coal mines of South Africa and Zimbabwe, are major contributors to GHG emissions in Africa (Zhakata, 2019).

The contribution of the mining industry to GHGs emissions and climate change is a significant challenge to environmental sustainability in ESA countries (Mudd, 2010). Mineral resource extraction is reported to be responsible for 80% of biodiversity loss and 53% of GHG emissions (UNEP, 2019). Mining is often done in areas that are already vulnerable to climate change. When mining companies clear the land by removing trees to extract minerals, the stored carbon is released into the atmosphere . This exacerbates the accumulation of GHGs and the depletion of the ozone layer (Gorte and Sheikh, 2010).

Projected trends in climate change and its impacts in ESA

Global trends will influence the region, especially on rainfall

The frequency of heavy precipitation or the proportion of total rainfall from heavy rainfalls will increase in the 21st century over many areas of the globe (Seneviratne et al., 2012; IPCC, 2018; Braizer 2015). This is particularly the case in high latitudes and tropical regions. Heavy rainfalls associated with tropical cyclones are likely to increase with continued warming induced by enhanced GHG concentrations although few will have landfall in ESA, except for Madagascar. In some regions of the world, increases in heavy precipitation will occur despite projected decreases in total precipitation. In addition to other regions, the IPCC report foresees that rainfall is likely to increase East Africa and other areas close to the Equator, but will decrease in the mid-latitude dry regions, including in the western parts of Zimbabwe, Botswana and Malawi in southern Africa.

According to the IPCC, sea levels could rise by 26 - 55 cm by the end of the century even if GHG emissions are reduced, but could increase by between 45- 82 cm if emissions continue at the current rate of increase. By 2100, sea levels rise by 98 cm and could continue to rise for centuries even if GHG emissions are stopped. There is low confidence in projections of changes in extreme winds because of the relatively few studies on this and shortcomings in simulation of these events. The tropical cyclone maximum wind speed may increase, although this may not occur in all ocean basins. The frequency of tropical cyclones may decrease for those in mid-latitudes or remain unchanged, although there is low confidence on detailed geographical projections on this.

ESA countries will experience climate extremes

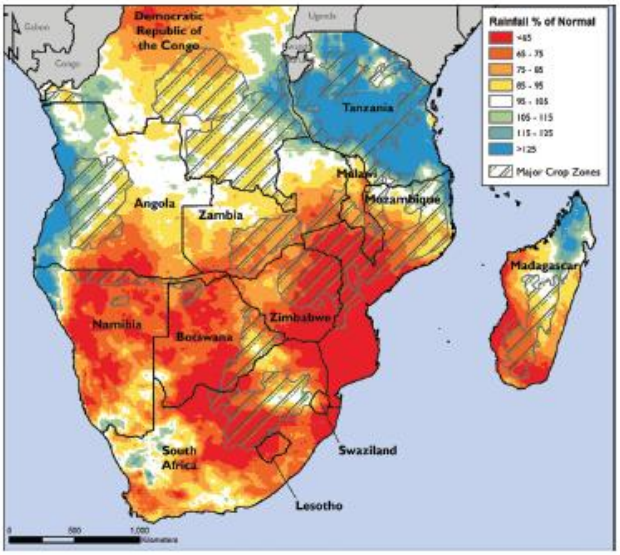
Southern Africa is projected to be warming faster than the rest of the continent (IPCC,2007). This would imply more annual heatwave days by 2100 and extreme weather events would be frequent, especially droughts. Climate change will alter hydrological processes, through the flooding of coastal operations in the event of sea-level rise (Odell, et al., 2018; UNU-WIDER, 2017). Flooding may weaken the strength of tunnels, bridges, pipelines and tailing dams, causing landslides and harming transport infrastructures and economic activities (Boyle, 2013; Ford, et al., 2010; Pearce, et al., 2011). It can interrupt production and demand additional water treatment capacities.

By 2050s, northern and southern Africa will experience reduced annual rainwater runoff. *Figure 1a and 1b* overleaf show the rainfall projections for different parts of the ESA region. Compared to the other parts of the Eastern region, the south-eastern part of Tanzania will be drier in the 2020s, 50, and 2080s (Gebrechorkos et al., 2019). Countries such as Zimbabwe which used to experience droughts at an interval of 8 to 10 years are now experiencing them more freqyently, every 2 years (NCCRS, 2014). Intense droughts will affect Botswana, Mozambique and South Africa. Although the number of cyclones landfalling in Southern Africa will not be as frequent as droughts, cyclones are projected to be of a higher magnitude when they do occur, such as in the case of the 2019 Cyclone Idai noted earlier (Zhakata, 2019).

Sub-Saharan Africa is particularly vulnerable to these impacts of climate change on agriculture. Most of the region's agricultural crop production is rain-fed and is highly susceptible to shifts in rainfall and temperature. Projections indicate a net expansion of the overall area classified as arid or hyper-arid and this will adversely affect crop and livestock production.

Figure 1a:

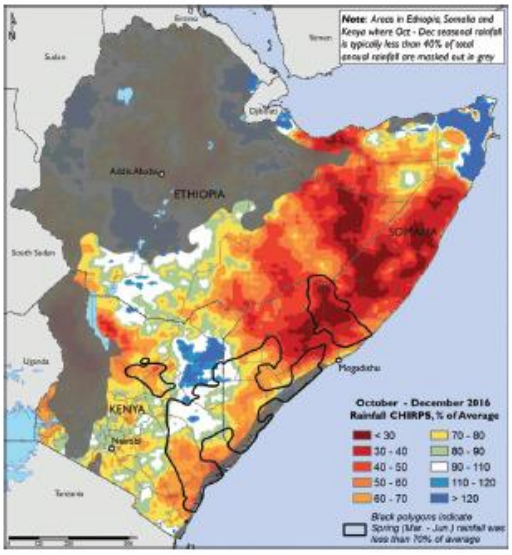
October 2015–February 2016 Rainfall Anomalies
(Percentage of the 1982–2011 Average)
for Southern Africa



Source: FEWS NET (2016:1)

Figure 1b:

October–December 2016 Rainfall Anomalies
(Percentage of the 1981–2010 Average)
for East Africa



FEWSNET (2017:1)

Savannah grasslands may be reduced in area, impacting on livelihoods and pastoral systems. By the time global warming reaches 3°C, savannahs are projected to decrease from about a quarter of total land area at present to approximately one-seventh of the land area, reducing the availability of food for grazing animals (Serdecnzy et al., 2016). In Southern Africa, the area with water shortages could increase by 29% annually by 2050 (against the current 9%), with Mozambique, Tanzania and South Africa being the most affected (IPCC., 2014). By 2025, nine countries mainly in eastern and southern Africa will face water scarcity and twelve countries will face water stress This could mean that by then, two out of five people in the region could be living in poverty (Masante, et al., 2018).

Climate will challenge mining and unchecked extraction will exacerbate harms

The 2019 Global Outlook Report estimates that if the trend on resources extraction continues unchecked, most countries will fail to fulfil the goals of the Paris Agreement and Sustainable Development Goal 15. Since 2000, the rate of mineral extraction is reported to have increased worldwide (UNEP, 2019; Jegede, 2016). The 2019 UNEP Global Outlook Report notes that the volune of materials extracted has increased from 27.1 billion tons to 92.1 billion tons between 1970 and 2017. This expansion means that the negative impacts of mining on the environment and climate change noted earlier are also increasing. It may also mean that the mineral ore grades could be becoming poorer and therefore require extraction methods that are not energy efficient.

Climate change itself impacts on the extractive sector (UNU-WIDER, 2017; Odell, et al., 2018; Pearce, et al., 2011; Ford, et al., 2010). Flooding can disrupt mining, forestry and farming operations, disrupting supply chains, affecting ports and trade. This may be a significant loss for for countries reliant on extractives and exports (Jegede, 2016; Boyle, 2013). Heavy rain and increased erosion may affect slope stability near opencast mines and rising sea levels may make coastal facilities harder to access. Artisanal small-scale mining,often undertaken in unsustainable conditions are particularly vulnerable to floods and their risk to the miners. For example, Battlefields Mine flood in Zimbabwe claimed lives of over 28 miners who were drowned underground following spillage of nearby dams (Mabhikwa, 2019).

Climate change will reduce water availability for the dust suppression, product separation and crushing, concentrate and waste transport processes in mining. Water scarcity is predicted to increase to 25% in ESA (Niang et al., 2014). Water scarcity will increase in costs for pre-use and

post-use water treatment (Ranchord et al., 2015). Mining may further exacerbate water stress through its processing demands, with conflict over water with other users, and limited water affecting operations and production. Climate change causes surface temperatures to rise and this will increase energy demand to cool underground mines and surface facilities. Greater demand and rising prices (driven by the limited supply of natural gas, the imposition of carbon taxes, and expensive alternative energy sources) will add to costs. Temperature fluctuations that increase energy demand and strain the capacity of transmission and distribution facilities can disrupt supply to operations. The pressure over resources and energy rationing may affect mining and other areas of production, profits and prices, generating competition over these scarce resources.

Green technologies are clean, renewable, environmentally friendly, and significantly contribute to mitigation of climate change (Berga, 2016). There are three possible green technologies can replace coal, oil and nuclear power based energy generation. They include hydropower, solar and wind energy (Kaaberger, 2018). Research shows that these green technologies are cheaper to produce that fossil fuel-based energy because societal demands for cleaner energy and reduced pollution are escalating the production costs for fossil fuel-based energy sources. Green technologies are also associated with lower operational costs and short-term marginal costs (Kaaberger, 2018).

However some of these technologies will themselves be affected by the changes in water availability described earlier. Hydropower, a cleaner source of energy in the ESA region, is very susceptible to climate change and in Southern Africa where the climate is projected to be drier it will affect the potential generation of hydropower. During the 2015 drought, Tanzania had to shut all its hydropower generators and produced only 12% of its requirements. The 2016 drought in Zimbabwe left lake Kariba generating on 25% of its capacity. In the same year, water levels in the Cahora Bassa dam dwindled to less than 34% and plunged Mozambique and South Africa into stringent power outages (Lara, 2018).

The move towards green technologies raises issues for ESA countries such as South Africa, Botswana and Zimbabwe that have large reserves of coal for thermal power. Other ESA countries such as Mozambique, Malawi and Tanzania have recently discovered oil, with its potential economic contribution, in a context where countries are moving away from fossil fuels. Whilst not being major emitter of GHGs, most ESA countries are willing to adopt renewable energy but are less prepared for it and still making investments in fossil fuels. South Africa intends to move towards solar and wind energy with plans to build the Sere Wind Farm in Vredandal and a solar farm of 5000MW in Northern Cape (Fant et al., 2016). At the same time of the 44.2GW of electricity South Africa produces, 36.GW is from coal powered plants (Patel, 2019). Zimbabwe has also removed duty on imported solar products and is advancing green technologies such as the Gwanda Solar project, but is also in the process of building a 2800MW coal-fired power station in Sengwa (Lara, 2018; Marawanyika, 2020).

Health and wellbeing impacts of climate change

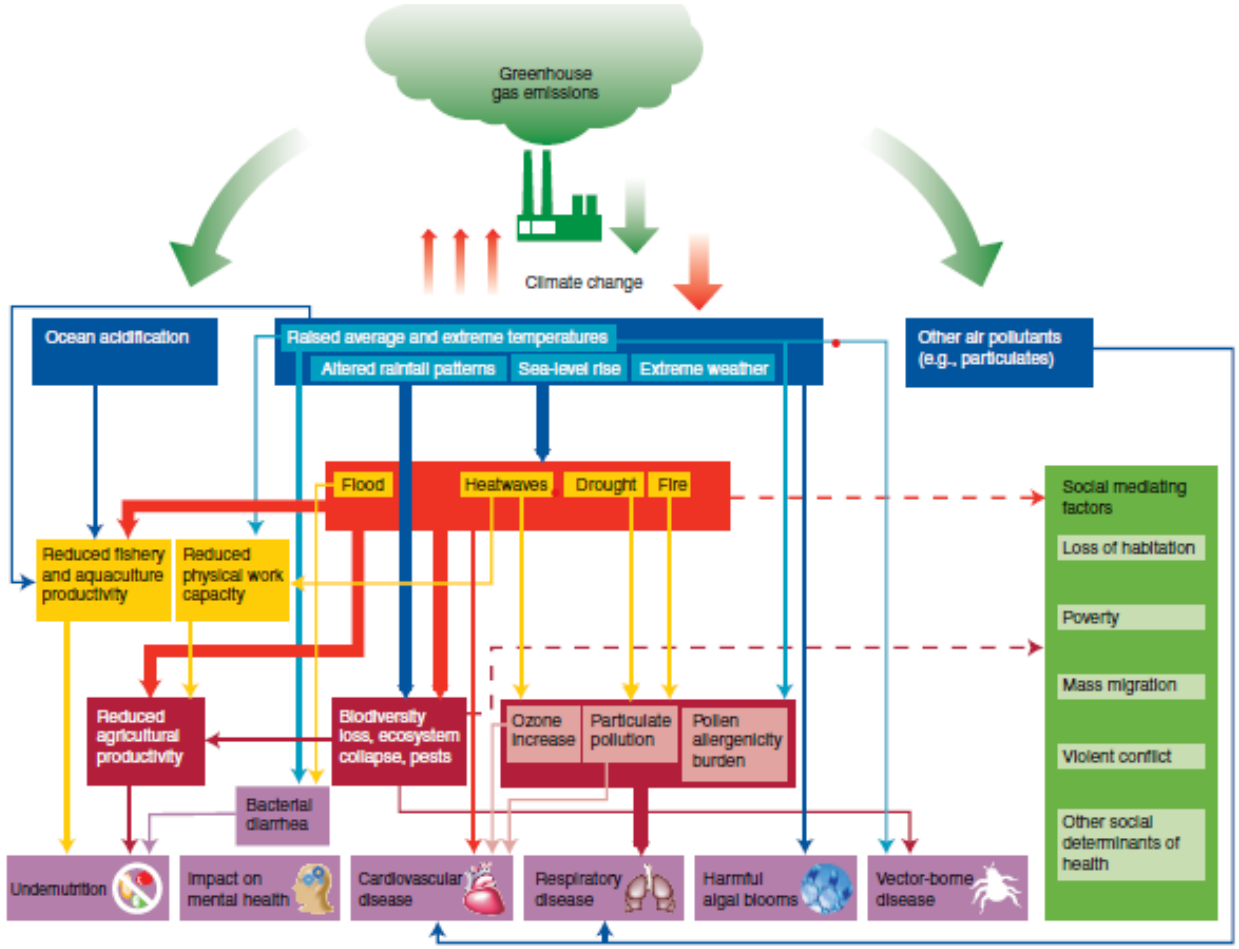
Climate change affects population health and wellbeing directly - such as through the impacts of extreme heat on kidney function, or flooding on loss of life; indirectly through the environmental quality – such as air and water quality- or through the spread of vectors to new areas; or through socioeconomic systems- such as food production, incomes and health care. As shown earlier, there is variation in how climate change and its drivers affect ESA countries and in their readiness and capacity to cope with the health impacts. Climate change and its drivers interact with other determinants of health at national and global level (McMichael 2010). All ESA countries are vulnerable in some way so the question is what they could do to prevent, mitigate or adapt in the face of the challenge.

Climate change is affecting health through multiple pathways

WHO (2019) report that 86 out of 184 countries who submitted Nationally Determined Contributions (NDCs) reports to the UNFCCC secretariat observed that their health sector is hurt by climate change. The reports noted these negative impacts arise due to the escalation of vector-borne diseases, and food and nutrition insecurity. While many countries infer these health impacts, there is limited evidence of direct causal links as the pathways are multifactorial and

complex. Climate change may not be the most important current driver of health outcomes but could become a more significant factor by 2050. It is now, and will be in the future a 'stress-multiplier', putting pressure on vulnerable systems, populations, and regions. For example, increased temperature elevates the risk of common food- and water-borne diseases in ESA that result from poor access to safe water and sanitation. The loss of incomes that results from climate change, described earlier, is also a factor in poverty-related undernutrition and illness (Smith et al., 2014). *Figure 2* showns some of these pathways between climate change and health.

Figure 2: Links between greenhouse gas emissions, climate change and health



Source: World Bank Group, 2017:7

As shown in *Figure 2*, habitat loss is associated with emerging infectious diseases spreading from wildlife to humans, such as Ebola, West Nile virus, SARS, Marburg virus and others (Zohdy, et al 2019) A coevolution effect is used to link ecology and evolutionary biology, to explain the mechanisms that underlie this association. Climate change, deforestation and biodiversity loss are combining to cause global pandemics. With habitat loss, forest fragments act as concentrated islands of the wildlife hosts of disease-causing microbes that live within them, leading to rapid diversification of microbes. The SARS-Cov-2 virus, the cause of the COVID-19 pandemic, has a zoonotic origin, potentially bats, spread through a still unknown intermediary animal host to humans, possibly through a 'wet' market, with rapid spread in a congested urban area. If current trends continue, as climate change further drives loss of habitat, further such pandemics will occur.

ESA countries currently experience a combination of communicable diseases, non-communicable diseases and epidemics, with high levels of inequality in the distribution of these health problems and determinants relating to living, working and socio-economic conditions that are more deeply documented elsewhere (EQUINET SC, 2012). In ESA, climate change has been linked, as above to food and water-borne diseases, zoonotic/ vector-borne diseases (World Bank, 2017). For areas that are becoming wetter, the conditions are increasing for water-borne

diseases and some vector-borne conditions that breed in stagnant water. For areas where temperatures and desertification is increasing, such as in parts of Botswana and western Zimbabwe, the changes expand environments for vectors that require higher temperatures, such as malaria mosquitoes.

Cyclone- related floods such as Cyclone Idai in Mozambique, Zimbabwe and Malawi described earlier, was associated with the increased transmission of diarrhoeal diseases due to lack of access to safe drinking water and sanitary conditions. Mozambique reported a surge of 3500 cholera cases soon after the flood (RRA.2019). While in the immediate flooding reduces levels of the adult mosquitoes as breeding sites are washed away, in the long run, breeding sites expand as their habitats increase due to the destruction

Climate change may affect child health through: environmental changes associated with GHGs; direct climate change impacts; and changes in environments triggered by climate change (World Bank, 2017). *Table 1* below summarises these and their impact on child health.

Table 1: The relationship between climate change and health of children

Pathway	Impacts on children
1. Environmental changes associated with anthropogenic GHGs	• Respiratory diseases • Sunburn • Melanoma • Immuno-suppression
2. Primary climate change impacts	• Heatstroke • Drowning • Physical injury • Gastrointestinal disease • Psychosocial maldevelopment
3. Ecological alterations triggered by climate change	• Malnutrition • Allergies • Vector-borne diseases (malaria, dengue, encephalitides, Lyme disease) • Infectious diseases (e.g. diarrhoea)

Source: UNICEF, 2011:40

While the changes in weather patterns create conditions for the emergence or spread of these diseases and of undernutrition, their impact is more severe where primary health care is weak in terms of prevention, care and outbreak control. Individual factors such as age, gender, education levels and pre-existing health problems can also affect vulnerability to these conditions (Barata et al. 2011). Elderly populations, especially women, orphan children and children in the most insecure households and those living in concentrated urban settlements are particularly affected. Older people with weaker immune systems are, for example, more vulnerable to severe consequences of infectious diseases, while households with raised income and education levels have more social and economic resources to respond to scarcities, extremes and to disease outbreaks (World Bank, 2017). Women's and girl children take on increased caring roles as a result of these impacts (UNICEF, 2011). The high levels of socio-economic inequality in many ESA countries thus interacts with the health effects documented above, with poorer communities and less well funded health systems also less resourced to manage these changes. Added to this, ill health deprives households of labour during critical periods, adding to their vulnerability (Chagutah, 2010).

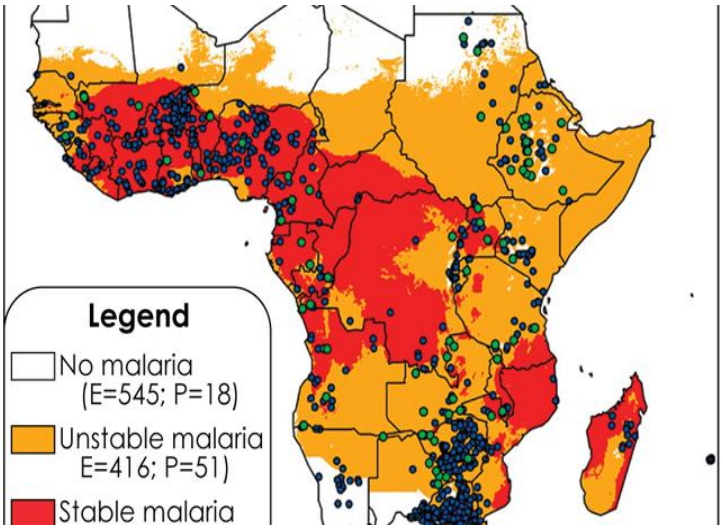
Unchecked, future trends in climate change may worsen current health effects

It is not possible to make projections on these impacts with any certainty due to lack of a standardized long-term monitoring of climate-sensitive diseases in many regions; methodological difficulties in measuring and controlling for non-climatic influences on long-term health trends, and the fact that the small (but significant) climate changes that have occurred so far are an inadequate proxy for the larger changes that are forecast for coming decades (Smith et al., 2014; Michael et al., 2004). What is likely to happen is a worsening of current adverse health outcomes in severity or spread (McMichael 2009). Rising temperatures bring heat stress and encourage the spread of vector-borne diseases (WHO, 2010). An increase in extreme weather events—

such as storms and torrential rains—lead to water-bornbe disease, crop desctruction and food insecurity, injuriy and death. The GHG emissions that contribute to climate change are already degrading air quality, causing respiratory and cardiac problems and certain cancers, reported by WHO to be causing more than 5.5 million deaths each year (WHO, 2010).

Climate change and changes in temperature and precipitation will boost the population of disease-carrying mosquitoes and risk of malaria, while increased flooding could facilitate mosquito breeding in a region already heavily affected by malaria (Warsame et al. 1995). Already over 60% of clinical episodes and 90% of deaths from malaria occur in sub-Saharan Africa and more than a million children, mostly under the age of 5 years, die from malaria each year (See *Figure 3* for its distribution). Climate change could add an additional 21–67 million people at risk of malaria by the 2080s as temperature and rainfall changes widen the areas affected. In South Africa, for example, the area prone to malaria will double and 7.8 million people will be at risk by 2100 (WHO, 2014b). It is thus projected that areas climatically suitable for malaria will increase, extending further south, increasing the incidence of malaria and presenting new challenges for areas such as South Africa, which were previously not as heavily affected (Hartmann et al., 2002)

Figure 3: Malaria distribution in Sub Sarahan Africa , 2015



Kibret et al. 2015:3

The water stress, frequency and severity of droughts described earlier, while it may reduce vector breeding sites for malaria, negatively impacts on crop and pasture yields (Lunduka, et al., 2017). Warmer conditions encourage rapid multiplication of bacteria in food and flies, leading to increased incidence of food borne diarrhoea, other gastro-intestinal diseases and food poisoning. Warmer conditions can also lead to faster maturity of the agents in nutrient-loaded water that cause malaria and dengue (McMichael, 2009). These climate patterns also affect the density and movement of the reservoir animal species that bring zoonotic diseases to human populations (McMichael, 2009).

The health-related effects of global climate change are predicted as being heavily concentrated in poorer populations at low latitudes (Smith et al., 2014). This is where the most important climate-sensitive health outcomes such as malnutrition, diarrhoea and malaria are already common and where vulnerability to climate effects is already greatest. If current economic inequalities persist, these weather- and climate-related hazards will continue to combine with socio-economic vulnerabilities and assets, as described earlier in the current conditions, with similar links to livelihoods and socioeconomic outcomes. Over time, these vulnerabilities will interact with factors that are more certain, like growing population densities, with those that are less certain and more amenable to action, like the strength and accountability of governance and institutions or access to households assets and capabilities.

Choices, responses and policies

Africa's position and the global politics of climate change

Despite Africa's relatively low per capita levels of GHG emissions, the growing risk of catastrophic global climate change means that all countries must move away from high-emission models to low carbon growth models of economic growth (Madzivhandila and Niyimbanira, 2016; UNU, 2019). High income countries have focused on reduction in GHG emissions and financial support to low and middle income countries for mitigatory efforts on this, even while some are in climate-change denial, as noted earlier. International Conventions, Protocols and Agreements on climate change like the United Nations Framework Convention on Climate Change (UNFCC), the Kyoto Protocol and the Paris Agreement require countries to take measures to mitigate climate change, anticipate its impacts, prevent and minimize them.

African countries raise concern that such climate change measures not limit their socio-economic development (UNU, 2019). Thus a wider focus on an equitable and just transition has been a predominant theme in the discourse from African countries in the UNFCC negotiations on climate change. For the continent, the concern is to ensure reasources and measures that will enable adaptation and technological transfer for a green economy that also propels their socio-economic development. As raised earlier, for example, there are concerns on the continent on how climate response measures affect the economies of African countries that mine coal and oil, even while many such countries are already investing in green energy alternatives, as noted earlier, particularly after the experience of extreme events, such as Cyclone Idai. There are also contradictions between policy and practice. For African countries, efforts towards mitigation targets and sustainable climate change adaptation strategies cannot be at the cost of their socio-economic development. This poses a challenge, particularly as the dominant international policy paradigm has been one of mitigation, with less focus on adaptation in climate negotiations.

An equitable, just transformation is not simply a matter of policies, but of resources and technology transfer. It raises issues of how far current intellectual property regomes will allow for the sufficienty rapid spread of green technologies to ESA and other low and middle income countries for climate adaptation, how far there will be active sharing of technology and investment in green technologies, including in research and development for innovation on the continent. Current trends suggest that this is weak and that there are inconsistencies between practices and global policies. For example, billions of dollars are being invested in coal extraction and in coal-fired thermal-power generation in Africa by high income countries and emergent economies, with much less investment in green technologies, even while the same countries are boosting investment at home in solar and wind power at home (Magawu, 2018) . The World Bank estimates that between 2010 and 2050, the annual cost for adaptation to climate change in SSA will be at least US$18 billion, excluding the costs of changing to a low-carbon development pathway. While the amounts are debated, there is a consensus that the level of international financing for African countries to apply adaptation measures is inadequate, with only $1.16 billion approved for SSA by 2011 (compared to the US$18 billion estimate) and even less diisbursed (Nakhooda et al., 2011). An African lens on climate change in global negotiations is thus linked to negotiations on resources, technology transfer and intellectual property regimes. It also depends on how far the ESA region is factoring climate change into its own development policy choices.

National policies and responses in the ESA region

Appendix 1 outlines the laws, policies and strategies currently in place in the ESA region. It shows that most have developed a National Climate Change Policy, National Climate Change Response Strategy (NCCRS), National Adaptation Plan of Action (NAPA). Many countries do not have a specific climate change law, although this is in progress in some and suggested to be important for all ESA countries, including for establishing the rights and policy principles to advance in regional co-operation and international negotiations. The discussion below raises some key developments that link climate change responses to equity and justice in the transition, referring to laws, policies and strategies listed in *Appendix 1*.

Countries are advancing policies on climate change

All ESA countries have ratified the Paris Agreement and are therefore implementing Nationally Determined Contributions (NDCs) towards this, with a clear priority for adaptation over mitigation. The NDCs are commitments by each country to mitigate climate change by reducing each country's GHG so that the world will not breach the 1.5-2 degrees warming. For example,. Zimbabwe has set a Long-term Greenhouse Gas Emission Strategy (2020-2050) to mitigate and adapt to the effects of climate change based on its commitments under the Paris Agreement and its NDCs. Uganda's National Climate Change Policy sets objectives to identify and promote adaptation and mitigation responses, and to strengthen mechanisms for adaptation. The policy makes clear that adaptation is the main priority and mitigation a secondary priority. This is also in line with East African Community regional policy priorities. Tanzania's 2012 National Climate Change Strategy developed in 2012 recognises that climate change is a significant threat to people and the country, sets adaptation as one of the country's highest priorities and calls for concerted efforts to increase the resilience and adaptive capacity of people and health systems.

Setting environmental rights for current and future generations

Several ESA countries have included key environmental rights for current and future generations in their constitutions. For example, Zimbabwe's 2013 Constitution affords every citizen environmental rights, including the right to an environment that is not harmful to their health and well being for the benefit of present and future generations. It indicates that this will be achieved through reasonable legislative and other measures that prevent pollution and ecological degradation and secure ecologically sustainable development and use of natural resources while providing economic and social development. The Tanzanian Constitution imposes a duty on all persons to protect the natural resources of the country. Zambia's Constitution affords every person the right to a safe, clean and healthy environment and requires the state to provide reasonable measures for the progressive realization of economic, social, cultural and environmental rights. Kenya's Constitution includes the right to a clean and healthy environment and details how a court of law should enforce these rights when they are denied, violated, infringed or threatened. In South Africa, unlike countries that have made the realization of environmental rights subject to resource availability, the Constitution includes this right in the Declaration of Rights, making it a fundamental right that must be delivered on immediately.

These rights are also linked to subsidiary laws,. For example, in Zimbabwe the constitutional rights noted above are replicated in the Environment Management Act and the national environmental policy and strategies. These instruments address the links between climate change, health and the extractive sector raised earlier and identify the solution as a sustainable development transition to a low carbon economy. Subsidiary laws in ESA countries, such as the 2016 Kenyan Climate Change Act, provide for mechanisms and measures to achieve these rights and for principles that guide practice. For example, the Kenya Climate Change Act in its interpretation section law plicitly defines adaptation - as 'adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects which moderates harm or exploits beneficial opportunities' - and mitigation - as 'efforts that seek to prevent or slow down the increase of atmospheric greenhouse gas concentrations by limiting current or future emissions and enhancing potential sinks for greenhouse gases.'

Linking climate change to key developments in the economy

ESA countries have identified pathways towards a climate-resilient and low carbon development economy. For example, Zambia's 2020 Climate Change Response Strategy (pii) sets a vision of " a prosperous climate change resilient economy" while its mission is to " ensure that the most vulnerable sectors of the economy are climate proofed and sustainable development achieved through the promotion of low carbon development pathway". It identifies sectors such as mining and health that are vulnerable to climate change or a focus for the strategy. Zimbabwe's Climate Change Response Strategy mainstreams climate change in all sectors of the economy, including the extractive sector, and recognises climate-related challenges for water and agriculture. In many countries energy policies are key to these changes. For example, Zimbabwe's National Energy Policy seeks to promote an optimal safe, sustainable and environmentally friendly energy supply, including by setting targets for and providing incentives for investment in renewable energy. Strategies for reducing GHGs are linked to those for promoting sustainable economic development in key economic sectors that include energy, industrial processes and product use, agriculture, forestry and other land-use sectors and waste. South Africa's 2018 Climate Change

Bill sets as objects to address climate change impacts through enhancing adaptive capacity, strengthening resilience and reducing vulnerability. Its principles include ensuring a just transition for all towards an environmentally sustainable economy and society in light of national circumstances and development goals.

Some ESA countries have elaborated how they will integrate climate change in economic policy decisions. The Kenyan law cited earlier identifies the processes within which climate change should be mainstreamed, including in development planning, implementation and decision making. It stipulates duties of statutory bodies for this and the evidence, including from traditional knowledge and international policies, to be used in decision-making. It imposes a positive obligation on public duty bearers and measures for enforcement of rights in the courts, and binds government in this enforcement of rights.

Challenges to policy implementation

There are challenges, gaps and inconsistencies in taking these policies and strategies into practice that constrain advances in addressing some of the challenges raised in this brief. They relate to:

a. **Resource and other constraints to realising rights set in law in practice**. While the principle of progressive realization in most ESA country legal frameworks, except South Africa, makes these rights subject to resources available to the state, ESA states face a significant shortfall in resources. They also, as noted earlier, face constraints in global intellectual property, finance, economic and trade regimes.
b. **The extent to which judicial and legal practice supports these rights**. Judicial practice may still not adequately reflect climate change concerns. For example, court cases in South Africa related to climate change - such as Earthlife Africa Johannesburg v. the Minister of Environmental Affairs and Others; and Trustees for the Time Being of GroundWork v. Minister of Environmental Affairs, ACWA Power Khanyisa Thermal Power Station RF (Pty) Ltd and Others - considered the licencing of coal-fired power plants without considering their climate change impacts, judging that environmental impacts were adequately addressed in Environmental Impact Assessments, despite these not including climate change impacts.
c. **The inconsistency between a commitment to renewable energy and the real levels of investment in non renewable coal and oil sources** of energy that contribute to GHG emissions, raised in several places in this brief.
d. **The gaps and weak links between different laws and policies**, such as Zimbabwe's Environmental Management Act not covering GHG emissions reporting or reporting on climate mitigation and their effects. With climate changes mainstreamed across multiple sectors, it raises issues of where it is co-ordinated. Uganda has, for example, established a climate change unit within the Ugandan Ministry of Water and Environment to provide a more specific institutional focus for this area.
e. **Making effective links with the public.** Public participation and access to information are essential for managing climate change in an equitable and just manner in a democratic society. However, the laws, policies and practices are still weak in ensuring the measures for raising public awareness, involvement and informed choice and for meeting social needs in adaptation, including in making coherent links between short- and longer-term measures.

This brief provides evidence that climate change will impact on the region, that these impacts will be distributed in different ways across ESA countries and unequally between different socio-economic groups, potentially exacerbating inequality. The brief indicates that these challenges will increase, intensifying old problems or raising new challenges as rainfall, flooding, temperatures and other conditions change. Climate change raises a demand, but also an opportunity, beyind mitigation, for more sustainable economic and social pathways.

ESA countries vary in their response to these issues, in law, policy and practice. While international policy focuses on mitigation, there is a clear preference in the region for adaptation over mitigation, raising a need for new technology, production systems and economic approaches. Having clear rights, duties, principles and a domestic legal framework, harmonised across laws will be important for national actions to manage the current and future challenges. It also calls for regional co-operation to bring a clear African lens into international negotiations underway, including to address inconsistencies in policy responses and the financial resources, technology innovation and transfer demands needed for an equitable and just transition.

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Appendix 1: Policy and legislative responses to climate change

Country	Legal Instruments	Policies
Angola	• Constitution	• Nationally Determined Contributions • National Climate Change Response strategy • National Implementation Strategy for the UNFCCC and the Kyoto Protocol • The National Action Programme to fight Desertification • National Adaptation Programme of Action (NAPA) • Presidential Decree 184/12 which creates and approves the Statute of the Centre of Tropical Ecology and Climate Change • National Committee on Climate Change and Biodiversity • Executive Decree 161/10 which approves the Regulation of the National Direction for Renewable Energies (DNER)
Botswana	• Constitution	• Nationally Determined Contributions • National Climate Change Response Strategy; Climate Policy
DRC	• Constitution	• Nationally Determined Contributions • National Climate Change Response Strategy; Climate Policy • National Adaptation Programme • Nationally Appropriate Mitigation Actions
Kenya	• Constitution of Kenya 2010 • Climate Change Act, 2016 • National Drought Management Authority Act (#4 of 2016) • Public Finance Management (National Drought Emergency Fund) Regulations, 2018 • Energy Bill (2017) • Health Act (#21 of 2017) • Water Act (#43 of 2016)	• National Climate Change Framework Policy (2011-2031) • East African Community (EAC) Climate Change Policy • National Climate Change Response Strategy (NCCRS) in 2010 • National Climate Change Action Plan (NCCAP, 2013-2017) • Kenya Vision 2030 • Draft Water Harvesting and Storage Policy (2018) • Kenya's National Adaptation Plan 2015-203 • Kenya Climate-Smart Agriculture Strategy (2017-2026) • Climate Risk Management Framework (2017) • National Climate Finance Policy (2018) • Big Four Agenda (2018- 2022) • National Strategy on Genetic Resources within the Context of Climate Change (2016-2021) • Blue Economy Strategy (2017) • Kenya's Disaster Risk Financing Strategy (2018- 2022)
Lesotho	• Constitution	• Lesotho - National Adaptation Programme of Action • National Climate Change Policy and Response Strategy • Nationally Determined Contributions
Mada-gascar	• Constitution	• Nationally Determined Contributions • National Climate Change Response Strategy and Policy • Nationally Appropriate Mitigation Actions (NAMA) • National Adaptation Program of Action (NAPA) • National Strategy for Disaster Risk Management • National Strategy to Face Climate Change in Agriculture-Livestock-Fishery
Malawi	• Malawi Constitution • Environmental Management Act 2006 • Disaster Preparedness and Relief Act 1991 • The National Parks and Wildlife Act 2004 • The Road Traffic Act 1997 • Water Resources Act 1969 • Mines and Minerals Act 1981 • Energy Regulation Act 2004 • The Local Government Act 1998 • Forestry Act 1997 • The Fisheries Conservation and Management Act 1997.	• National Climate Change Management Policy, 2016 • Climate Change Policy • National Climate Change Response Strategy, 2012 • Nationally Determined Contributions • National Environmental Policy • National Adaptation Programmes of Action • Nationally Appropriate Mitigation Actions • The National Environmental Policy (2004) • National Forestry Policy (1996); Wildlife Policy (2000) • National Energy Policy (2003); National Water Policy (2005) • National Land Policy (2002) • National Land Resource Management Policy and Strategies (2000) • Mines and Minerals Policy (2007) • National Fisheries and Aquaculture Policy (2001) • Food Security Policy (2006) • Draft National Agricultural Policy
Mozam-bique	• Constitution	• Nationally Determined Contribution • National Climate Change Response Strategy (NCCRS) in 2010 • National Climate Change Adaptation and Mitigation Strategy • Energy Strategy; Biofuel Policy and Strategy; • New and Renewable Energy Development Strategy 2011- 2025

		• Conservation and Sustainable Use of the Energy from Biomass Energy Strategy (2014 to 2025); • Master Plan for Natural Gas (2014 to 2030) • Renewable Energy Feed-in Tariff Regulation (REFIT); • Mozambique's Integrated Urban Solid Waste Management Strategy (2013 – 2025) • National REDD+ Strategy (2016);
Namibia	• Constitution • Environmental Management Act	• National Climate Policy on Climate change • Nationally Determined Contributions • National Climate Change Response Strategy
South Africa	• National Climate Change Act • Carbon Tax Bill • National Environmental Management ACT • National Energy Act • Carbon Tax Act • Air Quality Act • Disaster Management Act	• National Climate Change Response Policy • Nationally Determined Contributions • National Climate Change Policy • National Climate Change White Paper • Long Term Mitigation Scenarios
Eswatini	• Environmental Management Act, • National Disaster Management Act (NDMA)	• Nationally Determined Contributions • Climate Policy; Change response Strategy • National Climate Change Strategy and Action Plan • National Disaster Management Policy • Swaziland National Disaster Management Plan • Disaster Risk Reduction National Action Plan
Tanzania	• The Disaster Management Act of 1990 • Environmental Management Act • Constitution	• National Adaptation Programme of Action 2017 • Nationally Determined Contributions • National Climate Change Strategy 2012 • Tanzania National Development Plan (2016/17- 2020/21) • National Guidelines for Mainstreaming Gender into Climate Change Related Policies, Plans, Strategies • Tanzania Climate Change Gender Action Plan • Tanzania Agriculture Climate Resilience Plan, 2014–2019 • The National Climate Change Communication Strategy • Guidelines for Integrating Climate Change into National Sector Policies, Plans and Guidelines, 2013
Uganda	• Uganda National Meteorological Authority Act, 2012 • The Water Act, 1997 • The Physical Planning Act, 2010 • Land Amendment Act, 2004 • National Agricultural Research Act 2005 • National Planning Authority Act of 2002 • National Environment Act, 1995	• National Climate Change Response Strategy and Policy • Nationally Determined Contributions • National Adaptation Programme of Action • National Forestry and Tree Planting act, 2003 • National Disaster Preparedness and Management Policy, 2010 • The Oil and Gas Policy, 2008; • The National Adaptation Programmes of Action (NAPA), 2007 • The Renewable Energy Policy 2007 • The Energy Policy 2002 • The National Health Policy • The Water Policy, 1999 • National Forestry Policy 2001 • National Environment Management Policy 1994
Zambia	• Constitution	• National Climate Change Response Strategy; Climate Policy • Nationally Determined Contributions • National Adaptation Programme of Action • National Environmental Policy; Environmental Management ACT
Zimbabwe	• Constitution • Climate Change Bill • Zimbabwe Energy Regulatory Authority Act • Environmental Management Act • Meteorological Services Act • Water Act • Finance Act, 2019 • Forest Act	• National Climate Policy • Nationally Determined Contributions • National Climate Change Response Strategy • Zimbabwe National Agriculture Policy Framework (2018-2030) • Low Greenhouse Gas Emissions Devt Strategy 2020-2050 • Climate-Smart Agriculture Manual; Smart Agriculture Policy • Sustainable Development Goals Implementation • National Adaptation Planning Project (2019-2021 • Child-Friendly Climate Policy by UNICEF • National Environmental Policy,2009 • Transitional Stabilisation Plan 2018-2020 • Energy Policy; Renewable Energy Policy