



AFRO

AFRICAN REGION

REGIONAL GUIDE



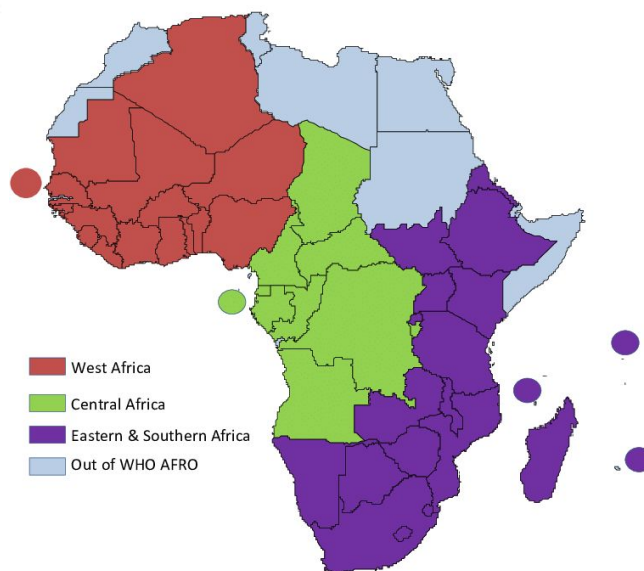
2023 AMWHO INTERNATIONAL CONFERENCE
PLANETARY HEALTH AND THE HUMAN CONDITION

INTRODUCTION

The World Health Organization's (WHO) African Region (AFRO) consists of 47 participating countries spread throughout the majority of the continent, with most members concentrated in Central, Eastern, Southern, and Western Africa (see Figure 1 below).¹ In an effort to accommodate the diverse needs of the member states and decentralize the Regional Offices' operations, each recognized state is supported by one of the three Inter-country Support Teams (ISTs), separated by sub-region.² These teams, located in Harare, Libreville and Ouagadougou, exist to scale up proven public health interventions.²

Africa is a continent with a vast amount of biodiversity that plays a substantial role in the public health of its inhabitants. In fact, the AFRO region alone houses almost a quarter of the total biodiversity of the entire planet.³ The land mass covers various biomes, from tropical locations with multitudes of rivers to the arid Sahara. This complex lattice of nature has been utilized heavily to support the second most inhabited region of the world. However, this support is being put in jeopardy by the changing climate conditions.

The AFRO region's fertile soil makes agriculture one of its predominant industries, however, recent years have threatened this livelihood of the AFRO region as well as many of its citizens. From drought in Kenya to flooding in Nigeria, the farming land is becoming less and less reliable, impacting the agricultural industry and worsening preexisting food insecurity in the region. In addition to food concerns, the rising temperatures have also shed light on geo-political concerns with African natural resources.



Climate change has pushed many countries to pursue alternate sources of energy and consumables, and considering Africa's diverse natural formations, AFRO's countries have vast opportunities to implement alternative sources. However, this pursuit comes with its own challenges, especially in the political arena.

Considering the AFRO region's immense biodiversity, climate change raises an additional concern of displacing many of the native animals and the risk of its effect on communities in close proximity to these habitats. As climate change takes its toll on ecosystems that harbor these animals, many groups have been pushed into a closer physical sphere of influence with humans than ever before. This is troublesome due to the multitude of diseases that these animals, especially African mammals that have been largely untouched by humans, contain. Many of these diseases can cause irreparable damage to the communities they touch, which is especially important in the increasing globalization of the modern world. The issue of climate change has drastically impacted the AFRO region, requiring both national and international responses.

FAMINE AND FOOD INSECURITY

Agriculture is by far the most prevalent economic and social sector in the AFRO region. As of 2017, the agricultural sector made up 54% of the workforce in the average African country. The AFRO region depends heavily on the farming industry to prop up the economy as well as feed its large mass of constituents. However, with the onset of natural disasters fueled by climate change, this sector has heavily suffered. From the increased water levels and flooding on western coasts to the continuous drought in the east, climate change has been detrimental to the preexisting issue of food insecurity in a region that represents over a third of the global undernourished.

CASE STUDY 1: FLOODING OF CROPS IN NIGERIA

The AFRO region has a remarkable level of biodiversity and geological features. Nigeria exemplifies this with the multitude of long rivers that flow through it. Connected to these riverbanks and the surrounding land are large swathes of farmland that provide nourishment to the rest of the country by producing widely used grains such as rice. Unfortunately, since the beginning of September 2022, the area has experienced a series of successive flooding in some of its major rivers.⁸



While seasonal flooding has been a recurring issue for the coastal country with dense rainforests, increasing temperatures have only intensified the damage. Fields have been inundated with saltwater, valuable crops in the surrounding space have been destroyed, and Nigerian people have been displaced.¹²

In early October 2022, the farm-focused communities located near the River Niger Bridge were flooded so severely that the majority of the land in the area was underwater and roughly 266,000 acres of farmland were damaged to an unusable degree.¹² This substantially cut the agriculture that the local people depended on. It also heavily limited the trade of food to the rest of eastern Nigeria. In a country where over 80 percent of rural citizens like those near the River Niger Bridge are under the poverty line and malnourished, this kind of destruction can be permanently crippling to both their economy and health.⁵

The impact of the flooding extends past the immediate lack of crops in Nigerian communities. Much of the farmland in these areas are not owned by the communities they are in, but instead by larger agricultural conglomerates. With the loss of a substantial amount of product, the companies' standard prices tend to rise concerningly high. For instance, the Olam Group, a food and agribusiness conglomerate that owns large swathes of rice crops in the region, has announced that their projected product price for December 2022 is going to be larger to accommodate for the loss.¹⁶ This means lowered access to basic nutrients for both the local Nigerian communities and the larger AFRO region to which the Olam Group supplies grains.

The WHO defines the poverty line as “the percentage of the population living on less than \$1.90 a day at 2011 international prices.”⁶ Unfortunately, many sections of Western Africa fall into this category, including communities in Nigeria.⁵ Many were unable to meet the prices of food before the increase in flooding. With the price increase, it is expected that some will simply be unable to afford the minimal grains they have access to. This will further the gap between the region's citizens and access to sustenance.

A multitude of environmental protection organizations such as the UNFCCC and Global Citizen are currently calling for increased flood infrastructure within Nigeria as a means of countering the natural disaster. As of 2022, the Nigerian government has no official flood management initiative.¹⁰ However, ground reservoirs, dams, and levees are all methods that are currently being proposed to mitigate the impact these floods will have on the public and crops.

CASE STUDY 2: SEVERE DROUGHT IN KENYA

Located on the coast of the Indian Ocean, Kenya is an East African nation that covers 224,081 mi² and contains 54,027,487 people, making it the 23rd largest African country by land area and the seventh most populous nation on the continent.^{17,18} Kenya is also one of just three nations bordering Lake Victoria, the largest freshwater lake in Africa and the largest tropical lake in the world. Hot, arid plains cover most of the coastline, while increasing elevation gives way to a large inland plateau called the Central Highlands.¹⁹ Prior to COVID-19, Kenya was experiencing rapid economic growth, with GDP increasing by 5.9% each year from 2010-2018.²⁰ The majority of this growth stemmed from Kenya's agricultural sector, which comprises 33% of the country's economic output and employs 40% of the population.^{20,21}

However, 75% of Kenya's total land area is classified as arid or semi-arid, leaving just 20% of the country suitable for farming, primarily the high-rainfall regions surrounding Lake Victoria and parts of the southwest coastline.¹⁸

Anthropogenic climate change has exacerbated stress on Kenya's agricultural sector, disrupting the domestic food supply. Thanks to its proximity to the Equator, Kenya is acutely vulnerable to rising temperatures, with temperatures projected to rise 2.5 degrees Celsius by 2050 (compared to global estimates of 1.5 degrees).^{22,23} In recent years, reduced rainfall and rising temperatures in Kenya have created a prolonged drought—the worst in 40 years.²⁴ Since 2019, Kenya has experienced below-average rainfall during both its short (October-December) and long (March-May) rainy seasons. In 2021, maize (a staple crop grown on 90% of Kenyan farms) production during the long and short rainy seasons was 12% and 57% below the five-year average, respectively.^{21,25} As a result, the number of food-insecure Kenyans living in pastoral and marginal agricultural regions rose from 2.1 million in August 2021 to 3.2 million in February 2022.²⁵

The ongoing drought has had deleterious effects on population health and nutrition across Kenya. In rural communities, livestock plays a vital role as a protein source (through meat or milk) for residents, many of whom depend on subsistence agriculture. Less precipitation and hotter temperatures increase livestock mortality, which is exacerbated by the greater distance livestock must travel to graze when vegetation is scarce. Since the start of the drought, roughly 1.5 million cattle have perished.²⁶ The dramatic spike in food insecurity and livestock mortality is best understood in the context of Kenya's nutritional landscape. Despite progress that has been made in combating certain nutritional deficiencies (e.g., hypovitaminosis A), millions of Kenyans still lack adequate nutrition.

Stunting, permanently impaired growth and development caused by malnutrition and disease, remains at 26%, while anemia rates sit at 36% and 42% among children under 5 and pregnant mothers, respectively.^{27,28} The ongoing famine threatens to worsen these deficits by decreasing the supply of crops and meat containing vital micronutrients.

Unfortunately, the short-term future of the Kenyan drought is bleak. Early forecasts suggest that the short rainy season from October to December 2022 will continue the trend of below-average rainfall. As a result, the earliest a resolution to the drought could arrive would likely be during the 2023 long rainy season.²⁹ Until the drought subsides, resource management, agricultural innovation, and international aid will play key roles in alleviating food insecurity and preserving population health. Following the 2022 repeal of a law prohibiting the transport and cultivation of GMOs, the integration of drought-resistant crops into the agricultural sector may also offer a new angle from which to address this issue.³⁰ Regardless of the current crisis' trajectory or ultimate duration, the frequency and severity of such events will only continue to grow as long as climate change persists.



INFECTIOUS DISEASE

One of the largest concerns for the AFRO region in the field of public health is the topic of infectious disease. The region has been dealing with the threat of both zoonotic and vector-borne diseases for many decades. In 2002, the AFRO Region was the leading source of deaths by communicable disease, with a death total that was almost nine times as high as AMRO region.³² Furthermore, within the realm of child deaths, 10.9% were due to cases of Malaria and 3.6% due to HIV/AIDS.³² This trend has only grown in the wake of global climate change. As the warming environment allows for a better environment for vector borne disease transfer and deforestation limits human-animal proximity, the prevalence of infectious disease has increased dramatically.³⁵

CASE STUDY 1: MALARIA IN THE DEMOCRATIC REPUBLIC OF CONGO

The Democratic Republic of Congo (DRC) is situated in the middle of the African Continent. It is bisected by the Equator and is home to a large river basin, high plateaus, and a coastal plain. The climate of the DRC experiences a large amount of heavy rainfall and humidity. In addition, due to the country's proximity to the equator, the Congo experiences higher average temperatures than both the AFRO region and most of the planet. The mean surface temperature of DRC from 1991-2020 ranges between the 40°C and 50°C mark.³³

As the surface temperature of the planet continues to rise due to global warming, the already warmer than average temperature of the Democratic Republic of Congo is only increasing. The country's annual mean temperature has jumped from 24.02 degrees to 24.46 degrees (Celsius).³³ This shift may seem minimal, but climatologists have seen that even small shifts can have devastating impacts on a country's biome and on those who live in it. In the DRC's case, they have had to deal with the implications of this temperature increase on the prominence of Malaria.

Malaria is currently the primary source of morbidity in the Democratic Republic of Congo.³² It is the cause of more than 40% of outpatient hospital visits and 19% of infant deaths.³¹ The disease is vector borne, meaning it is transmitted through an arthropod, in this case a mosquito. Mosquitos contract the disease by drawing blood from an infected animal and then transposing it onto humans.

The mosquito as a species is a very heat sensitive arthropod. As temperature increases, the bug's incubation time (the time it takes for it to reproduce) decreases.³⁵ This developmental stage can last anywhere from 7.5 days at 35 degrees (Celsius) to 39.7 days at 15 degrees (Celsius).³⁵ The science suggests that the uptick in temperature in the DRC has greatly contributed to the increase in population of mosquitos in the region and as a result, has led to an increase in the spread of this particular disease. From 2016 to 2017, the DRC saw an increase of about 600,000 Malaria cases.²⁹ This trend has not slowed down in the years since that survey was taken.

The impact of the proliferation of this disease is not simply individual health. The symptoms of Malaria can vary and many of those who make it through the disease have long term health concerns. This can impact the workforce of the country, the rate at which the country reproduces, and the overall stability of the nation. Due to these concerns, some third party organizations are lobbying for funding for climate relief on the basis that entire countries are at risk. In a more retroactive approach to relief, other organizations such as Gavi, The Vaccine Alliance, are trying to deliver more Malaria vaccines to citizens of high risk nations like the Democratic Republic of Congo.

CASE STUDY 2: EBOLA OUTBREAK IN SIERRA LEONE

Home to more than 8.7 million people, Sierra Leone is a small West African nation whose 29,925 square miles of territory share borders with Guinea, Liberia, and the Atlantic Ocean.^{38,39} Hot and humid year-round, Sierra Leone depends on agriculture for most of its economic strength; the industry employs two thirds of the labor force and comprises 50% of the country's gross domestic product (GDP).⁴⁰ Farms are usually small, family-managed establishments found throughout central Sierra Leone. Subsistence farming accounts for a substantial share of domestic agriculture, but commercial farming is rising as Sierra Leone develops economically. Eighty percent of farms grow rice, a diet staple that plays a key role in subsistence agriculture. Cocoa, coffee, ginger, palm kernels, and kola nuts are also grown—primarily for export to foreign markets. To clear large swathes of land for agriculture, farmers often employ slash-and-burn techniques, increasing deforestation and decreasing biodiversity.⁴⁰

Alongside climate change, these agricultural practices have increased the nation's vulnerability to disease outbreaks. Since 1960, the average temperature in Sierra Leone has increased by 0.8 degrees Celsius. Current projections estimate that the average annual temperature will increase by 1-2.6 degrees Celsius by 2060.⁴¹ These changes are associated with more extreme weather patterns and rising sea levels. Together, these factors are poised to cause mass flooding during future rainy seasons, increasing the risk of waterborne diseases like cholera and dysentery. Rising temperatures will also trigger animal migration as habitat ranges shift to match the climate, bringing animals into closer contact with humans.^{41,42} Deforestation and slash-and-burn agriculture will also increase interactions between humans and other animals in the coming years. Deforestation is of particular concern; forest cover in Sierra Leone has decreased by 30% in the last two decades.⁴³

Decreased proximity between humans and animals propagates zoonotic diseases, illnesses that can spread from animals to humans and vice versa.



The 2014 Ebola outbreak in Sierra Leone constitutes one of the worst zoonotic epidemics in recent history. Ebola is a type of viral hemorrhagic fever that infects humans and nonhuman primates (fruit bats carry the virus but don't experience symptoms). In the earliest stages of infection, Ebola produces symptoms similar to the flu (fever, body aches, sore throat, fatigue, etc.), which rapidly progress to vomiting (often of blood), diarrhea, rash, damage to internal organs, confusion, and bleeding (internal and external). Ebola is spread through direct contact with bodily fluids (blood, semen, saliva, breastmilk, urine, etc.) and has an average 50% fatality rate.⁴⁴ In 2014, West Africa experienced an unprecedented surge in Ebola infections. The outbreak began in the tropical forests of western Guinea and spread to neighboring countries, namely Liberia and Sierra Leone. In terms of confirmed cases, Sierra Leone was hit harder than any other country by the epidemic, recording 14,124 cases and 3,956 deaths during the 2014-2016 outbreak.^{45,46} Poor medical and sanitation infrastructure allowed the virus to rapidly spread throughout the country, especially in regions with high population density (Freetown and its suburban periphery accounted for 41% of total cases).⁴⁵

Although the precise origins of the 2014 outbreak are unknown, scientists have pointed to environmental degradation as a key contributing factor. Retrospective studies have found strong correlations between the likelihood of Ebola outbreaks and levels of deforestation in surrounding regions.⁴⁶ Climate-linked natural disasters have hindered economic development and the expansion of advanced medical infrastructure, rendering Sierra Leone vulnerable to future epidemics. Elevated animal migration will increase the transmission of zoonotic diseases, while human climate refugees will present significant obstacles for public health officials trying to contain future outbreaks.

Cultural diversity and the spiritual practices of indigenous groups may also pose additional challenges for public health officials and medical personnel. Ebola is more transmissible during the later stages of infection, so the bodies of the deceased are potent sources of infection. Some religious groups in West Africa practice traditional ceremonial burials overseen by community leaders. Many communities opposed the intervention of outside medical personnel to safely bury deceased Ebola victims during the last outbreak, citing spiritual consequences for disturbing traditional practices.⁴⁷ Some saw the insertion of medical professionals into religious practices as a cultural imposition, a criticism amplified by centuries of colonialism. Unfortunately, traditional burials increased Ebola transmission, and the resulting distrust between Sierra Leoneans and the medical community impeded efforts to distribute accurate public health guidance.⁴⁷

Since 2016, several developments have changed the future prospects of Ebola in Sierra Leone. In late 2019, an Ebola vaccine was developed and approved for widespread use. This dramatically reduces the potential for another severe epidemic on the same scale as 2014-2016.⁴⁸ However, vaccine pricing and distribution remain serious concerns, especially in rural regions with high poverty rates and low transportation infrastructure.

Vaccine hesitancy and misinformation must also be addressed to maximize the impact of these developments. The Ebola epidemic also forced the expansion of disease surveillance networks and emergency medical resources. Although substantial work remains to improve epidemic countermeasures, officials are better prepared to respond swiftly to the next outbreak. In the meantime, Sierra Leone and its regional neighbors should consider reevaluating agricultural practices, reducing deforestation, increasing disease monitoring and research, improving healthcare infrastructure (e.g., hospitals, testing sites, clinics, etc.), and forming culturally competent health partnerships with the region's many different ethnic groups.

The threat of new zoonotic diseases looms large on the horizon as temperatures rise and forests thin. On the current climate trajectory, the frequency of epidemics is expected to increase from one every 17 years to one every 10 years by 2070.⁴² The Sierra Leonean Ebola epidemic illustrates the importance of monitoring and preventing zoonotic diseases before they spiral out of control. The nation must heed the lessons learned through painful, first-hand experience by bolstering preventive measures and environmental protection so that when the next deadly epidemic emerges, there are systems in place to fight it.

CLEAN ENERGY AND GEOPOLITICS

The AFRO region is home to some of the richest biodiversity on the planet. With this biodiversity comes access to a multitude of rare natural materials that are highly valued on the global market. For instance, the African continent has the largest mineral reserve in the world, with many of these minerals playing an important role in new technology. Some of the integral semiconductors used in modern clean technology can be found in the region.

However, as more countries commit to contributing less to the global climate crisis - 140 nations have publicly announced plans to go net zero - geopolitical conflict has shed light on some key factors that are limiting the clean energy movement in the AFRO region. While many African countries are situated near these natural minerals, many don't have the infrastructure necessary to make this transition. From determining ownership and accessibility of the land needed for clean energy to economic inequity that limits the benefits of new technology, there are significant geopolitical implications that come along with the shift to renewable energy that need to be addressed in order to safeguard the wellbeing and longevity of the region.

CASE STUDY 1: SOCIAL AND ECONOMIC BACKLASH IN KENYA

When comparing the plans of action proposed by countries in the AFRO region that pertain to clean energy, few are as ambitious as Kenya. With a population of almost 54 million people, Kenya is currently the 7th largest country in the region by population.⁵⁰ Furthermore, the country is currently experiencing one of their highest rates of yearly increase, with the population growing by 2.28% this year.⁴⁹ In an effort to establish a strong foundation for future growth and development, the Kenyan government has set a multitude of goals related to infrastructure and clean energy. In Kenya Vision 2030, a widespread campaign that intends to push the country into middle income status and introduce major industrialization within the next decade, they cover major arrears of improvement in the fields of healthcare, law and governance.⁵¹ However, one of the largest and most central aspects of the plan is increased infrastructure, fueled by electricity.

In large part, Kenya has made great strides on their path to better access to electricity. As of 2019, 87% of the electricity produced and utilized within the country has been generated through either wind, hydro, or geothermal energy sources.⁴⁸

This has led to Kenya having one of the highest rates of electricity access in East Africa, with about 75% of citizens having access to electricity.⁴⁷ However, the country's plan for the quick addition of new infrastructure to guarantee energy to the public has unearthed some concerns.

Kenya, like many other countries in the AFRO region, is home to a variety of indigenous groups, 32 to be exact.⁴⁸ Many of these groups claim ancestral and historical ownership of land throughout the country. This complicates many of the clean energy projects that the government has instituted. The majority of the renewable energy sources the country is pushing for take up large swathes of space. Wind turbines alone require roughly 1.5 acres of land for each 2-megawatt machine.⁴⁸ This doesn't take into consideration the space needed for water power and geothermal technology. Often, these projects spread into indigenous territory and result in major conflict between the local people and national government administration. Many of these conflicts have either slowed or ended the roll out of clean energy planning in the country. For example, The Kinangop Wind Park was going to be a large renewable energy source with a projected 60 MW of energy being produced.⁴⁸ However, the project was canceled in 2016 due to adamant community protest and legal dispute over the impact it would have on locals. Situations like these have pushed back many of Kenya's efforts.⁴⁸ The question of how to equitably handle these disputes is of major importance for the entire region, with many of the other AFRO region's constituents having similar indigenous populations.

In addition to social pushback against Kenya's energy plan, some have expressed concern over the amount of economic sway it gives private corporations. Instituting renewable energy, especially in the early developmental stages, is an expensive task.

This is true for the richest countries in the world, but especially true for Kenya, which is ranked 67 in GDP.⁵³ This makes such an ambitious clean energy plan unobtainable for the country on its own. In order to quickly introduce the new infrastructure, the government allowed private investors to fund its energy and electricity projects. This has resulted in the private sector accounting for over 43% of energy generation in the country.⁴⁸ This level of control over general access to a necessary aspect of industrial society has left many people concerned about the impact that private businesses have on the everyday life and safety of the Kenyan people.

As Kenya continues to be a leader in the clean energy movement, the social and economic factors that are currently disrupting that process will need solutions. Whether that be through the proliferation of official land ownership documents or more publicly funded and controlled energy initiatives, something must be done to clear a path for clean energy in the country. These solutions can also provide insight for other countries in the AFRO region who may also run into these conflicts as they pursue net zero.



CASE STUDY 2: SOLAR POWER IN SOUTH AFRICA

After the dissolution of its oppressive apartheid system in 1994, South Africa quickly emerged as a regional superpower. Today, the 471,359-square-mile nation is home to 61.1 million residents, making it the 25th largest country by population in the world and the fifth most populated country in Africa.^{57,58} In addition to being one of the most populous countries on the continent, South Africa is also one of the most economically developed. With a 2021 GDP of 418 billion dollars, it's the second-richest country in Africa after Nigeria.⁵⁹ This economic prosperity stems from a combination of rich natural resources (e.g., diamonds, gold, and platinum), large financial markets, extensive infrastructure with access to key coastal ports, and a relatively democratic central government.⁶⁰ However, this wealth is not distributed equally throughout the country. As of 2021, unemployment sits at 35.3% (65.5% among those aged 15-24) and the country's 2022 Gini coefficient (a scale from 0-1 that measures wealth inequality, where 0 represents perfect equality) is 0.63, making it the country with the most economic inequality.^{61,62}

Alongside this economic regression, South Africa's infrastructure is faltering. In 2022 alone, failures in the electrical grid resulted in 2,400 hours, or 100 days, of load shedding: initiating deliberate, controlled blackouts to avoid overloading the electrical grid.⁶³ More than half the population lives below the poverty line, so many South Africans cannot afford generators or alternatives to the energy provided by Eskom, South Africa's state-owned energy supplier that has been criticized for corruption and its handling of load-shedding.⁶⁴ During load shedding, many residents thus turn to cheap, temporary energy sources like paraffin, plastic, wood, and petrol, which increase carbon emissions and pose health risks like carbon monoxide poisoning or burns.

Because 76.8% of South Africans rely on electricity for meal preparation, frequent load shedding may also increase the risk of foodborne illness.⁶⁴

To supplement these insufficiencies, South Africa has begun incorporating solar-powered generators into its power grid in a process called solar wheeling.⁶⁵ Turning to solar power is a promising approach, as the region's hot, arid conditions are ideal for solar energy production. According to a 2020 report by the World Bank's Global Solar Atlas, Africa has the greatest solar potential of any continent. Within Africa, South Africa is the country with the single biggest solar capacity.⁶⁶ In the first five months of 2022, South Africa imported 135 billion USD worth of photovoltaic solar panels, increasing the 2.1 gigawatts of estimated small-scale solar potential by 24%.⁶⁷ Solar investment is vital to cutting carbon emissions and protecting the environment. According to the International Energy Agency, Africa must invest at least \$190 billion per year from 2026 to 2030 (with \$127 billion allocated to renewable energy) to meet its current climate goals.⁶⁸ As one of the region's most developed countries with strong diplomatic ties outside the continent, the successful domestic adoption of solar power will likely influence other developing nations to follow suit.

Despite these benefits, many of the criticisms levied against South Africa's economy also apply to the expansion of solar power. The government has been slow to incorporate new solar generators, pushing many South Africans towards self-installing solar panels out of frustration.⁶⁷ Unfortunately, South Africa's economic stratification means that only those who are already well-off can afford to order and install solar panels, while individuals living in poverty are left without power.

Although solar panels are a source of green energy, there is also concern about the toxic waste they produce when they break down. If not properly recycled (a relatively new, complex, and uncommon process), heavy metals like arsenic or cadmium from discarded solar panels can leach into the soil, risking water contamination and environmental damage.⁶⁹

Holistically, the adoption and integration of solar panels into South Africa's power grid will likely yield significant ecological and health-related benefits over the coming decades. However, this move is not without its drawbacks; more innovation is needed to improve the efficiency of solar panels and reduce the environmental costs associated with their production and disposal. At the same time, economic inequality and government ineptitude within South Africa will continue to impede the effective implementation of environmental protection measures. Despite these difficulties, South Africa should be monitored as a barometer of green innovation throughout Africa to inform plans for more sustainable future development.



CONCLUSION

Despite producing only 4% of global carbon emissions, Africa's biodiversity, political complexity, uneven economic development, and resource insecurity render it uniquely vulnerable to the public health challenges posed by climate change.⁷⁰ However, unlike most continents, the role Africa will play in combating the climate crisis is deeply uncertain. The region's population is projected to double (at minimum) by 2050, at which time 25% of the global population will live there.⁷¹ During the same period, the continent's GDP will increase from 2 trillion to 29 trillion USD.⁷² This explosion of population growth and economic activity could radically alter global climate preservation efforts by serving as an inflection point for the continent's climate policy. Young African nations looking to construct more complex, integrated economies could fuel their expansion with renewable energy and green infrastructure. On the other hand, rapid population growth could outpace economic development, incentivizing nations to double down on fossil fuels or biofuels as cheap, established energy sources. Unlike Europe or the Americas, where political and economic structures have grown ossified, Africa sits at the crux of a developmental revolution, whose path may hold the key to building a greener world or contribute to a downward spiral of rapid urbanization and dirty energy.

As this development forges ahead, the region must also grapple with the consequences of climate change that are already unfolding. Flooding, droughts, heat waves, air pollution, and epidemics will rise, necessitating effective responses from regional governments and the broader international community. The full extent of these problems remains unknown, but continued research, innovation, and cooperation will be vital to securing a prosperous future for Africa and the rest of the global community.

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