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STATE OF AFRICA'S ENVIRONMENT 2023

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CONTENTS

INTRODUCTION

POVERTY OF ENVIRONMENT

State of environment in Africa defines its economic well being

WEALTH IS increasing in the world but will not be sustainable in countries that have degraded their natural environment or capital. The world is busy at negotiating carbon budget to mitigate climate change. A similar and equally critical debate is unfolding on another front: Can we control the use of natural resources? It is also related to the consumption that is at the centre of the climate change debate. Like carbon budget, use of natural resources is also an issue of development and the right to it, even if it means breaching the sustainable level. Like in the climate change debate, in this case as well there is a sharp division between the developed and the developing and poor countries. Taking the similarity further, in case of natural resource consumption as well, the developed countries are obsessive consumers while the developing and poor countries just use them for survival. So, the contentious question is: How to approach this fundamental use of resource debate?

Right to development is the axis that is driving the global strategy on controlling global warming. Developed countries have long crossed over to the world of prosperity while pumping non-comparable levels of greenhouse gases (GHG) into the atmosphere that warm the planet. Developing and poor countries have just started running on a development path and need to emit. Meanwhile, the planet is near its bearable level of warming. Developing countries want to continue to develop — irrespective of GHG emissions — as this is a basic human right. So, developed countries need to take up more discounts on emission levels. Now, apply this principle to the use of natural resources, or natural capital like forest, land and water. The World Bank's "The Changing Wealth of Nations 2021" report — a periodic evaluation of wealth generation and distribution beyond the traditional GDP (gross domestic product) matrix and includes natural resources as part of a country's wealth - is unequivocally clear on one aspect: Wealth is increasing in the world but will not be sustainable in countries that have degraded their natural environment or capital.

Many estimates have pointed out that nearly half of the world population ekes out a living from degraded resources like land and forests. In future, these resources might not be able to sustain productive livelihoods. But, for this population there is no alternative as well

WHICH COUNTRIES WILL FACE THIS?

The expected answer is those who depend more on natural resources for income and sustenance. And these countries dominantly are the poor and developing countries. This is a cause of concern. The report says: "Because low-income countries have so few other assets, proportionately, renewable natural assets such as land and ecosystems are crucial for them, comprising around 23 per cent of their total wealth. This is the highest fraction of total wealth coming from renewable natural capital among all income groups." Like GHG emission, poor and developing countries need to use these natural resources even if it reaches an "unsustainable" level. This is because these are the only resources available for sustenance.

Many estimates have pointed out that nearly half of the world population ekes out a living from degraded resources like land and forests. In future, these resources might not be able to sustain productive livelihoods. But, for this population there is no alternative as well. Wealth per capita has grown in low- and middle-income countries, according to the Bank's latest report, due to an increase in agricultural areas and also in harvesting resources like fishery. This means the gain is an outcome of using more natural resources. This also makes the crucial point that where ecology is the main economy, prosperity can't be assured without using the natural resources. The rise in consumption is a big concern for driving GHG

emission up and also exhausting the planet's capacity to support.

In this debate, the poor and developing countries, or those whose survival and prosperity critically depend on natural resources, will be again put under pressure to bring down consumption. But, like in the case of carbon emission, consumption of natural resources is also very unequal: A citizen of a rich country consumes oil and other resources up to 30 times more than that of a poor country. More to it, rich countries have reported high levels of natural wealth because their basic survival doesn't depend on natural resources as much as in poor countries. It is time for another equity battle, over access and use of natural resources.

NATURAL CAPITAL AND THE ECONOMIC IMPERATIVE

Africa's prosperity and economy is deeply linked to its natural resources endowment, or its natural capital. According to the United Kingdom (UK) Natural Capital Committee, "natural capital is that part of nature which directly or indirectly underpins value to people, including ecosystems, species, freshwater, soils, minerals, oil and gas, the air, and oceans, as well as natural processes and functions." According to a study by the Africa Development Bank, Africa's natural capital was estimated at $6.2 trillion in 2018. To make sense of this endowment, this is nearly three times of the economy of the entire continent. Over 80 per cent of its population directly depend on natural resources like land and forests.

It means that any decline in the natural capital will have a direct negative impact on the people's livelihood and economy. On the other hand, if the natural capital degrades, development in future will not be sustainable – more people will have to fight for limited resources. According to World Bank, per capita natural capita is declining in Africa: from

According to a study by the Africa Development Bank, Africa's natural capital was estimated at $6.2 trillion in 2018. To make sense of this endowment, this is nearly three times of the economy of the entire continent. Over 80 per cent of its population directly depend on natural resources like land and forests

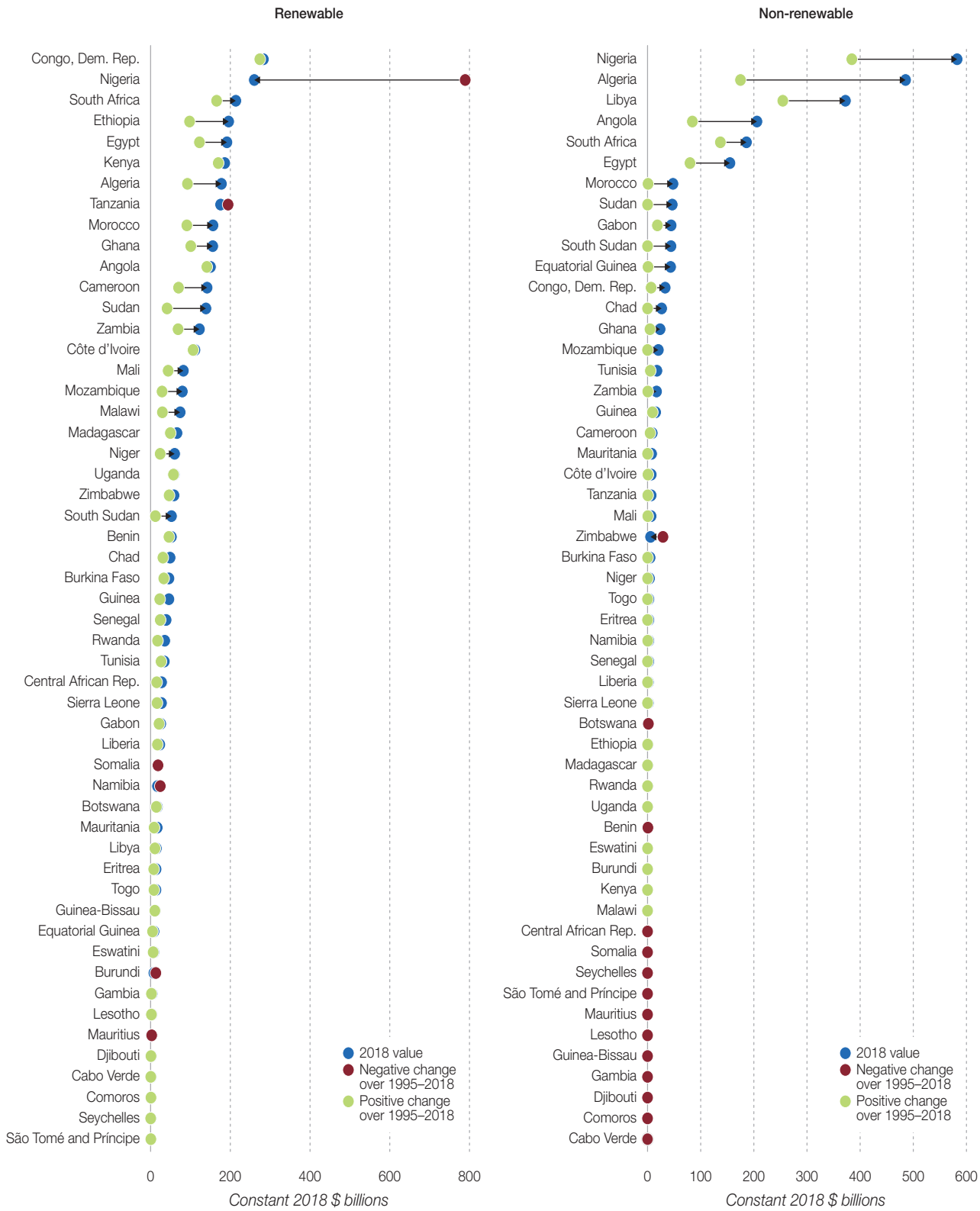
$4,374 in 1995 to $2,877 in 2018. This decline is attributed to the rising population in the continent. The Green Value Initiative of the German Federal Ministry for Economic Cooperation and Development says that the natural ecosystem is under risk limiting its ability to provide services to people. "African countries could see a 10 per cent drop in GDP by 2030 and by 2050, some 1.2 billion Africans could face higher water pollution, 1.5 billion people increased food insecurity and millions coastal erosion risks," says one assessment of the Green Value Initiative indicating what degradation in natural capital would mean for people.

A POST-PANDEMIC WORLD

Of the many factors the led to the COVID-19 pandemic, the primary were destruction of biodiversity, clearing of the land, illegal trade in wildlife, and climate change. These constitute the basis of our progress and are sometimes referred to as natural asset/capital. The loss or depletion of natural capital, like biodiversity, caused or facilitated the transfer of unwanted pathogens to humans. We have been receiving warning signs through outbreaks of disease like SARS, but we did not pay attention. Earlier, we were in luck; but not this time. As scientists suggest, this would not be the last pandemic if we do not change our development path and maintain the synergy between nature and human activities.

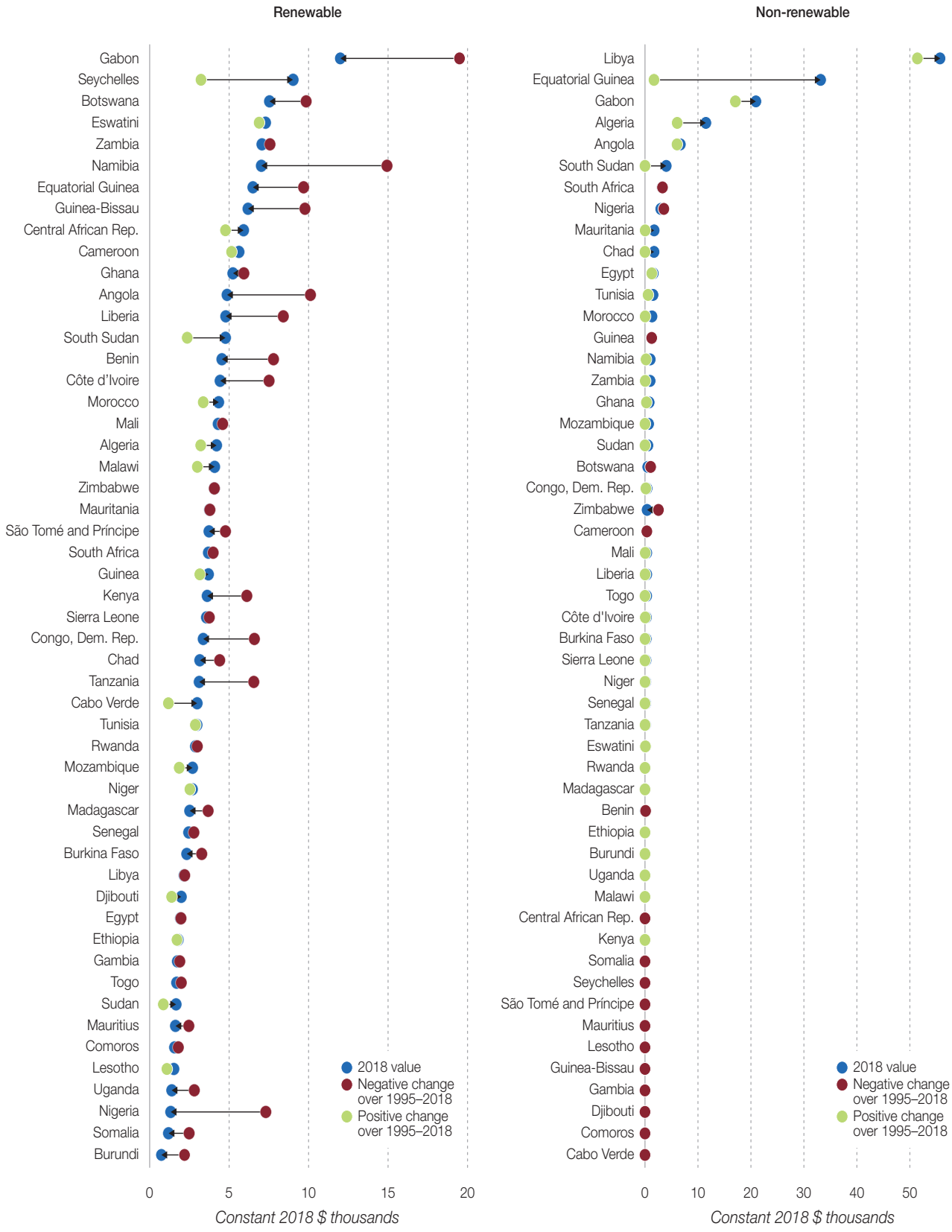
In June 2022, the world met at Stockholm, Sweden, to review what it achieved in the 50 years since the Stockholm conference of 1972, and what should be its priorities for next 50 years. Measuring progress and prosperity as if sustainability (economic, environmental and social) mattered, would command top priority. Economic development since the industrial

Changes in the value of natural capital for African countries, 1995–2018



Source: AfDB staff calculations using data from World Bank (2021)

Changes in per capita value of natural capital for African countries, 1995–2018



Source: AfDB Staff calculations using data from World Bank (2021)

revolution has ushered in an era of unprecedented improvements in the human condition. Still, environmental trends require urgent action.

Recent years have seen an unprecedented destruction of planetary health, a resurgence of populism and social unrest, spiralling inequalities in health, skills, and opportunities, and a growing sense of dissatisfaction with democracy. Combined, these pressures threaten to undermine more than a century's worth of progress. Calls to "build back better" are now widespread, but in practice, this requires building back differently: Different objectives and different strategies to achieve the goals.

The first step has been taken. The objectives are defined in the United Nations 2030 Agenda for Sustainable Development by its 17 Sustainable Development Goals (SDGs). Meeting them requires a wealth management strategy that recognises all of society's assets — natural, human, social, and manufactured. Delivering the SDGs will take much more than GDP growth alone. GDP is associated with improvements across many SDG targets and indicators, such as the elimination of poverty (SDG 1). But GDP growth can also come at the expense of progress towards other goals such as climate action (SDG 13) This suggests that delivering the SDGs entails moving "beyond GDP".

The interconnected nature of the goals reflects the interconnected nature of wealth. Investments in any one component of wealth impact (for instance, human capital) the returns to other components of wealth (for instance, physical capital such as computers and IT infrastructure). This is equally true of SDGs, where progress towards Quality Education (SDG 4) impacts progress in other goals such as Decent Work and Economic Growth (SDG 8).

Recent years have seen an unprecedented destruction of planetary health, a resurgence of populism and social unrest, spiralling inequalities in health, skills, and opportunities, and a growing sense of dissatisfaction with democracy. Combined, these pressures threaten to undermine more than a century's worth of progress. Calls to "build back better" are now widespread

INCLUSIVE WEALTH

The United Nations Environment Programme's Inclusive Wealth Index — crucial for delivering the SDG — focuses on the change in wealth, not just the level of wealth. It is critical to achieving the 2030 Agenda on Sustainable Development and SDGs, which require a statistical infrastructure capable of measuring both the means (inclusive wealth) and the outcomes (SDG indicators). Inclusive wealth statistics present an opportunity to explicitly define the recovery from COVID-19 in terms of sustainable development, the Paris Climate Agreement, and the "Beyond GDP" movement. The Inclusive Wealth Report (IWR) 2022 records the continuous decline in per capita natural capital, while the per capita human and produced capitals are on rise. The growth of GDP per capita is much higher than the per capita wealth. That means part of wealth is depleted and is treated as income. The findings prove that the ongoing measure of progress and sustainability is inadequate as they show that we are mixing income with wealth. Mainstream economic statistics have focused too heavily on changes in income over time without enough emphasis on changes in the underlying assets that generate those income flows. In the short term, income can be increased by over-consuming capital, but this reduces productive capacity in the long run.

The inclusive wealth paradigm demonstrates that future economic possibilities depend on the current management of all forms of wealth — human health and skills, physical infrastructure, sustainable natural resource and ecosystems management, trust and strength of social relationships, and the quality of democratic institutions. Combined, these assets

determine an economy's inclusive wealth, and are the building blocks for achieving SDGs.

Inclusive wealth statistics can help guide policy efforts towards enhancing the capacity of nations to deliver the United Nations 2030 Agenda for Sustainable Development. Sustainable development encompasses a broader suite of guiding objectives and requires a more inclusive statistical infrastructure to reflect it. There is an urgent need to compile inclusive wealth statistics now so they can shape the recovery.

Inclusive wealth statistics have seen major improvements in the past decade. The UN's "Inclusive Wealth Reports" and World Bank's "Changing Wealth of Nations" books have shown that it is possible to assess changes in natural, human, and physical capital in all countries, regardless of income level. The UN System of Environmental Economic Accounts and its Experimental Ecosystem Account has enhanced our ability to account for environmental stocks and their economic contributions. But substantial investments are needed to improve, expand, and get the most out of inclusive wealth statistics. Priorities include greater funding for national statistical offices and investments to automate and digitise inclusive wealth data collection (for instance, remote sensing, machine learning, and artificial intelligence for environmental statistics).

Existing measures of social and human capital — as underlying assets and outcomes in terms of SDG indicators — suffer from poor coverage and conceptually simplistic. That these fundamental assets are difficult to measure means they deserve more, not less attention in official statistics. Building capacity and resilience after the pandemic requires investments in vital assets that can underpin a sustainable 21st century. Inclusive wealth statistics present an opportunity to define the recovery from COVID-19 in terms of sustainable development, the Paris Agreement, and the "Beyond GDP" movement. ■

1 CLIMATE CHANGE

HIGHPOINTS

Of the total deaths from extreme weather, climate or water stress in the world in last 50 years **35%** **was in Africa**

Reducing carbon emissions can prevent **4,000-6,000** **child deaths due to heat in Africa every year**

The rate of sea-level rise has reached **5 mm** **per year in several areas on the continent's coastline**

Once every 30 years heat waves are projected to be longer than **180 days** **over parts of central Africa**

Africa will account for **40%** **of global migration due to climate change**

PHOTOGRAPH COURTESY: CARITAS.ORG

CLIMATE'S FIRST VICTIMS

Climate change has been more rapid in Africa than the rest of the world

AFRICA IS extremely vulnerable to and bears the brunt of drought, flooding, cyclones and other climate change-led weather events. In fact, every third death (or 35 per cent) in the world from extreme weather, climate or water stress in 50 years was in Africa. In November 2022, the World Meteorological Organization (WMO) released the "Provisional State of the Global Climate 2022" report. The world had already witnessed the climate crisis unfolding; contrasting and deadly weather events hitting all continents taking huge economic and human tolls. In Africa, the WMO report emphasised, the climate crisis was becoming an existential one impacting millions of people already enduring the wreath of nature for years non-stop.

"Weather and climate extremes and their induced impacts are also exacerbated by rising

global surface and sea temperatures. In East Africa, rainfall has been below average for four consecutive wet seasons, the longest sequence in 40 years. Across the region, under the effects of the drought and other shocks, an estimated 18.4-19.3 million people were facing acute food insecurity," said WMO. Rainfall was above the long-term average in the west Africa, Sudan, coastal areas extending from western Libya to Egypt. On the other hand, rainfall was precariously low – below the long-term average – in the Eastern Africa and most of North Africa. As 2023 set in, the continent was staring into an unheard of human crisis. The World Food Programme (WFP) of the United Nations (UN) in a bulletin in January 2023, said that "from southern Ethiopia to northern Kenya and Somalia, around 22 million people are at risk of hunger as the worst drought in four decades grips the Horn of Africa." This is nearly double of the figure at the start of 2022, according to WFP.

Simultaneously, severe cyclones lashed many countries in Africa in 2022. Four cyclones ravaged Madagascar in just one month period in late January and February 2022. Cyclones Ana (in January) caused massive floods in Mozambique and Malawi. Further, cyclone Gombe (in March) brought in another spell of floods in Mozambique. Contrast this to the situation the country has been in: since 2015-2016, the south and western regions of Madagascar have been enduring a dry spell.

Coming back to East Africa, it had already recorded five consecutive deficit rainy seasons by end of 2022. The rainy season of March to May 2022 was the driest one in over 70 years for Ethiopia, Kenya and Somalia. In the first week of June, 2022 in a joint statement by agencies like the Intergovernmental Authority on Development Climate Prediction and Applications Center, the Food and Agriculture Organization, the Famine Early Warning Systems Network

There is no end in sight for the hunger crisis and hope is slowly fizzling out as families enter the January to March dry season with little hope for rainfall. Estimates show that the March to May 2023 rainfall will also be below average, leading to a dramatic increase in the number of people in need of emergency food aid

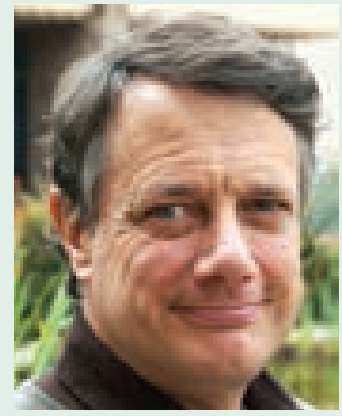
(FEWS NET) and WFP warned the situation leading to a famine not seen in recent history. By January, 2023, over 22 million people were facing severe food shortages in Ethiopia due to back-to-back droughts caused by five failed rainy seasons, according to non-profit Save the Children. More than half of them were reeling from climate-induced shocks with conflict, inflation and forced displacement, causing further misery and children facing increased risk of death from malnutrition, it further said.

The Tigray region of Ethiopia continued to experience one of the worst food security emergencies globally. Food consumption deficits were expected to be the most severe in the southern, southeastern and northern parts of the country located in the Horn of Africa. Almost 4 million children in Ethiopia were severely malnourished, accounting for around half of those suffering from malnutrition across the Horn of Africa. Millions were unable to generate income and access food due to the drought, which was likely to lead to widespread and severe levels of food shortage through at least mid-2023, Save the Children warned in a statement. Southern and southeastern Ethiopia was of extreme concern, as a record-breaking drought was forecast to continue in this area through at least mid-2023. Some of the most severe drought conditions were observed in the Borena zone in the Oromia region and in Dawa, Liban, Afder and parts of Shabelle zones in the Somali region. Xavier Joubert, Save the Children's director for Ethiopia, said: "There is no end in sight for the hunger crisis and hope is slowly fizzling out as families enter the January to March dry season with little hope for rainfall. Estimates show that the March to May 2023 rainfall will also be below average, leading to a dramatic increase in the number of people in need of emergency food aid and driving many into catastrophic levels of hunger."

CLIMATE CHANGE IS MAKING LA NIÑA IMPACT SEVERE

La Niña has created an exceptionally dangerous series of four droughts in the years 2021-2022

CHRIS FUNK



UNDERSTANDING THE climate of eastern East Africa begins with understanding its close connection to the movement of heat energy in the Pacific Ocean. Under normal conditions, the Pacific Trade Winds push heat energy towards Indonesia. The area surrounding Indonesia ("The Warm Pool") has the warmest, rainiest weather in the world. The very warm waters of this region create a low-pressure system that pulls in moisture from the surrounding atmosphere. This is why East Africa tends to be, on average, dry. There are year-to-year variations in this pattern, though, as the Pacific Trade Winds get stronger or weaker in response to ocean temperatures. The next thing to understand is that climate change has caused — and is causing — the heat in the oceans to increase rapidly.

The current droughts have been produced by an interaction between natural climate phenomena called La Niña and climate change. Naturally occurring La Niñas are associated with cool sea surface temperatures in the east Pacific. The impact of La Niñas is increasing for eastern East Africa, because of human-induced warming in the oceans. When there is a La Nina event, the west-to-east winds over the Pacific Ocean intensify, pushing the "extra" heat in the Pacific into the western Pacific. These warm waters cause the rainfall around Indonesia to increase. To the west of this precipitation one finds dry, hot, rising air over East Africa, which reduces total rainfall and increases air temperatures?

The current multi-season drought has been produced by a natural multi-year La Niña event, amplified by climate change and expressed as exceptionally warm west Pacific sea surface temperatures and exceptionally warm air temperatures over East Africa. There are two aspects to this question: La Niña frequency and La Niña intensity. Regarding the first aspect, it is very important to note that La Niña events have been very common since 1998. Over the past 25 years there have been 12 La Niña events.

While there is a lot of debate on this in the climate community, many observational studies and my own research has suggested that the climate is becoming more La Niña -like. Another aspect that I have a great deal of confidence in is that when a La Niña happens, now, its intensity is greatly amplified by human-induced warming in the western Pacific. After a giant 1997-98 El Niño' event (associated with exceptionally warm waters in the eastern Pacific), sea surface temperatures in the western Pacific jumped up. There the average state is very warm, and they become even warmer during and right after a La Niña event.

As described above, these warm waters amplify the ability of La Niñas to reduce East African rains. The impact of this has been especially marked on the March-to-May rains. This sets up a very dangerous, but also very predictable, pattern of back-to-back droughts in October-November-December and March-April-May. This type of sequence produced devastating sequential droughts and food crises in 2010-11 and 2016-17.

Tragically, the current two-year La Niña (2021-2022) has created an exceptionally dangerous series of four droughts, capped by what was the worst March-April-May 2022 season on record. I see two major trends: More extreme dry and wet rainy seasons, driven by more extreme changes in sea surface temperatures, as described above; and more extreme air temperatures, which can desiccate crops and pasture lands, while also having negative impacts on human and livestock health.

Furthermore, as we are seeing now in the Horn of Africa, these two sources of risk combine, such as when we get droughts in dry regions like East Africa. But, I am also very worried about human impacts associated with extreme "humid heat". More intense dry / hot spells can drive farmers into cities where they may be exposed to more extreme heat. But, in general, it is important that trends are really produced by extreme events, events that we can monitor and predict. We are not powerless in the face of climate change.

(Chris Funk is director of Climate Hazards Center. The column is based on an interview with Down To Earth magazine)

WHY IS THIS EXCEPTIONAL SITUATION?

The exceptional weather situation was attributed to La Niña, a natural large-scale cooling of ocean surface temperature in the central and eastern equatorial Pacific Ocean. This is caused the dry weather and high temperatures in East Africa. But this spell of the climate event had been protracted unusually, as WMO said in its bulletin on June 10, 2022. It started in 2020 and had a high possibility of continuing into 2023. The WMO in a statement said that the naturally occurring climate event was having unusual impacts such as though "La Niña has a cooling influence; temperatures are continuing to rise due to global warming". In July-August 2011, a strong La Niña resulted in the worst drought in 60 years in East Africa and the UN declared a famine in the region after a gap of 30 years. The situation in 2022 and early 2023 worsened to hit that level. Close to half of Somalia's population faced crisis-level food insecurity, which might lead to thousands of deaths due to starvations. Adam Abdelmoula, deputy special representative of the secretary-general of the United Nations, resident and humanitarian coordinator, said, "Somalia is in danger of entering an unprecedented fifth consecutive failed rainy season. Famine cost the lives of 260,000 Somalis in 2010-2011.This cannot be allowed to happen again in 2022."

A group of earth scientists from across the world has been forecasting with precision on the descent of famine-like situations to help governments and aid agencies to direct reliefs through FEWS NET. This unit of the United States Agency for International Development (USAID) was set up in 1985 in response to the famine that hit East and West Africa and killed more than a million people, particularly in Ethiopia. The Climate Hazards Center (CHC) in UC Santa Barbara is one institution that equips FEWS NET with precise data on climate change, its impacts and famine. CHC focuses on East Africa, the world's most drought-prone areas.

The impact of La Niñas is increasing for eastern East Africa, because of human-induced warming in the oceans. When there is a La Niña event, the west-to-east winds over the Pacific Ocean intensify, pushing the "extra" heat in the Pacific into the western Pacific. These warm waters cause the rainfall around Indonesia to increase

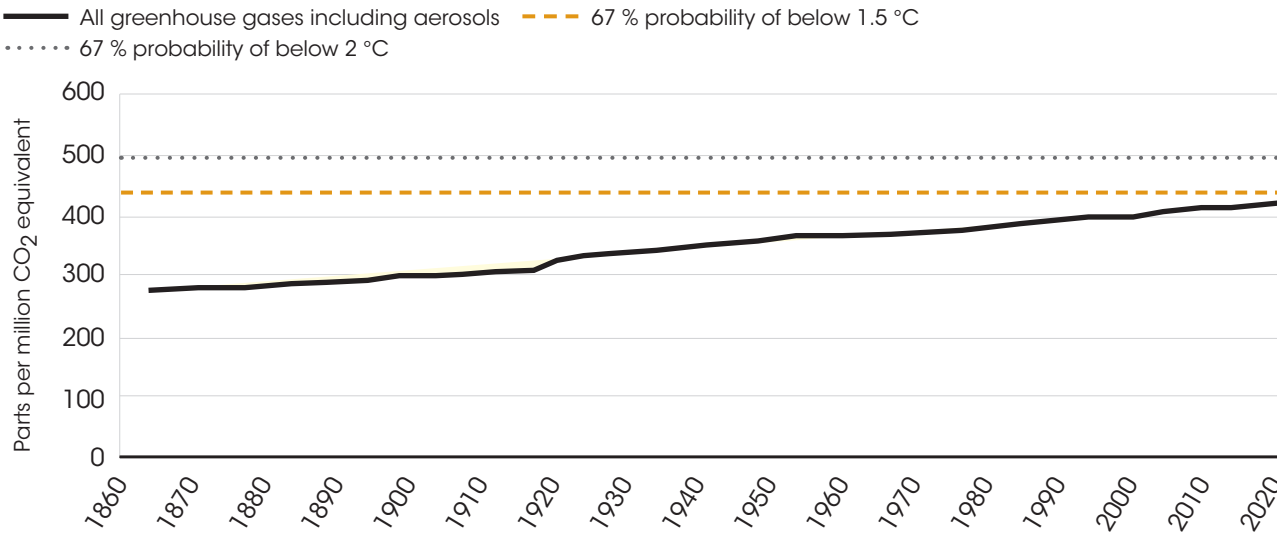
Chris Funk, the director of CHC and who forecast as part of the joint statement of multiple agencies on the dire state of situation in East Africa, has been assessing the frequent droughts in the region and their links to climate change. "In 12 out of the past 24 years, there have been La Niñas," Funk said, adding, "I am very confident that the circulation disruptions they cause are being amplified by climate change."

He, along with other scientists, predicted the 2010 famine in Somalia. He said: "Understanding the climate of eastern East Africa begins with understanding its close connection to the movement of heat energy in the Pacific Ocean." Under normal conditions, the Pacific Trade Winds push heat energy towards Indonesia. The area surrounding Indonesia has the warmest, rainiest weather in the world. The very warm waters of this region create a low-pressure system that pulls in moisture from the surrounding atmosphere. This is why East Africa tends to be, on average, dry. There are year-to-year variations in this pattern, though, as the Pacific Trade Winds get stronger or weaker in response to ocean temperatures.

"The next thing to understand is that climate change has caused — and is causing — the heat in the oceans to increase rapidly," he explained. The current droughts have been produced by an interaction between natural phenomena "La Niña" and climate change. Naturally occurring La Niñas are associated with cool sea surface temperatures in the east Pacific. The impact of La Niñas is increasing for eastern East Africa, because of human-induced warming in the oceans. When there is a La Niña event, the west-to-east winds over the Pacific Ocean intensify, pushing the "extra" heat in the Pacific into the western Pacific. These warm waters cause the rainfall

Observed trends in total greenhouse gas concentration levels between 1860 and 2018, considering all greenhouse gases and other forcing agents (including aerosols)

Taken together, the concentration of all GHGs stood at 457 parts per million in 2018



Source: European Environment Agency, 'Atmospheric Greenhouse Gas Concentrations', https://www.eea.europa.eu/data-and-maps/indicators/atmospheric-greenhouse-gas-concentrations-7/assessment, accessed in February 2021

around Indonesia to increase. "To the west of this precipitation one finds dry, hot, rising air over East Africa, which reduces total rainfall and increases air temperatures," said Funk. The current multi-season drought has been produced by a natural multi-year La Niña event, amplified by climate change and expressed as exceptionally warm west Pacific sea surface temperatures and exceptionally warm air temperatures over East Africa.

CLIMATE CHANGE IMPACTS ON AFRICA

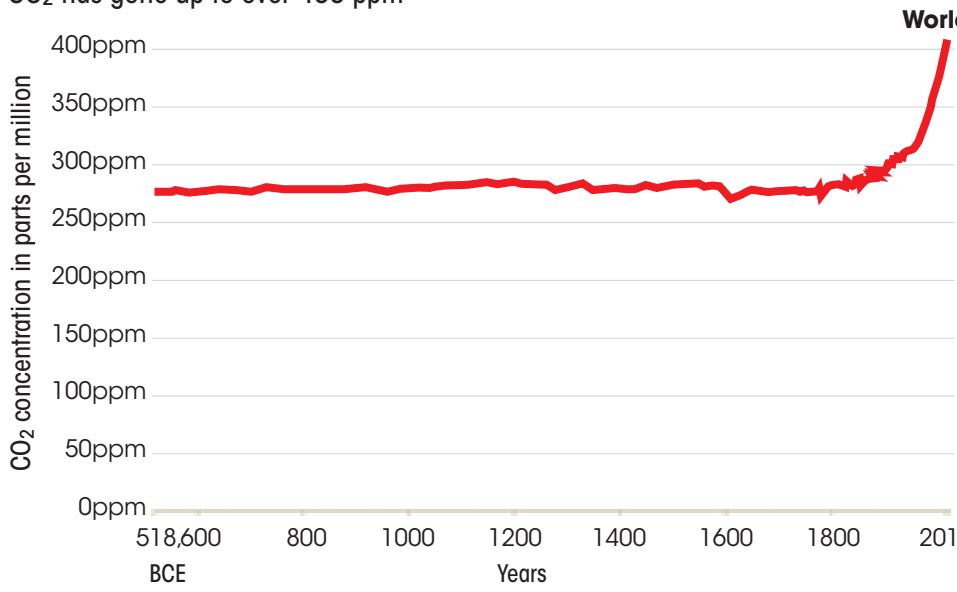
The Earth's climate system is complex and interactive, and consists of the atmosphere, land surface, snow and ice, oceans and other water bodies, and living things. The atmospheric component of this system characterises climate; hence, climate is generally defined as "long-term average weather", typically averaged over multiple decades. As such, climate change and weather are intertwined. Observations can show there have been changes in weather, and it is the statistics of changes in weather over time that identifies climate change.

The climate system evolves in time under the influence of its own internal dynamics. It can also evolve due to changes in external factors that affect climate – these factors are called "forcings". External forcings include natural phenomena such as volcanic eruptions and solar variations, as well as human-induced changes in the chemical composition of the atmosphere. The global mean surface temperature of the Earth, measured between 1951 and 1980, is about 14°C. This is due to the presence of gases which act as a partial blanket for the long wave radiation coming from the surface. This blanketing is known as the natural greenhouse (GHGS) effect. The glass walls in a garden greenhouse reduce airflow and increase the temperature of the air inside; similarly, through a complex physical process, the Earth's greenhouse effect warms the surface of the planet.

While many factors continue to influence climate, scientists are now quite clear that human activities have become the dominant force, and are responsible for most of the warming observed over the past 50 years. Human activities contribute to climate change by causing changes in Earth's atmosphere in the amounts of greenhouse gases, aerosols (small particles), and cloudiness. The largest known contribution to the enhanced greenhouse gas effect comes from

Atmospheric CO_2 concentrations over the years

From 250 parts per million (ppm) around the year 1800, concentration of CO_2 has gone up to over 400 ppm



Source: Hannah Ritchie and Max Roser (2017, 2020), 'CO_2 and Greenhouse Gas Emissions', https://ourworldindata.org/co$_2$-and-other-greenhouse-gas-emissions, Data from NOAA/ESRL, accessed in November 2020

the burning of fossil fuels, which releases carbon dioxide gas into the atmosphere.

There are more than 100 gases, most of them human-invented, which can alter the balance of the atmosphere – either through depletion of the ozone layer, or through the greenhouse effect. These GHGs accumulate in the atmosphere, causing concentrations to increase with time. GHGs follow a natural cycle in the atmosphere: they are constantly released into it and removed from it. But human-induced processes have led to an ever-increasing build-up of these gases in the atmosphere. The balance between emission and removal has been disrupted, leading to a rise in global temperatures.

Global warming, in turn, changes the climate cycle resulting in erratic weather events. In a warming planet, the impacts are felt by all, often disproportionately to level of emissions. Like the Africa continent. The world released 36.4 gigatonnes (Gt) of CO_2 in 2019 in fossil fuel emissions and from the cement sector. The entire continent of Africa, with 17 per cent of the world's population, contributed a mere 4 per cent to the emissions in 2019.

But, human-induced global warming has been more rapid in Africa than the rest of the world, according to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC). Average annual maximum temperature in northern and southern Africa is likely to be close to 4°C above normal, according to regional projections in the report released on August 9, 2021. The median temperature in these regions will rise 3.6°C when the Earth warms at 2°C above pre-industrial levels, predicted the group of scientists who authored the report. The annual minimum temperature is also projected to increase by over 2°C in some parts of north-western Africa, the analysis showed. Southern Africa will also see a rise in minimum temperature. This will lead to warmer cold days in the future, according to the authors of the IPCC report.

In 2021, Africa experienced its fourth-warmest April since 1910, with a temperature anomaly of 1.48°C, according to the National Oceanic and Atmospheric Administration (NOAA), USA. Extreme heat waves will continue to increase and extreme cold waves will decrease throughout the 21st century, with additional global warming, according to IPCC. At 1.5°C global warming, heavy precipitation and associated flooding are projected to intensify and be more frequent in most regions in Africa, the report said. With additional increases in global warming, changes in hot and cold temperature extremes, the frequency and intensity of heavy precipitation events are projected to increase almost everywhere in Africa, warned

DROUGHT FUELS HUMAN-WILDLIFE CONFLICTS IN KENYA

Ongoing dry spell displaces wildlife from their habitats in search of pasture and water

HISTORIC DROUGHT, exacerbated by climate change, is causing conflicts between humans and wild animals in Kenya and east Africa. The Horn of Africa is experiencing the worst drought in 40 years and the fourth consecutive year of failed / below-average rains. The biting drought hasn't spared wildlife. Elephants and other wild animals are wandering into human settlements in search of food and water, sometimes resulting in violent and deadly clashes.

David Leiyan, a 41-year-old local from Samburu East in northern Kenya, decried the sad state of affairs, calling for government intervention. "Wild animals now roam here freely. You can hardly walk a kilometre before seeing one or two. I just survived an elephant attack a week ago and have lost livestock to wild animals," lamented Leiyan. The devastated local, who is among the over 80 per cent of those in arid and semi-arid areas relying on livestock for a livelihood, had his 33 sheep and goats killed by wild animals at night.

Cases of lions or leopards wandering into residential areas in Nairobi and counties around protected areas like Nairobi National Park or Tsavo National Park have become common, with experts citing a lack of enough food and water in the wild for animals courtesy of biting drought. Pois Lenabori, a chief in Samburu East in Kenya, attested to a surge in human-wildlife conflict cases. He cited his jurisdiction and the surrounding arid areas as examples. "Cases of marauding elephants killing locals are now common. I have had to call officials from Kenya Wildlife Service (KWS) on several occasions to recapture stray elephants, buffalo, lions, hyenas roaming freely as they search for food and water and wreak havoc in villages," said chief Lenabori.

Experts are concerned that the water and electricity shortage across East Africa and the frenzy to construct dams has also resulted in unintended consequences such as crocodile and snake invasions and mosquito infestation in nearby communities. The situation in Uganda is almost

the same. Wild animals are getting out of their habitats, escalating human-wildlife conflicts to unprecedented levels. Over the past few months, residents of Tororo district near the border of Kenya and Uganda have been decrying attacks by wild animals. The local press is awash with tales of how deadly animals like lions from parks attack domestic animals while big animals like elephants and hippos break into farms and destroy crops. In parts of Somalia and Ethiopia, locals are forced to hide from wild animals when they seek food and water, especially during the day. "We can only go to water sources after elephants have drunk water and left. Some time back, elephants held the entire village at ransom for three days without water after the animals camped at the only water source," Isabella Liya, a resident, told Ethiopian media. Incidences of Human-wildlife conflicts have escalated in the recent past, she added.

Education on the Kenyan coast has been impacted due to this, with some schools often temporarily closing down due to human-wildlife conflicts. Also, some primary school children, especially in Tana River and Taita Taveta counties, report to learning institutions late in the day and leave for home earlier due to fear of wild animals. Kenyan authorities, through KWS, have acknowledged the crisis and put Kenyans on high alert, even as they put mechanisms to avert further losses in place. "KWS takes this opportunity to notify the public that the ongoing dry spell is displacing wildlife from their habitats in search of pasture and water. This has increased human-wildlife conflict as the wildlife comes into contact with members of the public and human activities," read a statement from KWS.

Following a surge in the incidences, the state agency established a rapid response unit January 2023 to help stem the crisis. The Problem Animal Management Unit will work closely with the affected communities as part of the government's plan to foster peaceful co-existence between wildlife and locals. The drought-induced human-wildlife conflicts have resulted in outstanding unpaid compensation claims for wildlife victims to the tune of $21 million in the last two years (2021-2022). A compensation of approximately $40,000 is normally paid to the next of kin in cases of human death after government verification. Victims are often compensated for crop destruction, livestock predation, human injury and death. Between 2020 and 2022, more than 370 Kenyans reportedly lost their lives after attacks by wild animals, while over 2,040 were injured, according to KWS data. Baboons and monkeys are the leading causes of human-wildlife conflict in Kenya, with a majority of the cases reported from areas where locals depend on crop growing and livestock keeping for their livelihoods, according to KWS statistics. Consequently, the Kenyan government has stepped up measures to reduce these conflicts by equipping KWS rangers with the necessary resources to ensure they swiftly respond when incidences are reported.

The government continues to implement several other strategies, including deploying more rangers to supply water and forage to animals in protected areas, to reduce the conflicts across the country, according to Lilian Ajuoga, an assistant director at KWS. "We are doing our best to try and contain wild animals. But it is necessary to also note that some pastoralist communities, too, are encroaching on wildlife corridors due to drought and this also results in conflicts when wild animals protect their territories," said Ajuoga. The KWS is also considering collating and tracking problematic animals with other stakeholders' help and translocating them to avert the destruction of property and human deaths.

IPCC in its projections for the continent.

The relative sea level around Africa has increased at a higher rate than the global mean sea level rise over the last three decades. This trend is likely to continue in the region. The rate of sea-level rise has reached 5 millimetres (mm) per year in several areas on the continent's coastline, especially along Eastern Africa, according to a WMO report. In south-western Indian Ocean from Madagascar, eastward towards and beyond Mauritius, it has even exceeded 5 mm a year. This is above the rate of average global sea-level rise of around 3-4 mm each year. Increase in global warming will contribute to increases in the frequency and severity of coastal flooding in low-lying areas due to coastal erosion, mostly along sandy coasts, according to the IPCC assessment.

Monsoon precipitation is projected to increase over Central Sahel and decrease over the far western Sahel. The monsoon season is projected to have a delayed onset and a delayed retreat, as stated in the report. At 2°C global warming, precipitation is likely to increase by 5-40 per cent in Sahara, including parts of the Sahel. There has been an increase in monsoon precipitation during the 20th century due to warming from greenhouse gas emissions, noted the IPCC report. But this has been masked by the decrease due to cooling from human-caused aerosol emissions. West and Central Africa is likely to experience heavy precipitation and pluvial flooding.

The average tropical cyclone wind speeds are likely to increase in East Southern Africa, according to IPCC. This may lead to increase in the heavy precipitation and more Category 4-5

The 10 most affected countries

Ranking 2018 (2017)	Country	Climate risk index score	Death toll	Deaths per 100,000 inhabitants	Absolute losses (in million US$ PPP)	Losses per unit GDP in %	Human Development Index 2018 ranking
1 (36)	Japan	5.50	1,282	1.01	35,839.34	0.64	19
2 (20)	Philippines	11.17	455	0.43	4,547.27	0.48	113
3 (40)	Germany	13.83	1,246	1.50	5,038.62	0.12	5
4 (7)	Madagascar	15.83	72	0.27	568.10	1.32	161
5 (14)	India	18.17	2,081	0.16	37,807.82	0.36	130
6 (2)	Sri Lanka	19.00	38	0.18	3,626.72	1.24	76
7 (45)	Kenya	19.67	113	0.24	708.39	0.40	142
8 (87)	Rwanda	21.17	88	0.73	93.21	0.34	158
9 (42)	Canada	21.83	103	0.28	2,282.17	0.12	12
10 (96)	Fiji	22.50	8	0.90	118.61	1.14	92

Source: The Global Climate Risk Index for 2018, The 10 most affected countries, www.germanwatch.org/en/cri, accessed in October 2020

(severe) tropical cyclones in the region. Climate change is expected to make Category 5 storms stronger and more numerous in the coming decades, according to Jeff Masters, hurricane scientist with the NOAA. Marine heat waves that have become more frequent since the last century are projected to increase around the continent.

With global warming of 2°C global warming and above, several regions in Africa are projected to experience an increase in frequency and / or severity of agricultural and ecological droughts. Aridity and droughts will increase across Mediterranean (Northern Africa), Western Africa, West Southern Africa and East Southern Africa, the report projected.

Several reports have noted the particular vulnerabilities of African populations to climate change. As WFP Executive Director David Beasley said "while the region has contributed nothing to climate change, it is paying the highest price." An analysis by Washington DC-based Brookings Institution said that seven out of the 10 most climate vulnerable nations in the world are located in Africa. Warming in Africa has exceeded the limits of natural variability. According to the earlier IPCC report (Assessment Report 5, AR5), the near surface temperatures had risen by 0.5°C over the past century. Despite the size and geographical spread of Africa, the only exception to the observed heating trend comes from the central and interior regions of Africa. But even here, there are problems. "It is very likely that mean annual temperature has increased over the past century over most of the African continent, with the exception of areas of the interior of the continent, where the data coverage has been determined to be insufficient to draw conclusions about temperature trends," said AR5. By the end of the century, most models show that temperatures across the continent under the "business-as-usual" scenario will be about 3-6°C higher than the average temperature observed at the end of the 20th century, which is already close to being 0.5°C more than average temperatures at the beginning.

AR5 noted that the maximum change in temperature by the end of the century is likely to occur in the northern and southern parts of the continent. But the fastest rate of change is expected to occur on the western side. "However, in the tropics, especially tropical West Africa, these unprecedented climates are projected to occur 1 to 2 decades earlier than the global average because the relatively small natural climate variability in this region generates narrow climate bounds that can be easily surpassed by relatively small climate changes," said the AR5.

While the AR5 regional profile has singled out Ethiopia and parts of eastern Africa for higher incidences of heat waves, more recent studies have suggested that the problem is likely to affect the entire continent. A study published in *Environmental Research Letters* in 2016 found that even modest warming of 2°C in global average temperatures would be enough to make heat waves a completely normal occurrence. Since Africa is situated between the Tropics of Capricorn and Cancer, it is likely to be the worst affected.

In 2017, the European Commission conducted the most comprehensive analysis of the risks of heat waves in the continent. It found that equatorial and sub-equatorial Africa

POOR OF A COUNTRY EMIT LESS, LOSE MORE

Climate change contributes to economic destitution in many ways

LOW- AND middle-income countries are disproportionately impacted by climate change even though they emit less greenhouse gases than their richer counterparts. The gap between the carbon emissions of the rich and the poor within a country, however, is higher than the difference in overall emissions among countries, according to the Climate Inequality Report 2023 authored by economists from the World Inequality Lab at the Paris School of Economics. The objective of the report was to decode the magnitude of climate inequality based on a detailed systematic analysis focusing on low- and middle-income countries. The report's authors have coupled this analysis with empirical data and studies to advocate advanced pathways to develop taxing and social policies that combat climate inequalities at their centre.

The report identified the key contributors and provided a firm perspective on climate inequalities. They have compared the global bottom (50 per cent), middle (40 per cent) and top (10 per cent) income countries. They found that 48 per cent of emissions is from the top 10 per cent of emitters, having 76 per cent capacity to finance, and their relative loss is a mere 3 per cent from climate change. However, the global bottom (50 per cent) has only a 2 per cent capacity to invest, with an emission of 12 per cent and a massive relative loss of 75 per cent.

The report introduced a section labelled "polluting elites". The 65,130 wealthiest individuals in this section with over $100 million (around €92 million) and representing 0.001 per cent of the world's adult population, should pay a "progressive tax" ranging from 1.5-3 per cent of their fortune to help less fortunate people adapt to global warming and crisis, the authors asserted. They also illustrated how combating global poverty need not overshoot global carbon budgets to meet the Paris Agreement targets. They suggested redistribution measures to combine poverty alleviation and climate change mitigation efforts towards increased efficiency. Considerably reducing the share of people in energy poverty (from 60 per cent at present to 10 per cent) would only moderately increase global energy consumption by 6.7 per cent, the authors wrote citing data from a 2021 report.

Climate change contributes to economic destitution in many ways. It lowers agricultural productivity in poorer countries. "Tropical cyclones and floods will continue to displace millions in low-income countries, and rising sea levels will make coastal land inhabitable. While such events affect our planet communally, studies point to a robust socio-economic relationship between exposure (especially vulnerability) and current living conditions, whereby the worst off are more affected than the rest," said the authors of the report. Some temperate countries are seeing their agricultural productivity increase under global warming, and their gross domestic product is also growing.

The 65,130 wealthiest individuals with over $100 million and representing 0.001% of the world's adult population, should pay a "progressive tax" ranging from 1.5-3 per cent of their fortune to help less fortunate people adapt to climate emergency

In contrast, many subtropical and tropical countries are facing significant output losses due to global warming. The report, citing the findings of a 2022 paper, pointed at a positive but decreasing effect of total annual rainfall on average output growth. Climate change also has adverse effects on mental health. A 1 degree Celsius increase in monthly average temperatures increases suicide rates by 0.7 per cent in the US and 2.1 per cent in Mexico, the report noted. It shed light on the changing nexus as emerging powerful economies like China now carry increased responsibility for the carbon dioxide stock in the atmosphere. The authors demanded they produce transparent strategies for reaching Net Zero emissions. "This report underscores once again the need for a just transition to a low carbon economy which reflects unequal responsibility for causing the climate crisis and uneven capacity to help address it," they wrote.

For decades there have been discussions about how countries have disparate responsibilities toward combating climate change. This report, for the first time, has stressed the differing responsibilities of individuals. It proposed the application of the "common but differentiated responsibilities" principle among individuals.

would be particularly badly affected. Under the business-as-usual scenario, "the Gulf of Guinea, the Horn of Africa, the Arabian peninsula, Angola and the Democratic Republic of Congo are expected to face, every 2 years, heat waves of length between 60 and 120 days. Once every 30 years heat waves are projected to be longer than 180 days over parts of central Africa and the Arabian Peninsula."

Over the past 15 years, several studies have warned of climate change and environmental stressors intensifying and aggravating regional, ethnic and resource-driven conflicts. Conflicts have been reported over land and water from Kenya, Tanzania, Uganda, Somalia, Sudan, Zimbabwe and Lesotho apart from West Africa and Sahel. In recent years, waves of dangerous migration across the Mediterranean into Europe have dominated the news. Outmigration from sub-Saharan and North Africa has been linked directly and indirectly to environmental changes and conflicts (also influenced by environmental changes). While migration depends on several complex social, economic, political and environmental factors, estimates suggest that by the mid-century, more than 200 million people could be on their way out of the continent unable to contend with the ground realities. This number would account roughly for 10 per cent of Africa's population in the mid-century.

DOUBLE BURDEN

Africa carries a double burden. One is to climate proof itself to save its natural resources dependent economy. The other one is to maintain the global economic growth because the continent is also a major exporter of raw resources that run the modern economy. According to the World Bank, most of the shocks caused by climate change are also the causes for poverty in

The youth from agriculture-dependent countries — Ghana, Chad and Mauritania — identified a close link between agricultural production and climate change. In Europe, climate change was ignored when the impact was felt elsewhere

the continent. "The consequences of climate change for Africa are devastating and threaten to push millions of people into extreme poverty by 2030, largely due to lower crop yields and higher food prices, and negative health impacts," said Benoit Bosquet of the World Bank. This projection is already playing out in South Sudan, the world's youngest country.

Expectedly, the young population in the continent sees the climate crisis as a major threat for future. Young Europeans and Africans consider climate change as the biggest threat to the world, according to a new survey. But there are key differences in the degree to which they perceived the threat. Every single European surveyed, cited climate change as a major concern. Most African participants did so. But some who did not, were concerned with fallouts of climate change like food insecurity, severe weather events and adverse economic conditions. The survey report was released November 16, 2022, at the 27th Conference of Parties (COP27) to the United Nations Framework Convention on Climate Change. It was released by the European Investment Bank and two citizen-engagement platforms — Debating Africa and Debating Europe.

The Securing our Future report finalised its conclusions based on a survey conducted among 100 young people (18-35 years) from Africa and Europe. The report also enlisted potential solutions identified by the respondents. The youth from agriculture-dependent countries — Ghana, Chad and Mauritania — identified a close link between agricultural production and climate change. In Europe, climate change was ignored when the impact was felt elsewhere. The region started to act upon it only when Europeans felt the consequences. The participants were aware of the links between climate change and other threats, such as migration, resource scarcity and conflicts. Africa remains the most vulnerable continent despite its low contribution to greenhouse gas emissions, noted the participants from both continents. "People in Africa are much more affected by climate change, than we are," said Alvaro, a participant from Europe. ■

ISTOCK PHOTO

CLIMATE MIGRANTS

Africa will report the maximum number of internal migration

THE 27th CONFERENCE of the Parties (COP27) to the UN Framework Convention on Climate Change finally came up with the much-awaited "loss and damage" fund for vulnerable countries, the most talked about agenda. But questions still remain as to who is eligible for it. For over 6,000 years, humans have restricted their habitat settlements to an annual average temperature of -11 to 15°C or climate niche. Currently—as of 2020—only 0.8 per cent of the world's land surface experience annual temperature of more than 29°C or over. But in a warming world, if emissions go unabated, this range could rise to 19 per cent of the Earth's surface, affecting 3 billion of the projected 9 billion people, by 2070.

In a warming world, as seen in the maps, "climate suitability" would stretch to even the

sparsely populated Arctic regions of the world. This expansion of the climate niche threshold could trigger the next wave of migration for people looking to locate to more temperate regions. To identify how migration in the future would look like, *Down To Earth* magazine mapped migration hotspots as per the World Bank's "Groundswell Part 2" report. According to the report, 216 million people will be migrating within their own countries.

While migration is often influenced by various reasons, socio-economic, political and environmental, the sub-Saharan and African regions will report the maximum number of internal migrants, up to 40 per cent of the global migration. East Asian and Pacific countries (23 per cent) and South Asian countries (19 per cent) are the next hotspots globally.

According to the report, while the Global South will bear the maximum burden of internal migration, the reasons might vary from region to region, depending on various climate change-related issues like water scarcity or rising sea level.

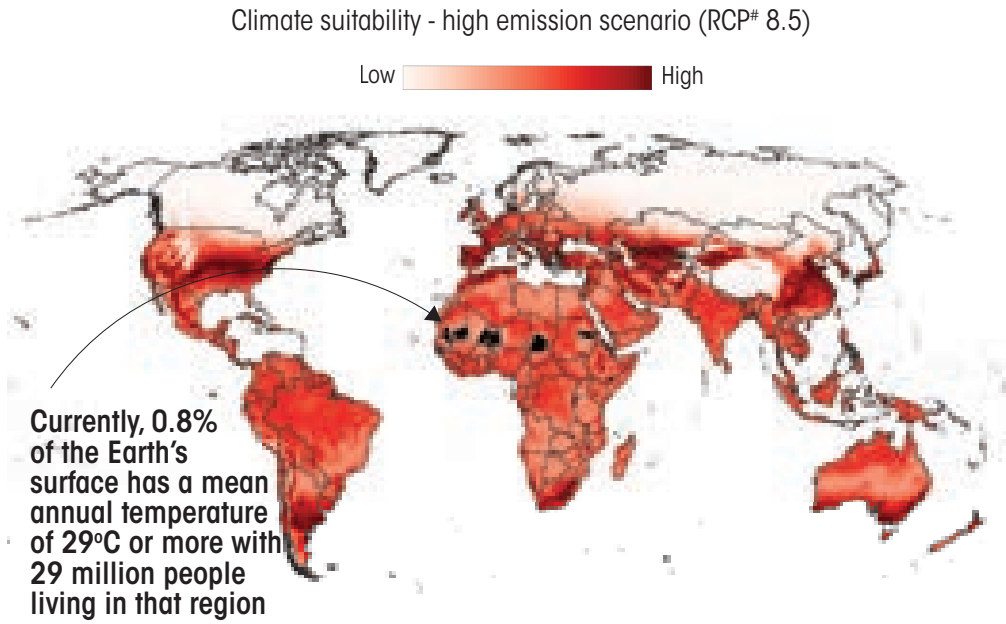
While climate change is a global phenomenon, a common thread across various datasets is how the sub-Saharan countries are disproportionately affected due to global warming.

As seen in the maps and across other future climate scenarios, the region stretching from Senegal in the west to Somalia in the east of the African continent, will be the hardest-hit if emissions are not reduced. Niger will be experiencing 238 days of temperature hovering over 35°C, followed by Mali (231) and Sudan (223).

The whole of the Global South will be affected as mortality costs will be into much of their GDPs or gross domestic products. In Niger, the most heat stress-affected country, mortality costs would eat 16 per cent of its GDP, followed by Sudan (11 per cent), Mali and Mauritania (10 per cent). ■

CURRENT CLIMATE SUITABILITY

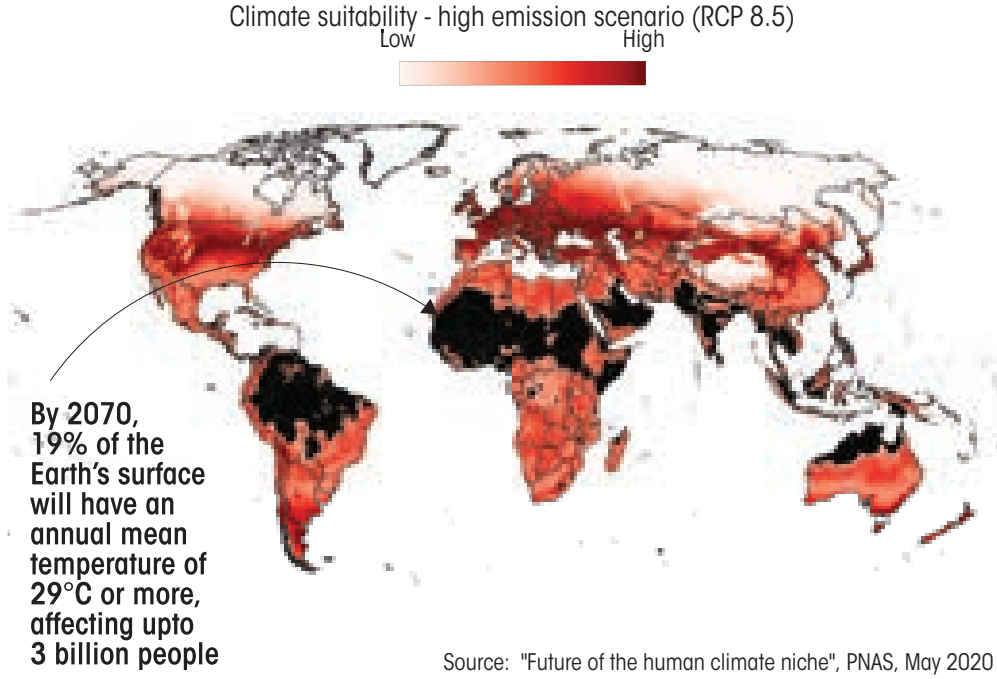
For over six millennia, people have resided in the same climatic niche or temperature range suitable for living with annual mean temperatures between -11°C and 15°C.



Representative concentration pathway (RCP) scenario; RCP 8.5 is highest emissions scenario
Source: "Future of the human climate niche", PNAS, May 2020

CLIMATE SUITABILITY: 2070

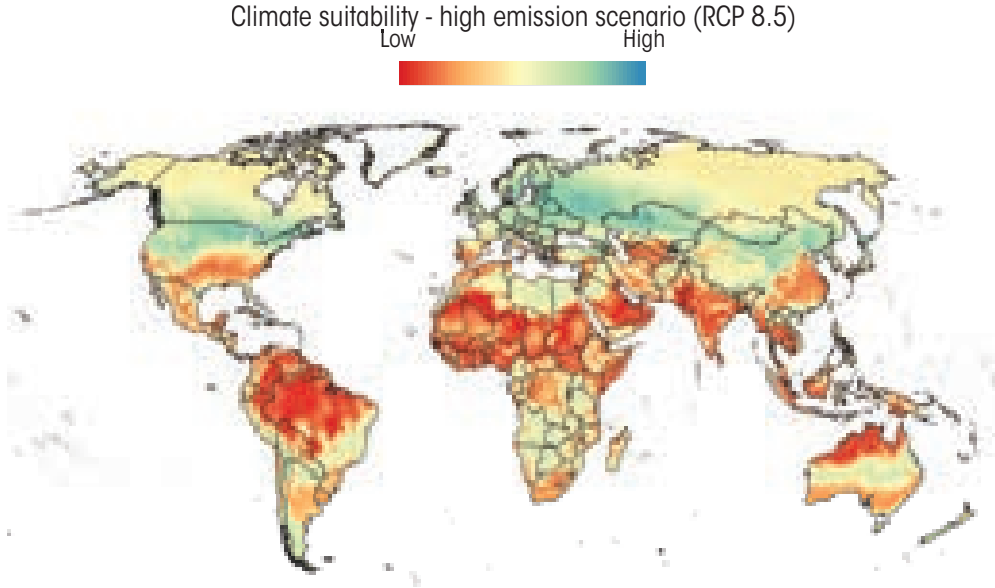
With global warming, 19 per cent of the Earth's surface is going to experience at least 29°C or more annual mean temperature by 2070, affecting 3 billion people and driving climate migration.



Source: "Future of the human climate niche", PNAS, May 2020

NET CLIMATE SUITABILITY

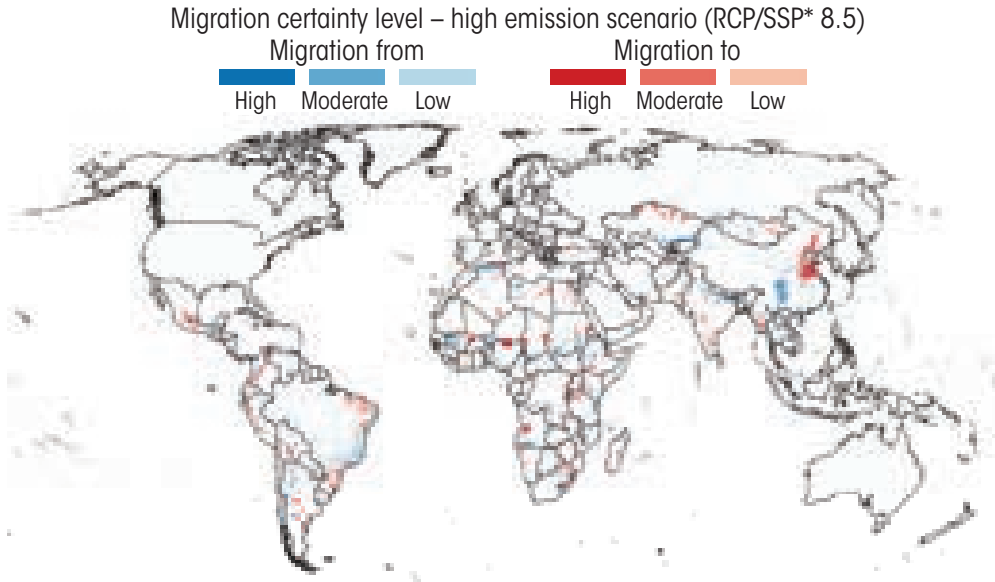
While it is difficult to predict future migration patterns, a warming world holds the key to unleashing the next wave of human migration, heading into the future. The map below presents net climate suitability change over the next 50 years (2020-70).



Source: "Future of the human climate niche" , PNAS, May 2020

MIGRATION HOTSPOTS

With climate change triggering the next wave of migration, according to a World Bank report, by 2050, at least 216 million people will be migrating within their own countries. Migration being a dynamic event, influenced by various socio-economic and political factors, the reasons might vary from region to region. According to the report, 40% of the total migration will happen in sub-Saharan African countries where water scarcity will be the main driving force, apart from other socio-economic reasons; in Bangladesh, where almost half the total number of internal migration will happen in the South Asia region, rising sea level and increasing storm surges will be the biggest factor in migration

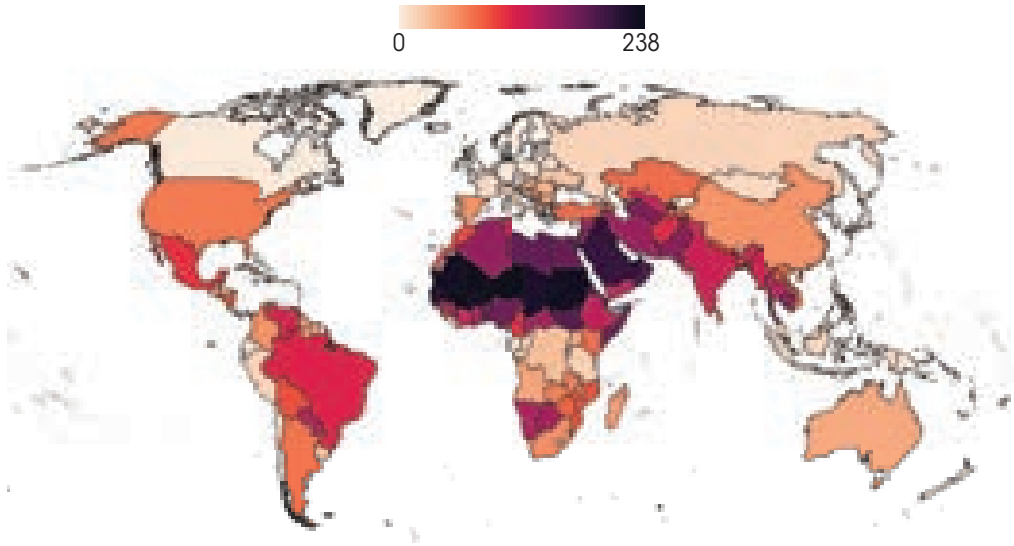


*Representative concentration pathway (RCP)/shared socioeconomic pathway; RCP 8.5 is highest emissions scenario. Source: "Groundswell II: Acting on internal Climate Migration", World Bank, 2021

DISPROPORTIONATE STRESS

But with time running out before the world breaches the 1.50C threshold, data compiled by researchers show how various countries are increasingly becoming vulnerable to heat stress. A common thread across all datasets is how vulnerable sub-Saharan African countries are to global warming and how disproportionate the share is, compared to other nations. While steps have been taken to set up a loss and damage fund during COP27 for vulnerable countries, which countries actually qualify for that?

Days over 35° (2040–2059) – high emission scenario (SSP 8.5)

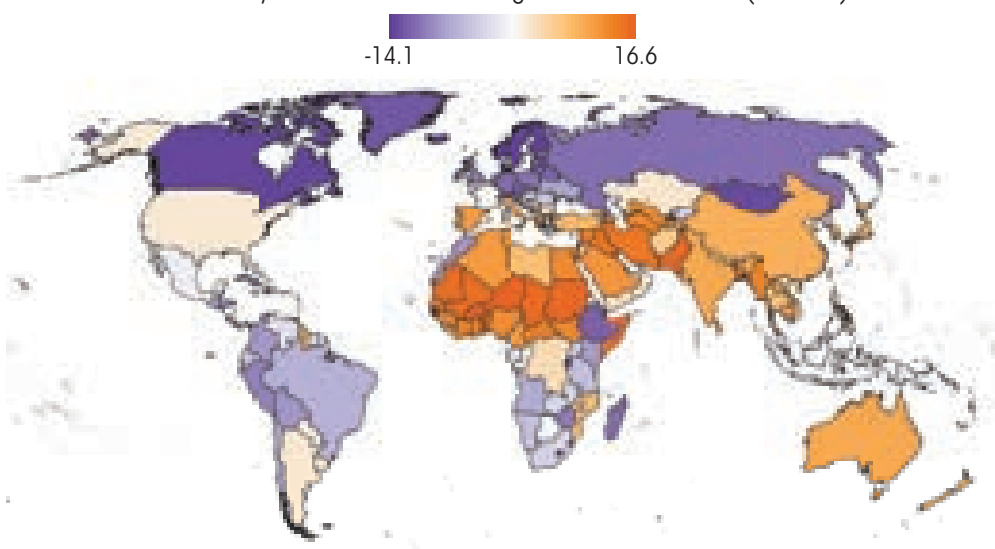


Source: Human Climate Horizons, UNDP, 2022

SO, WHO IS VULNERABLE?

According to the UN Framework Convention on Climate Change, vulnerable countries qualify for the loss and damage fund which was created during COP27. But who is actually vulnerable? Different organisations have varied definitions for that. While talks around "loss and damage" and who qualifies for that have been fuelled by vague arguments, the map below paints a human tragedy which will be unfolding heading into the future (2040-59): how can mortality costs due to climate change be quantified?

Mortaility costs as % of GDP - high emission scenario (RCP 8.5)



Source: "Human Climate Horizons", UN Development Programme, 2022

PHOTOGRAPH COURTESY: UNHCR

A CONTINENTAL DISASTER

The immediacy of managing disruptive climate events has displaced governance priority of bridging the development deficit

A CHURN IS underway across Africa. An era of civil conflicts that followed centuries of colonial plunder across the continent seems like a thing of the past. Just as the majority of African nations were scrambling out of violent conflicts, the challenge of climate change has put the aspirations of the entire continent in serious jeopardy. The immediacy of managing disruptive climate events has displaced governance priority of bridging the development deficit. More than 2,000 natural disasters have hit Africa since 1970 affecting 500 million people and killing 0.9 million. People have one common query: why Africa?

As one tracks the state of climate in Africa in 2021-2022 (till August), it emerges clearly

that the continent's climate has undergone drastic alterations. Weather-related disasters are hitting countries with unimaginable ferocity and frequency. In June, 2022 the Internal Displacement Monitoring Centre (IDMC) reported that in Africa, hundreds of thousands of people had been internally displaced due to the effects of climate change and recent droughts in Ethiopia's Somali and Oromia regions. Disasters related to climate change not only threaten to increase poverty and hunger and reduce access to natural resources such as water, but may also cause increased instability and violence, IDMC added. The Sahel region is enduring the worst of the climate crisis, with temperatures rising 1.5 times faster than the global average and exacerbating conflicts over scarce resources, the findings showed. This makes life more difficult for those forced to flee their homes.

Every third death (35 per cent) from extreme weather, climate or water stress in half a century was in Africa, the World Meteorological Organization (WMO) said in "The Atlas of Mortality and Economic Losses from Weather, Climate and Water Extremes (1970–2019)" released in September, 2021. The continent accounts for only 17 per cent of global population. Four droughts — 1973 and 1983 in Ethiopia, 1981 in Mozambique and 1983 in Sudan — were responsible for 89 per cent of the total deaths in Africa from weather, climate and water extremes in the last 50 years.

Up to 13.5 million people across Africa's Sahel region could fall into poverty due to climate change-related shocks by 2050, according to a World Bank report "The Country Climate and Development Report for the G5 Sahel Region" published in September 2022. Sahelian countries need $33.16 billion for climate adaptation by 2030, the report estimated. The Sahel extends south of the Sahara from Senegal in the west to Ethiopia in

Disasters related to climate change not only threaten to increase poverty and hunger and reduce access to natural resources such as water, but may also cause increased instability and violence

the east of Africa. It is particularly vulnerable to land degradation, droughts, floods and other climate shocks. The G5 Sahel is a group that comprises Burkina Faso, Chad, Mali, Mauritania and Niger. The impacts of climate change are unequally distributed among the people in the region. Small farmers, pastoralist populations, women and poor communities are at the receiving end of climate shocks.

Three of the G5 countries — Chad, Niger and Mali — rank among the top seven countries most vulnerable to climate change. Their ability to adapt is significantly constrained by poverty and fragility. The Sahel region is home to 89 million people, with population growth rates unequivocally higher than any other part of the world. The Sahel countries face multiple challenges. More than 50 per cent of the population lives below the poverty line and many countries are confronted with the threat of terrorism. The region's population jumped to 86.4 million from 17.3 between 1960 and 2020. The population is further expected to soar to between 180 and 211 million by 2050. Livelihoods in the region are highly dependent on agriculture, pastoralism or fishing and these sectors are deeply affected by climate change. "With the population projected to double over the next 20 years, Sahel countries need to accelerate growth and prioritise climate adaptation if they are to realise the demographic dividend," Ousmane Diagana, World Bank vice president for western and central Africa, was quoted as saying in the report.

Around 490 million children under the age of 18 in 35 African countries are at the highest risk of suffering the impact of climate change, warned Save the Children International, a child rights non-profit. Sub-Saharan Africa has 35 of the 45 countries globally at highest climate risk, found the global NGO in an analysis. Chad, Somalia, Central African Republic, Eritrea and Democratic Republic of the Congo are the least capable of adapting to the impact of climate change. Of the 750 million children in 45

YOUNG CHILDREN ARE ESPECIALLY VULNERABLE TO THE HEAT EXPOSURE

More than five million people die on average each year across the world due to extreme temperatures

REDUCING CARBON emissions can prevent 4,000 to 6,000 child deaths due to heat in Africa every year, according to a study published in *Environmental Research Letters* on July 4, 2022. Heat-related child mortality due to high emissions is projected to double in the continent by 2049, compared with 2005–2014. The study was conducted by a team of international scientists led by University of Leeds in collaboration with researchers at London School of Hygiene & Tropical Medicine (LSHTM).

Limiting temperature increases to Paris Agreement's 1.5°C targets through 2050 can prevent heat-related child deaths, found the study. It also estimated the impact of climate change on annual heat-related child deaths for the current (1995–2020) and future time periods (2020–2050). A comparative risk assessment was conducted to project the numbers of heat-related child deaths under low, medium and high-emissions scenarios. In the high-emission scenario, where carbon emissions were not reduced, heat-related child deaths could double by 2049 compared to 2005-2014. An estimated 38,000 child deaths could occur every year by 2049.

Under the low-emission scenario, approximately 4,000-6,000 heat-related child deaths annually can be prevented in Africa. Rapid carbon emission cuts across sectors are required to achieve this and to remain in line with the Paris agreement target of limiting global warming to 1.5°C. The medium-emission scenario, which combines elements of the low and high circumstances, would still prevent 2,000-3,000 deaths per year. The study co-author Cathryn Birch from School of Earth and Environment at Leeds said: "Temperatures are already increasing in Africa. Since 1980, temperatures have risen between 0.2-0.4°C per decade. As temperatures continue to increase due to climate change, so will heat-related deaths. Young children are especially vulnerable to the effects of heat exposure. They have limited ability to thermo regulate and high temperatures can increase disease transmission and outbreaks."

The study emphasises the need for urgent child health-focused climate change mitigation and adaptation measures. Minimal epidemiologic information is available on the relationship between temperature and mortality in children in African countries. The team used previous studies in Ghana and Kenya to represent high and low bounds of heat-related mortality burdens for the continent.

PHOTOGRAPH COURTESY: ICRC

The researchers did not project heat-related child mortality beyond 2050 because of uncertainties in the socio-economic projections.

More than five million people die on average each year across the world due to extreme temperatures, according to a 20-year study. Of this, 4.6 million deaths on average occurred annually due to extreme cold, while 0.48 million deaths occurred due to extreme heat. According to another study, more than a third of heat-related deaths (37 per cent) across the world between 1991 and 2018 were caused by the planet's warming due to anthropogenic activities. The share of heat-related deaths attributable to warming was above 40 per cent in Mexico, South Africa, Thailand, Vietnam and Chile.

The researchers acknowledged the limitations of this study, which include the reliance on heat-mortality relationships from existing literature that allowed the use of only two regions — Ghana and Kenya. Population-specific temperature mortality relationships have been found to vary by latitude, altitude, socio-economic factors such as income inequality and factors relating to the built environment, such as the prevalence of air-conditioning use. The study urged more research to understand how extreme heat affects the health of children and which interventions can effectively manage and mitigate heat impacts on vulnerable populations and save thousands of children from dying unnecessarily.

countries likely to be most affected by climate risk, 210 million are in three South Asian nations — Pakistan, Bangladesh and Afghanistan. The analysis is based on the most recent Notre Dame Global Adaptation Initiative (ND-GAIN) index. ND-GAIN has ranked the countries by their vulnerability to climate disruptions and their readiness or capacity to adapt to climate change. The lower the capacity to adapt and cope, the higher is the risk of impact on children. Climate risks are based on the scenario where climate policies limit and stabilise greenhouse gas concentrations to 4.5 W m-2 by 2100.

Extreme weather events — floods, droughts and hurricanes — will have impact on the vulnerable children and their families most. Children will be affected by food shortages, diseases and other health threats, water scarcity from rising water levels, or a combination of these factors, alarmed Save the Children. For example, children in the Democratic Republic of Congo are suffering from malaria and dengue attributed to climate change. Increase in extreme weather events can exacerbate these new health risks while the public health system is already under a lot of pressure. For when intensity of cyclones, hurricanes and typhoons increases in the next century due to global warming, Save the Children reminded of the need for social safety nets as a key adaptation measure, citing a study in the *PNAS* journal. In the absence of such measures, many more families and children are pushed further into poverty or are forced to flee their homes. This resonates with concerns raised by the International Organization for Migration (IOM) and United Nations High Commissioner for Refugees (UNHCR) in case of displacements due to hydro-geological events such as floods, cyclones, when frequent displacements due to such disasters leave little time for recovery between one shock and the next.

The year 2022 started with the spectra of climate change looming large over the continent. The UN had announced that Madagascar was on the brink of experiencing the world's first "climate change famine"

The year 2022 started with the spectra of climate change looming large over the continent. The UN had announced that Madagascar was on the brink of experiencing the world's first "climate change famine". Madagascar has among the highest poverty rates in the world. It was ranked as the fourth most vulnerable nation to climate impacts in the 2020 Global Climate Risk Index. Around 80 per cent of its population lives in rural areas. Most people in the south of the country depend on rain-fed, small-scale agriculture to survive. But climate change has had the most disastrous repercussions: Streams, rivers and small dams built for irrigation have dried up. In some areas, locust invasion has destroyed fields of maize.

The world's fourth-largest island, located just across the Mozambique Channel from the coast of mainland Africa, became notorious in late 2021 after water became more expensive than food in the country. This was acutely felt in the country's drought-hit southern regions. And it is still being felt. Twenty litres of water are priced at Ariary (Ar) 2,000-Ar4, 000— almost the half of a daily salary for a poor peasant — outside the regional capital city of Ambovombe, according to local businessman Tsimanaoraty Paubert. Many in Madagascar's capital Antananarivo and its suburbs risk their lives to access water for basic human needs. "I hardly sleep at night. I have to stay awake till midnight in order to collect water at the drinking fountain near my home," local photojournalist Hervé Leziany said.

Water had become a luxury in his neighbourhood located in the western suburbs of the country's main city. It was only available between 11 pm and 2 am. In the eastern suburbs of Antananarivo, some woke up at 1-2 am to fetch water at the only community-managed well on a downhill marsh where locals had come to for years. "The stock is not sufficient for everyone. If you are late, you have to wait for the water level in the facility to rise again

CHANGING FACE OF AFRICA

All five regions in Africa have been experiencing an increase in temperature. This trend is likely to worsen in the coming decades. There has also been a decline in precipitation indicating less rainfall, which could make the continent even more food insecure

Western Africa

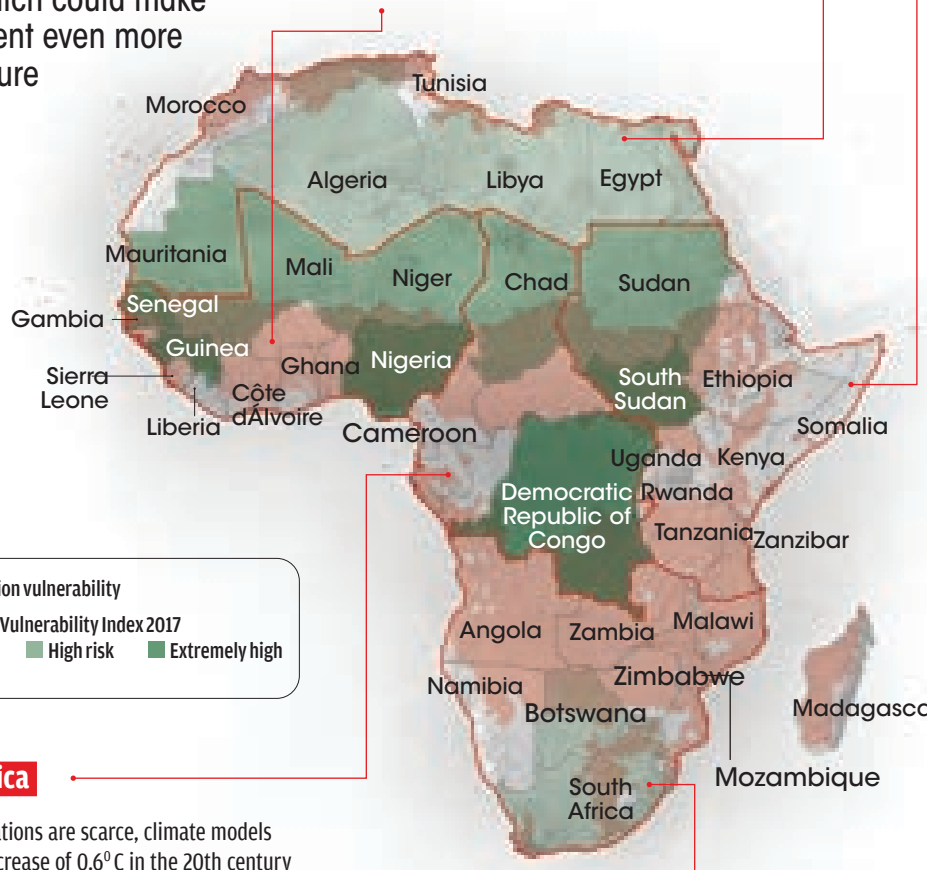
- Temperatures across West Africa have risen rapidly over the last 50 years. Average annual temperature has increased by about 2^0 C over the last century
- By the end of the current century, temperature increase could be between 3^0 C and 6.4^0 C relative to the 1961-1990 baseline, much higher than the global average
- Precipitation is likely to reduce marginally by around 7 per cent by the end of the 21st century
- A significant increase in the temperature of hottest days and coolest days has been observed in some parts. While an increase in drought in the region has also been observed, there is likely to be an increase in the frequency of hot days in the future

Northern Africa

- Temperature increases of about 2^0 C have been observed over the 20th century
- In recent decades, temperature has increased by about 0.16^0 C per decade
- Temperature increase by the end of the century is likely to be between 3.3^0 C and 6.5^0 C, relative to the 1961-1990 baseline, and higher than the global average
- There are no clear trends in precipitation. However, it is likely to decline by around 16 per cent by the end of the century

Eastern Africa

- The equatorial and southern parts of eastern Africa have experienced a significant increase in temperature since the early 1980s. Temperature in the region increased by 1.5-2^0 C in the 20th century
- Projected maximum and minimum temperatures over equatorial eastern Africa show a significant increase in the number of days warmer than 2^0 C above the 1981-2000 average by the middle and end of the 21st century. Temperature is likely to be between 2.7^0 C and 5.4^0 C above the 1961-1990 baseline by the end of the century
- Precipitation in eastern Africa is highly variable, however temperature and pressure in the Indian Ocean and the Mediterranean Sea have caused a significant decline in rainfall since the mid-20th century. As a result, there has been an increase in the number of droughts



Central Africa

- While observations are scarce, climate models suggest an increase of 0.6^0 C in the 20th century
- Climate projections indicate that temperature could rise up to 5^0 C, compared to the 1960-2000 baseline values
- Changes and projections regarding precipitation in the central African region and the Congo basin remain highly uncertain due to the lack of observational climate data
- Although data is scarce and projections are highly uncertain, countries in the central African region are considered to be among the most vulnerable due to poor socio-economic indicators, lack of governance framework and low levels of infrastructural development

Southern Africa

- Southern Africa has experienced increases in temperatures of up to 2^0 C over the last century. The most rapid heating has been observed post-1980
- Temperature is expected to continue to increase through the century, and is likely to be anywhere between 2.8^0 C to 6.3^0 C above the 1961-1990 baseline
- Western parts of southern Africa, from Namibia to Angola and the Congo, received less summer rain in the second half of the 20th century, while other southern countries like Botswana, Zimbabwe and western parts of South Africa have also had modest decreases in rainfall

before getting the chance to fill up your cans. The well dries up quickly and takes hours to replenish itself," Fetra R complained on December 20, 2021. The 25-year-old man and his wife had, for months, ensured water for households out of the state-owned electricity and water company Jirama's clients' network. They earned Ar500 for every 20 litres they delivered, against Ar300 previously. They scaled up their price because of the challenges they faced due to the mounting water scarcity. "I intend to put it at Ar700 if the problem continues." Water unavailability pushed upset students at the Antananarivo University campus to take to the streets and clash with the police in November 2021.

Many tried to avail water in whatever way they could, mostly from the insalubrious water sources in Antananarivo's plains and elsewhere for domestic purposes. Day and night, those having cars collected stagnant water on riverbanks kilometres away from the city. In the rural areas, carts, motorcycles, bicycles and any means of transport alike were used for the same purpose. "Like in 2019-2020, the country is now experiencing a prolonged dry season related to the La Nina phenomenon in the Pacific Ocean. The rainfalls are delayed. The onset of the rainy season is somewhat dry. We have the first rains only in December-January," Mamiarisoa Anzèla Ramarosandratana, head of the climate adaptation section within the meteorology department, said. She added that the current prolonged drought was the logical continuation of the low rainfall registered in 2019-2020 and 2020-2021. For the last two years, Madagascar received only around 60 per cent of its usual average rainfall, the lowest in 30 years.

The risk of desertification affects from around 30 per cent of the total land area towards the western parts in Ghana and Nigeria to around 80 per cent in eastern countries like Ethiopia and Kenya

EXPANDING DESERTS

Rising temperatures are altering the landscape of Africa. That Africa's deserts have been in a state of expansion is no secret. Archaeological records suggest that the continent has been becoming drier and more arid for nearly 5,000 years. Along with the massive deserts that stretch from the eastern to the western part of the continent, dry lands constitute more than two-thirds of the continent's surface area. According to estimates, these drylands are estimated to support nearly half-a-billion people. Two-thirds of Africa's cultivable lands, one-third of its grazing lands and 20 per cent of its forests have already turned to dust.

But while it may not be new, the rate and expanse of degraded and desertifying lands is unprecedented. The World Atlas of Desertification, prepared by the Joint Research Centre (JRC) of the European Commission and the United Nations Environment Programme (UNEP), released in 2018, showed that more than 75 per cent of Earth's land area was already degraded and some 418 million ha, or half of the size of the European Union, was getting degraded every year. Most of this is happening in Africa and Asia, which account for almost 67 per cent of the degradation occurring in dryland areas. By 2040, over 70 per cent of the big cities (housing 0.3 million population) currently in non-dryland areas will grow drier. In contrast, 43 per cent of the big cities in dryland areas will be hit by desertification.

The Sahara desert, approximately the size of the US, had expanded by a mind-boggling 10 per cent since 1923. All of it in the Sahelian belt and Central African region that stretches alongside the Sahara desert to its south. Across the Sahel, temperature increased by up to 2 degree C over the last century which is close to double the observed global average temperature increase. The risk of desertification affects from around 30 per cent of the total land area towards the western parts in Ghana and Nigeria to around 80 per cent in eastern countries like Ethiopia and Kenya.

TO PLAY IN THE MIDDLE

Global warming made Niger, Nigeria floods 80 times more likely

THE TORRENTIAL rains and floods that killed 600 and 200 people Nigeria and Niger respectively from June to October 2022 were made 80 times more likely because of climate change, according to an analysis by the World Weather Attribution (WWA), an initiative by a global network of climate scientists report. The deadly floods in Chad, Cameroon and surrounding regions in the same period may also be linked to human-induced climate crisis. Flooding occurred as a consequence of above average rainfall throughout the 2022 rainy season, the authors said in the report. This condition was exacerbated by shorter spikes of very heavy rain leading to flash floods as well as riverine floods, found the analysis. he analysis by scientists from Nigeria, Cameroon, India, the Netherlands, France, Denmark, South Africa, Sweden, the United States and the United Kingdom used published, peer-reviewed methods to perform the event attribution study.

The team of these experts compared past climate data and present weather information focusing on Lake Chad and the lower Niger River basins to determine the impact of rising temperatures on flooding in the region. Seasonal rainfall over Lake Chad was found to have increased significantly due to the rising global temperatures, the study said. Climate change from human activities that lead to greenhouse gas (GHG) emissions and changes in aerosol pollution and other gases affect rainfall in the region, it added.

Human-caused climate change made the extreme seasonal rainfall in Chad about 80 times more likely, concluded the study. Lake Chad is located in the Sahelian zone of west-central Africa at the conjunction of Chad, Cameroon, Nigeria and Niger. The extreme rainfall over Lake Chad Basin was also likely to be more frequent and intense, the analysis showed. It found that the extreme seasonal rainfall in Chad was 20 per cent more in volume and intensity than the normal as a result of climate change.

In Chad basin, such intense events have a one in 10 chance of happening each year, the report added. Over the lower Niger basin, the unseasonal extreme rain will be twice as likely and approximately 5 per cent more intense or more in volume than the normal due to climate change, the analysts wrote.

And this trend is not limited to the Sahel and Central Africa. Two of Africa's three hot deserts are in the south, namely the Kalahari and the Namib deserts. In March 2018, a study published in the Journal of Climate showed that the largest desert in the world—the Sahara—had been expanding due to shrinking rainfall and extended dry conditions. Armed with 93 years of field and satellite data, researchers said that the Sahara had expanded by about 10 per cent—close to a staggering 1 million sq km. If it were a nation, the expanded area itself would be the 30th largest country in the world.

In southwest Africa, there are reports that the hot Namib Desert too is expanding. In the latter half of the 20th century, the continent has been witnessing extended spells of drought and extreme rainfall. The rapid and successive swinging between dry and wet conditions has devastated regions in the south and east of the continent. According to the latest IPCC report, it is "very likely" that the northern and southern parts of the continent will experience a decline in precipitation levels and undergo more intense dry conditions in the future. At the same time, the eastern and central regions are set to have a wetter future. However, wetter doesn't necessarily mean better. IPCC noted that over the last 30-60 years, extreme precipitation changes alternating between tempestuous rains and prolonged droughts had been observed with increasing frequency. While the Namib stretches along the coast in Namibia and South Africa, the Kalahari is more expansive, spreading across Botswana, Namibia, Zimbabwe, Zambia and Angola. Rainfall, in agreement with previously made projections, shows a declining trend in the already dry regions of southwest Africa. Intense droughts over the last 50 years, an especially in the last decade, have contributed to a creeping expansion of degraded and dry lands.

While the degradation of land is worrying in itself, it is compounded by population pressures. Sub-Saharan countries have among the fastest growing populations of the world with several countries exhibiting more than twice the global average. Worse, close

to 80 per cent of the population is dependent on land-based natural resources and subsistence farming both of which are under-threat by expanding deserts and degraded lands. As the population continues to increase through the first half of the 21st century, the stress on natural resources is expected to exacerbate human conflict and migration.

The 1992 Earth Summit in Rio recommended the formation of a convention to combat desertification which came into force in 1996. But despite over 25 years of its existence, the United Nations Convention to Combat Desertification (UNCCD) is yet to gather steam in its efforts to halt and ultimately reverse the terrifying trend of quickly degrading lands, especially in Africa. In 2007, the Great Green Wall Initiative was launched as a collaborative effort to reforest and restored a 16 km-wide corridor stretching 8000 km from west Sahel to the east with a total expected outlay of US $8 billion. According to UNCCD, more than 20 million hectares have been restored under the initiative however success is not consistent across the Sahel.

In 2015, while the world was preoccupied with the Paris Agreement and its potential to address climate change, a first-of-its-kind pan-African initiative known as the African Forest Landscape Restoration (AFR100) was launched in relative obscurity. Under the initiative, 26 sub-Saharan African countries committed to restore 100 million ha of degraded and deforested land by 2030. More than seven years since its launch, the focus now is to move beyond commitments and towards implementation and nations are actively developing restoration strategies. ■

BEING WATER-SCARCE

Climate change will have a direct impact on the water resources of Africa, thus, on the food security as well

BY 2020, between 75 and 250 million people in Africa were projected to be exposed to increased water stress due to climate change. In some countries, yields from rain-fed agriculture could drop up to 50 per cent. This is because traditional water sources are drying up. Take Ethiopia for instance. Known as the continent's water tower, the country is confronting huge challenges of disappearing lakes and rivers. Zewudu Molla, a farmer who grew vegetables using water from the Lake Ziway in the Rift Valley Basin, said that tapping the lake's water was no longer possible. "The lake has shrunk so much that there is a big landmass between my farm and the water area of the lake," he said. Ethiopia had already lost one of its great lakes, the Haramaya Lake. The lake, which once covered 16 km and had a depth of over 9 metres,

WAR FOR WATER

Almost all major river basins have become the epicentre for conflicts in Africa

Countries that have experienced unrest over water

NILE RIVER
Egypt, Sudan and Ethiopia

Dispute started in 2011

The Nile water dispute stems from an **under-construction dam by Ethiopia**, which **Egypt** (that lies downstream) **fears will impact its water flow.** Once completed, the Grand Renaissance Dam hydropower project will be the **largest in Africa**

LAKE CHAD BASIN
Nigeria, Niger;Chad; Cameroon

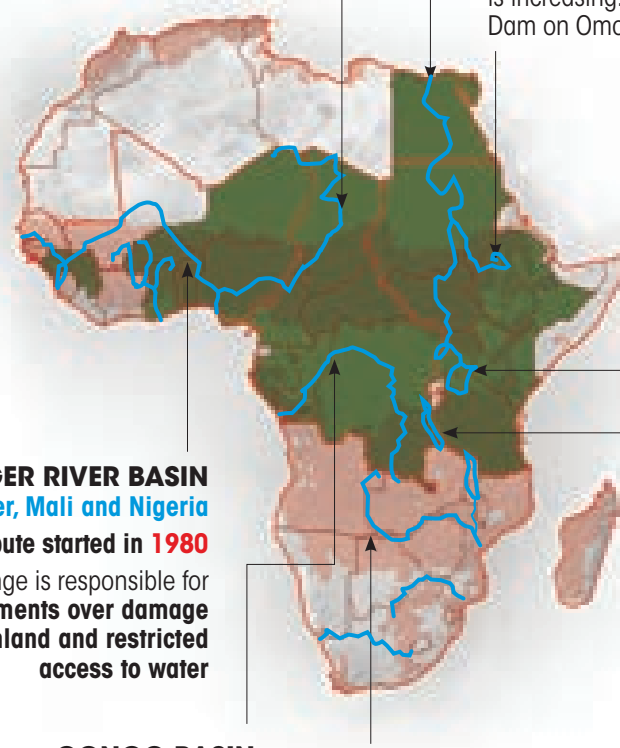
Dispute started in 1980

The water body has **diminished by 90% since the 1960s due to overuse and climate change effects.** Conflict between herders and farmers have become common as livelihoods are lost. Families dependent on the lake are migrating to other areas in search of water.

TURKANA LAKE
Kenya and Ethiopia

Dispute started in 2016

Lake Turkana receives **90% of its water from Omo river**. **Rising temperatures** and **reduced rainfall** have contributed to the lake's retreat into Kenya. To survive, the Ethiopians tribes began following the water. As a result, inter-tribal conflict is increasing. The construction of the Gilgel Gibe III Dam on Omo river has made matters worse.



VICTORIA LAKE
Kenya, Uganda, Tanzania

Dispute started in 2009

Competition over the lake's **dwindling resources** has been fueling conflict between the three countries.

LAKE EDWARD
Uganda and DRC

Dispute started in 2018

Tensions have mounted between the two countries over who has the **right to the lake's natural resources**.

NIGER RIVER BASIN
Niger, Mali and Nigeria

Dispute started in 1980

Climate change is responsible for **disagreements over damage to farmland and restricted access to water**

CONGO BASIN
Cameroon, Central African Republic, Democratic Republic of the Congo, Equatorial Guinea and Gabon

Dispute started in 1960

The basin witnesses multifaceted crisis including f**orced displacement,** violent conflicts, and political instability and climate change impacts

LAKE NYASA
Tanzania and Malawi

Dispute started in 2011

The **discovery of oil and gas** in 2011 brought an Anglo-German treaty signed in 1890 back to the fore. The treaty allows Malawi—which, back then, was a British protectorate under the name of Nyasaland—**exclusive rights to use of the lake. However, Tanzania claims the lake should be a shared** resource in accordance with international law.

had vanished. Harar city, which was dependent on its water, is now searching for an alternative source. Fishing communities have become climate refugees.

Ethiopia has 12 major river basins and most of its lakes and rivers are found in the Great Rift Valley, where the country shares cross boundary water with Kenya and with other lower riparian countries. Zinabu Gebre-Mariam, a professor with the Ethiopian Hawassa University, said that increasing water demand from many cities and towns located along the Rift Valley lakes was drying up the water sources. Debasu Bayleyegn Eyasu, director general of Climate Change Implementation Coordination wing of Ethiopia's environment ministry, said high evaporation due to increasing temperature is adding to the problem of overexploitation. "Temperature is usually higher in the Rift Valley basins than in other highlands," he said.

According to US-based non-profit World Resources Institute's aqueduct global water risk mapping tool, Africa is one of the world's most water-stressed continents. About a third of the population lives in drought-prone areas. As per the 2021 edition of the World Meteorological Organization's "State of Climate Services" report, in past five decades, Africa was hit by 1,695 disasters related to weather, water, and climate, which have caused 0.73 million deaths and an economic loss of $38.5 billion.

While floods accounted for 60 per cent of the disasters and 4 per cent of the deaths, droughts were behind 16 per cent of the disasters and 95 per cent of the deaths—the highest human loss due to drought in the world. This is a double whammy for sub-Saharan Africa, where 90 per cent of the rural population depends on agriculture for income and 95 per cent of agriculture is rainfed. According to the World Meteorological Organization (WMO), 5 per cent of Africa's GDP is lost every year due to water scarcity. "The MENA [Middle East and North Africa] region faces

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the greatest expected economic losses from climate-related water scarcity— estimated at between 6 per cent and 14 per cent by 2050," stated Ferid Belhaj, World Bank Vice President for the Middle East and North Africa, in a press release on August 23, 2021. But more than that, it has pushed Africa into a vicious circle of poverty, water and disease. The African Development Bank's "Africa Water Vision for 2025", the document that guides the countries in the continent in shaping water policy and programmes, said inadequate access to water and sanitation caused diseases which, in turn, resulted in economic loss and extreme poverty. Extreme poverty also disabled people to spend on access to water and sanitation. As the document put this: "half the work of a sick peasantry goes to feed the worms that make them sick."

With 17 rivers, over 160 lakes and vast wetlands, Africa is endowed with abundant water resources. While the Nile is regarded as the world's longest river (some estimates also peg the Amazon as the longest), Lake Victoria is the second largest in the world. Yet, Africa is the second driest continent after Australia. Extreme droughts that regularly plague the Sahel and eastern Africa are well known. Now climate change is exacerbating the paradox, hitting the most vulnerable the hardest.

A review article published in *Frontiers in Sustainable Food Systems* on July 1, 2021, noted that since 2005, the rate of occurrence of drought in Eastern Africa had increased from one in every six years to one every three years. Between 2008 and 2010, over 13 million people in eastern Africa had been affected by droughts. From 2010 to 2011, the Horn of Africa which includes Djibouti, Eritrea, Ethiopia, and Somalia, experienced extreme droughts with food insecurity affecting about 20 million people. Somalia alone recorded 250,000 deaths during the period.

CLIMATE CHANGE FUELLING CONFLICT IN LAKE CHAD BASIN

Over the last decades, competition for land, water and food has increased leading to an uptick in inter-communal fighting and displacement

SHRINKING NATURAL resources due to adverse weather heightening tensions, said a report by the human rights group Refugees International, published on January 19, 2023. The report highlighted the dangerous link between climate change and conflict in countries like Cameroon, Chad, Niger and Nigeria in the Lake Chad Basin. Around 3 million people had been displaced and an additional 11 million were in need of humanitarian assistance, according to this report.

Lake Chad is located in the Sahel, the vast semi-arid region south of the Sahara desert. It is fed mainly by the Chari River through the Lagone tributary, which used to provide 90 per cent of its water. The area is particularly sensitive to drought and the lake has fluctuated dramatically in size during prolonged dry periods historically. As the lake shrinks, communities are struggling and there is competition for the dwindling resource. For years, the lake has been supporting drinking water, irrigation, fishing, livestock and economic activity for over 30 million people in the region. It is vital for indigenous, pastoral and farming communities in one of the world's poorest countries. However, climate change has fuelled massive environmental and humanitarian crisis in the region.

International actors and regional governments have long ignored the interplay between climate change, community violence and the forced displacement of civilian populations, it further said. International responses to the Lake Chad Basin crisis singularly focused on the presence of armed groups. The report was released on the eve of a high-level international conference on the Lake Chad region on January 23-24, 2023 in Niger's capital Niamey.

The humanitarian responses of all four countries of the Lake Chad Basin region go underfunded year after year. By the end of 2022, each country's humanitarian appeal had only received between 42 and 59 per cent of the funding required for aid groups to provide assistance.

The four countries that surround the lake have a combined population of 246 million people, having grown significantly over the last few decades. This trend is likely to continue, as the Lake Chad Basin population is likely to double over the next twenty years. Over the last decades, competition for land, water and food has increased — leading to an uptick in inter-communal fighting and displacement. There are repeated conflicts among

ISTOCK PHOTO

nationals of different countries over the control of water. Cameroonians and Nigerians in Darak village constantly fight over the water. The unfolding situation in Cameroon's Logone Birni commune in the Extreme North Region is a prime example of climate change-fuelled violence and displacement. Situated along the shores of the Logone River, which feeds into the lake through Chari River, Logone Birni witnessed an outbreak of violence in mid-2021 when tensions came to a head among fishing, farming and herding communities.

In mid-2021, climate-driven scarcity triggered tensions between fishing, farming and cattle-herding communities. The result was an eruption of violence. The ensuing hostilities have caused an estimated 60,000 Cameroonians to seek refuge in neighbouring Chad. Many of the displaced Cameroonians the Refugees International team spoke with in Chad said these tensions were linked to the worsening consequences of climate change. Chadian and Cameroonian authorities have failed to resolve these types of clashes effectively, the report said. Even worse, they are actively contributing to the region's violence, it added.

According to aid workers and displaced people Refugees International interviewed, high-ranking Cameroonian and Chadian officials have been purchasing large herds of cattle and hiring armed herders who use violence to control water points and grazing pastures.

Scientists have started observing the West African Monsoon, a climate system that has also not been studied much but it has interconnections with many other climate tipping points, especially AMOC, or the Atlantic Meridional Overturning Circulation which is a large scale temperature and salinity driven current in the Atlantic Ocean, often known as the Gulf Stream. The collapse of AMOC might change the wind and rain patterns of the West African monsoon which could lead to disruptions in the lives of 300 million, mostly agriculturalists of West and Central Africa.

The West African monsoon is powered by the temperature difference between the cooler tropical Atlantic Ocean and the warmer African continent. It has three distinct seasons with onset between March and May, high rainfall between June and August and southward shift from September to October. The balance in temperatures on land and in the ocean which drives rainfall during these seasons may get disturbed by the slowing down of AMOC as the heat transfer from northern hemisphere to the southern hemisphere becomes inefficient and warms up the tropical Atlantic Ocean. "A disruption to the West African monsoon would cause further droughts in the Sahel region, and the region would potentially have a lack of capacity to adapt to the change," said Paul Ritchie, research fellow at the Global Systems Institute, University of Exeter, UK. The disruption in the monsoon winds has also been linked to the greening of the Sahara which is being caused by more rain towards the north of the continent. Many climate scenarios project a 45 per cent greening of the Sahara which would further impact the West African monsoon as vegetation has a major impact on wind, temperature and rain.

"The hydrological cycle is generally expected to be more intense in a warmer world with a propensity for more intense rainfall as well as drought situations. Global monsoons are expected

While extreme weather is exposing Africa's infrastructural and economic frailties, another creeping risk that is becoming more evident is the impact of changing climate on food security in the continent

to intensify because of global warming, but decreases could also result from increased concentrations of atmospheric aerosols," explained Rupa Kumar Kolli, executive director of the International CLIVAR (climate variability and predictability) Monsoon Project Office, hosted by the Indian Institute of Tropical Meteorology, Pune, India. Climate change impacts on the monsoon, in terms of the onset, intra-seasonal variability such as active-break cycles, number of rainy days, extreme rainstorms, as well as the seasonal total, will have a direct impact on the water resources, as most river basins in Africa are directly fed by the monsoon rains, Kolli added.

There are already numerous reports of clashes and conflicts between different communities on access to water. The escalation of clashes over natural resources into full blown armed conflicts is exemplified by the case of Boko Haram, the notorious militant group supposedly active in Nigeria, Chad, Niger and Cameroon. In fact, a 2017 resolution published by the UN drew direct links of the armed insurgency terrorising large parts of northern Nigeria with the drying up of Lake Chad—it has shrunk by about 90 per cent in just four decades and still supports around 17 million people. Early 2018, the UN Security Council expanded on the resolution and declared that environmental changes, depleting resources and desertification were posing clear threats to the stability of West Africa and the Sahel. The two regions put together house 26 countries, which is nearly half of the continent.

THREAT TO FOOD SECURITY

While extreme weather is exposing Africa's infrastructural and economic frailties, another creeping risk that is becoming more evident is the impact of changing climate on food security in the continent. The food shortage is linked inextricably with the availability and access to water. Satellite images of the receding Kilimanjaro glaciers or of rapidly shrinking major lake systems like Victoria, Chad or Turkana have in recent years gone viral on the social media. These

WATER SECURITY POSSIBLE THROUGH PARTNERSHIPS

Decentralising water and wastewater systems can build resilience at a more localised scale and reduce supply costs

CATHIE LEWIS AND CHARON B CHNER-MARAIS

PREDICTIONS ARE that climate change is likely to severely impact water availability in most parts of South Africa. A recent prolonged drought in the country highlights its vulnerability to water scarcity. Its Department of Water and Sanitation's 2018 National Water and Sanitation Master Plan (NWSMP), aptly titled "A Call to Action", paints a dire picture. South Africa is predicted to experience a 10 per cent supply-demand deficit by 2030, even if planned additional water supply projects are implemented. Only 64 per cent of households have access to reliable safe water. NWSMP acknowledges that the situation cannot be resolved by one party alone and urges all water sector stakeholders to work together. This is where things become more complex.

South Africa's water governance legal framework is regarded as one of the most progressive water legislations globally. The right to access to water has been a constitutionally entrenched human right since 1996. The legal framework is unfortunately severely fragmented, and contributes to confusion between actors in the water sector, and continual conflicts. The 2015 to 2018 Western Cape drought is one of the worst crises in a metropolitan area. It remains reminder of the impact of climate change. Experts reckon that it is five to six times more likely that the region will experience such droughts, and these could become common in South Africa, impacting the city and the economically important agriculture sector, which is its largest water user.

Case for collaborative governance: Collaborative governance is an approach that brings together government, community and private sectors in a non-adversarial and non-competitive manner to deal with grand challenges such as water security, and thereby achieving more than any one sector is able to do on its own. Research overwhelmingly shows that governance is a key challenge in achieving water security.

Through collaborative governance actors affected by the problem engage and self-regulate to develop new ways to govern water for the collective benefit. The Cape Town response showed that business and citizens alike can step up to build water resilience in cities collaboratively, by supporting catchment management efforts, changing their perceptions and behaviour around water use and values, and making significant investments in water technologies. A further shift is needed towards collaboration, rather than competition.

(Authors are founders of CoGo, a collaborative governance for water security network)

images are representative of the widespread shortages of freshwater and surface water sources across the African landscape. Combined with an increasing population, which will see Africa's population nearly quadruple in a little more than 100 years, climate change is likely to put added stress on the availability and access to freshwater.

Global warming of 2°C would put over 50 per cent of the continent's population at risk of undernourishment. Projections estimate that climate change will lead to an equivalent of 2 to 4 per cent annual loss in GDP in the region by 2040. According to the World Bank, most of the shocks caused by climate change are also the causes for poverty in the continent. "The consequences of climate change for Africa are devastating and threaten to push millions of people into extreme poverty by 2030, largely due to lower crop yields and higher food prices, and negative health impacts," said Benoit Bosquet of the World Bank.

Cropping systems across Africa have been found to be incredibly stressed and are slated for significant declines in production in the coming decades. About 70 per cent of Africa is dependent on small and rain-fed agriculture that is expected to be badly hit by a changing climate. IPCC noted that maize yields are likely to reduce by about 22 per cent across sub-Saharan Africa, while Zimbabwe and South Africa are likely to experience yield declines of over 30 per cent by the mid-century. In the same period, wheat production would drop by as much as 35 per cent. Though

some produce might show modest increases in the immediate future, this is likely to be offset by declines in the production of most cereals and horticultural crops.

There are enough evidences that establish impact of "climate crisis on food production". Hence, this will lead to local food scarcity and price hikes, said Save the Children. Children of the poorest households will be the most-affected. In fact, there have been scientific evidences of the link between obesity, under-nutrition and climate change. Further, no country is in the position to provide safe future to children, cautioned a Lancet study last year. "But even children in countries that are less at risk overall can be seriously impacted as we've seen from recent wildfires, heatwaves, hurricanes and floods affecting countries," told Save the Children. "Children have contributed the least to the crisis we are facing but will pay the highest price," said Inger Ashing, CEO of Save the Children International. ■

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COASTAL WOES

Climate change and ocean degradation trends in Africa augment its story of despair

OCEAN WARMING and acidification are depleting marine ecosystems, which provide nutrition to millions of inhabitants living on Africa's large coast. An analysis of fisheries in 132 countries by Edward H Allison in 2009 revealed that about two-thirds of the most vulnerable countries are situated in Africa. The worst affected are likely to be coastal countries in West Africa where value of fish is expected to decline by more than 20 per cent, equivalent to an annual loss of US $310 million per year by mid-century, according to AR5.

Climate change has put coastal ecosystems under a serious threat. Across Africa, Ghana has the highest concentration of people and infrastructure along the coastal belt. More than 2.5 million Ghanaians have built their homes along the coast, which stretches for 550 km. Fishing is the main source of livelihood for these residents. But over the last four decades, hundreds of these homes have submerged into the Atlantic Ocean. In fact, large parts of Ghana are now under sea

water. Take Kporkporgbor for instance. It used to be a vibrant coastal community in the Keta Municipality of the Volta Region. The community had more than 50 houses, a church, playground and a population of more than 500 people. Today, the sea has swallowed all, except one of the houses.

At the UN Conference on the Human Environment in 1972, the world community laid down the common principles that linked our environment and sustainable livelihoods. These principles were reaffirmed 20 years later in the first Earth Summit at Rio de Janeiro. Agenda 21 became a blueprint for environmental and sustainable development in the 21st century. Since then, a lot has happened on the global platforms to save the planet—from the inception of the UN Framework Convention on Climate Change in 1992, the formulation of the Kyoto Protocol in 1997, the Paris Agreement of 2015, the Sendai Framework for Disaster Risk Reduction of 2015, the landmark Agenda 2030 for Sustainable Development, to the Sustainable Development Goal (SDG) 14 of 2017 about conserving the oceans.

All these goals remind us that without eradication of poverty or addressing injustices, and striving to advance human and socio-economic progress, there can never be that "Future We Want". Today, climate change and marine pollution are the most pressing "cocktail" of environmental problems ever to face humanity. In fact, the impacts of climate change are threatening to reverse decades of technological success that the world fought so hard to achieve. These existential challenges have already forced us to invest more in securing our future while simultaneously striving for sustainable livelihoods.

This is not easy. The climate and ocean degradation trends in Africa augment its story of despair. The UN Economic Commission for Africa's Blue Economy Policy Handbook notes the

Sea level rise, coastal erosion, saltwater intrusion, warming sea waters, ocean acidification, coral bleaching and an upsurge of invasive species are some of the almost insurmountable challenges facing African countries and have affected livelihoods dependent on ocean and freshwater resources

continent is highly vulnerable to the impacts of climate change. Increasing floods and droughts, erratic and extreme weather, sea level rise, coastal erosion, saltwater intrusion, warming sea waters, ocean acidification, coral bleaching and an upsurge of invasive species are some of the almost insurmountable challenges facing our countries and have affected livelihoods dependent on ocean and freshwater resources. These impacts are expected to worsen. The current course to a 4°C increase in global temperature by 2100 leaves Africa, whose existing coping mechanism is modelled for only 1.5–2°C thresholds, staring at a catastrophe. The 2050 Africa's Integrated Maritime Strategy of the African Union says it all: for a continent that has undergone severe climate change and natural disasters, a road to recovery requires a dedicated global agenda and the political will of our governments. Looking closer, this is a never-ending story of failing economic systems affected by drought-induced migration; catastrophic cyclones threatening islands and coastal areas of the Western Indian Ocean region; destruction of coral reefs and mangroves due to unplanned coastal and marine development; destruction of critical coastal habitats on which livelihoods depend; lack of strong national ocean policies; limited scientific capacity to inform policy decisions; and illegal, unreported and unregulated (IUU) fishing.

Coral reefs are dying in the coasts of the continent. The most extensive coral bleaching event from 2014 to 2017 affected reefs across the world, including the Great Barrier Reef in Australia where the damage was intense; and also those found along the east coast of Africa; where the intensity of destruction was slightly less. David Obura, director of Kenya-based non-profit Coastal Oceans Research and Development– Indian Ocean (CORDIO), explained the extent of damage in Africa. "Seychelles was the worst hit country, followed by Madagascar, while parts of

Mauritius, Kenya and Tanzania were badly impacted. Comoros showed only a slight impact," he said. Bleaching is a process where corals lose their vivid colour and turn white. This happens when the zooxanthellae algae, which is in a symbiotic relationship with corals and provide them with food, die due to ocean warming and acidification. If bleaching continues for an extended period of time, corals eventually die. Coral bleaching and mortality exacerbated by climate change are one of the biggest threats to oceanic biodiversity. Coral reefs, which are mostly found in shallow oceans along the coastline, provide the perfect place for marine life to thrive, especially colourful fish.

The first-ever recorded coral bleaching took place in 1998. That year the El Niño Southern Oscillation, which occurs every three to seven years in the Western Pacific Ocean, caused massive bleaching of corals along the east African coast. Due to this, almost 20 per cent of corals were lost in the region. The fallout of bleaching and coral death is an increase in the growth of fleshy macro algae in reefs. The algae do not allow corals to revive by taking up their space. The 1998 event increased such algae cover in the oceans by 2.5 times. "Due to the bleaching event, coral cover in the region declined by 20 per cent and fleshy algae cover increased by almost 35 per cent," said Obura, who also chairs the International Union for Conservation of Nature's Coral Specialist Group.

So, how does bleaching of corals, also referred to as underwater rainforests because of their important role in supporting marine life and biodiversity, affect the African economy? African corals are a big tourist draw. Reefs along the east coast of Africa and the islands of Zanzibar, Seychelles and Madagascar provide jobs to thousands in diving and other allied industries. Amidst civil wars and ethnic violence, it is only the tourism sector that offers Africans a stable and viable economy. Widespread coral bleaching has badly hit the African scuba diving industry. According to a World Bank estimate, losses amount to US $2.2 million in Zanzibar and $15.09 million in Mombasa till now. Even Seychelles has lost considerable coral reefs and the country's

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'One Ocean' approach is the only way to fight climate change. These two opposite pillars are inseparable. Fisheries and marine protected areas must be treated as one component of resilience

profits from dive tourism have dipped. The reefs around Dar es Salaam, a major city in Tanzania, have recorded 6 per cent mortality since 1998, according to Leonard Chauka, a coral expert at the Tanzania-based non-profit, Western Indian Ocean Marine Science Organisation. As dive tourism across Africa has declined considerably, these days organisers bank upon novices or amateur divers, who cannot readily differentiate between healthy and non-healthy coral reefs. But on the whole, the dive industry is not dealing with the issue of bleaching and taking measures to generate public awareness. They are more concerned with dwindling visitors than with climate change, the real culprit behind reduced tourist footfall. "They don't want word to spread that their reefs are declining due to climate change. They fear tourists will go elsewhere, and so it is a bit of a head in the sand approach," said Obura.

And, it is the small island states, and communities of the Indian Ocean that continue to bear the brunt. Ocean acidification, marine pollution and coastal tourism have added to reef stress levels. Competition, and sometimes conflicts, between poor artisanal fisherfolk and the tourism industry have triggered concerns for the resilience of the coral reefs, which should be seen as the currency that could define our countries' goals in sustainable development. Without healthy oceans and reefs, there will be no alternative for the islands of the Western Indiar Ocean. Hence, conservation of environment and our limited marine resources should be at the centre of our development plans. The Regional State of Coast Report analyses the conditions of the ecosystems, resources and human activities, and their stated evolution in this part of eastern and southern coasts of Africa and the Indian Ocean island states. The area consists of 10 coastal and island states that are the contracting parties to the UN Regional Seas Programme called the Nairobi Convention. Besides fisheries and tourism, recent oil and gas exploitation trends in some of these countries can boost gdp, but also expose the marine ecosystems to new human-induced threats in the region that already faces rising sea surface temperatures, surface air temperatures and increasing wind speeds that precipitate record-breaking cyclones.

So, what should be the course of action for Africa and the region? We need to start acting on microplastics and develop a marine waste management plan that integrates the upstream habitats and ecosystems. We must invest more to combat invasive species and marine pollution, and go back to the 2011-2020 Strategic Plan of the Convention on Biological Diversity, called Aichi Target 11 on coral reefs. We also have to work towards protecting the high seas and Areas Beyond National Jurisdiction as part of our efforts to collectively protect our oceans and understand their dynamics. One ocean approach is the only way to fight climate change. These two opposite pillars are inseparable. Fisheries and marine protected areas must be treated as one component of resilience. The proposed "Blue Commonwealth Charter" for marine sustainable development to foster ocean regeneration should be adopted in the regional and even global context of ocean-climate nexus. Citing from The Mont Fleur Team's Scenarios exercises—an experiment first conducted in1991 that brought together society representatives to envision an end to apartheid—if we achieve this together, then we attain the flight of the flamingos. If we continue to go our separate ways, then we fall from the sky like Icarus. ■

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UNBEARABLE BILL

The mid to long-term effects of climate change are expected to drag down the gross domestic product of most African nations by 2-5 per cent annually by 2030

THE GROSS domestic product (GDP) of 65 countries in Asia, Africa and Latin America that are vulnerable to climate change may reduce by 19.6 per cent by 2050 and 63.9 per cent by 2100 with current climate policies, according to a report published by Christian Aid, a non-governmental organisation in 2021. The damage to the economy of these countries will reduce but remain significant even if global temperature rise at the end of the century is limited to 1.5 °C over pre-industrial levels. In this scenario, their GDP will hit 13.1 per cent by 2050 and 33.1 per cent by 2100.

The economy of African countries will be harshly impacted, according to the report. Eight of the top 10 most affected countries are in Africa and the other two in South America. All the 10 countries — Sudan, Mauritania, Mali, Niger, Burkina Faso, Chad, Djibouti, Suriname, Guyana, Guinea — face GDP damage of over 70 per cent by 2100 under our current climate policy trajectory

and of 40 per cent even if the world keeps to 1.5°C. Sudan topped this list with 83.9 per cent loss of GDP by 2100 under current policies. Even with a Paris Agreement-aligned 1.5°C rise, it will see a climate-induced GDP hit of 51.6 per cent. In 2020, Sudan's GDP per capita was under $600 per person — a large share of the population living in extreme income poverty of under $2 a day. Sudan is already reeling under the impacts of climate change. In September 2021, heavy rains and flash floods affected over 314,000 people in 14 out of 18 states across the country. These vulnerable countries are the smallest contributors to climate change but will continue to suffer in the future. The average per capita carbon dioxide emissions of the top 10 most-impacted countries is 0.45 tonnes. An average American, on the other hand, is responsible for more CO_2 (16.1 tonnes per capita) than 36 people from these 10 countries. The World Meteorological Organization had warned that sub-Saharan Africa could see a 3 per cent drop in GDP by 2050 as a result of climate change. Sub-Saharan Africa has lost over $520 million in direct economic damages annually as a result of climate change since the beginning of this century, the International Monetary Fund (IMF) estimated.

Many of these are low-income countries, which struggle to provide basic public services. All eight of the African countries in the top 10 list of most-affected countries spend under $80 per person on healthcare per year. So, further economic losses will make it even harder to attain decent public services which enable the fulfilment of human rights.

Africa will require $50 billion a year to survive the onslaught of extreme weather events, diseases and loss of livelihood sources in case the global temperature rise does not exceed 2°C, says the World Bank's Africa Climate Business Plan. The amount will rise to a humongous US

The World Meteorological Organization had warned that sub-Saharan Africa could see a 3 per cent drop in GDP by 2050 as a result of climate change. Sub-Saharan Africa has lost over $520 million in direct economic damages annually

$200 billion if global warming continues unabated over the next few decades. But just the way world leaders show no commitment to contain the temperature rise; there is no commitment as to who will bear the cost.

Africa in 2020 got just 14 per cent of the total finance it needed to manage the impact of climate change, according to an analysis by the Climate Policy Initiative (CPI). The CPI estimated that Africa needs $250 billion in climate finance annually on an average from 2020-2030. But total annual climate finance mobilised in Africa in 2020 was only $29.5 billion.

More to it, the continent needs eight times more in climate finance than current levels. Mitigation accounts for the largest share (66 per cent) of reported climate finance need in four of the five African sub-regions. Individually, it accounts for 77 per cent of the total need in western Africa, 75 per cent in southern Africa, 70 per cent in central Africa and 57 per cent in eastern Africa. Economic headwinds in the wake of the COVID-19 pandemic and Russia's invasion of Ukraine look to limit governments' flexibility to finance new climate projects.

In addition, the mid- to long-term effects of climate change are expected to further drag down the gross domestic product of most African nations by 2-5 per cent annually by 2030, the analysis showed. In Africa, the private sector plays a marginal role in the provision of climate finance. In 2019-2020, under 20 per cent ($4 billion) of total climate finance to Africa came from private investors, mostly international investors. The report listed barriers to climate investments in Africa to include financial market depth, governance, project-specific characteristics, lack of enabling skills and infrastructure. Governance barriers are related to the stability of national or sub-national political environments, the strength of legal and regulatory frameworks and the complexity of administrative processes in the country where the project is based, the report stated.

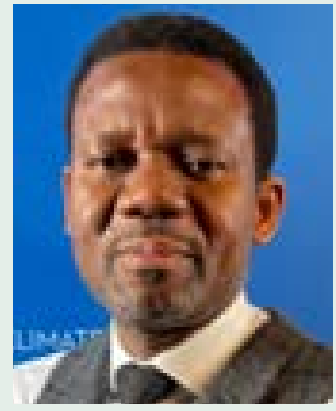
The CPI report evaluated the degree to which these barriers prevent domestic and international investment in four key sectors: Energy systems, transportation, buildings and agriculture,

AFRICA NEEDS SUPPORT FOR CLIMATE FORECASTING INFRASTRUCTURE

In Africa, the current weather observation network is only one-eigth of the required minimum density over the continent

FILIPE LUCIO

FARMING SYSTEMS are largely driven by weather patterns, especially rainfall seasons. Accurate and timely climate prediction and weather forecasting services are therefore important for facilitating decision-making and delivering early warnings for preparedness and sustainability in the agricultural production and value chain systems. Climate services provide information to help individuals, governments and organisations make climate / agriculture-smart decisions. Climate information is prepared, interpreted and delivered to meet the local society's needs.



There has been increased recognition of late for the potential of climate information to support sustainable development and production, enhance preparedness and protect people whose lives and livelihoods are directly impacted by climate risks. Africa has improved weather and climate forecasting services. There are specialised regional weather forecasting and regional meteorological training centres on the continent.

Climate outlook forums for consensus building on weather forecasting in the regions are also operational. There is also downscaling of the climate and weather information to local environments. Gaps specifically exist in certain areas. For instance, there are data gaps in many African countries. The number of data observational stations is on the decline. The Global Basic Observing Network, approved by the WMO in 2019, aims at overhauling the exchange of international observational data. It needs to expand its services on the continent.

A lot is being done, especially on the installation of automated weather stations. But, it has been noted that in Africa, the current observation network is only one-eighth the required minimum density over the continent and a large portion of observation infrastructure is in a state of disrepair. Data recovery and digitisation programmes are required. Support for infrastructure for forecasting such as model development, specialised training for experts is needed.

There is a need to create awareness about climate services uptake across various sectors. Also, there is inadequate communication and interpretation of climate information to last mile end-users. Farmers are accessing and using weather and climate information more than before. Most national meteorological and hydrological services now offer targeted / specialised climate services, especially for the agricultural sector ranging from short, medium to long term forecasts and agro-advisories.

This is disseminated through seminars, mainstream media and social networks including community engagements. Specifically, in many countries in Africa, farmers access weather information through:

- Official government departments
- Official government websites
- Mainstream media, radio, TV, newspapers
- Social media
- Telephone short messaging services
- Agricultural seminars through agricultural extension officers.

However, there are challenges related to the timelines of the information, understanding of technical terms used in forecasts, limited feedback, monitoring and evaluation of the use of climate services and direct financial and technical support to farmers to make use of the available climate services appropriately.

A key aspect is also that multiple communication platforms can be used to target different types of users. For example, messaging apps may be ideal for extension agents, while farmers may prefer radio and face-to-face meetings. In recent years, there has been an emphasis on 'coproduction' of seasonal climate advisories and enhancement of user-interface platforms.

Examples of coproduction include participatory scenario planning, participatory integrated climate services for agriculture and roving seminars. User interface platforms provide a structured means for users, researchers and climate service providers to interact at the global, regional and national levels to ensure that user needs for climate services

are met and enable effective decision-making in view of climate considerations.

Other challenges that exist include:

- Weak in-depth understanding of user needs in local contexts
- Use of heavy scientific language in communicating climate information to the public
- Inadequate iterative engagement of end users in the weather and climate services value chain
- High dependence on external support systems
- Weak ownership of project investments in climate change adaptation and weather and climate services

Farmers' livelihoods are cushioned due to the provision of climate services. Appropriate planting, tending, harvesting storage and processing times are advised and discussed with farmer groups. A lot of losses are alleviated. Better preparedness on part of the farmer, government and other agencies is achieved, especially in times of severe weather episodes. In a nutshell, weather and climate services / forecasting can influence crop growth, total yield, pest occurrence, water and fertiliser need and all farm activities carried out during the growing season.

So, good yield from the use of climate information boosts the revenue accruable by farmers and therefore enhances their livelihoods. Today, it can confidently be said that weather and climate services is driving behaviour change and livelihood transformation of farmers through the introduction of climate-smart and climate resilient approaches and technologies.

Adaptation to climate change is the primary concern of African countries. It is estimated that African countries spend between two and nine per cent of their gross domestic product on adaptation to climate change. Many of the African countries' National Determined Contributions (NDCs) are conditional upon receiving adequate financial, technical, and capacity building support. Overall, Africa will need investments of over $3 trillion in mitigation and adaptation by 2030 to implement its NDCs, requiring significant, accessible and predictable inflows of conditional finance. Adaptation strategies play a greater role for Africa, in particular sub-Saharan Africa, where economies are particularly dependent on climate-sensitive sectors.

A key component of the required capacities in Africa is an investment in hydro-meteorological systems and services to improve monitoring, predictions and early warning against high-impact hazardous events and tailored information for decision-making in climate-affected sectors such as those prioritised in African NDCs. Adaptation options are developed and implemented based on the climate information provided such as destocking in times of droughts, use of drought-resilient crops and technologies, seasonal climate predictions to guide cropping calendar, temporary relocation to higher grounds in times of heavy precipitation, to energy production, consumption and storage in agricultural entities.

Climate finance plans and policies in some African countries now follow vulnerability of the areas or regions concerned. Some countries are legislating around the NDCs to deepen accountability to climate mitigation and adaption targets at national levels and to ensure that weather and climate services are mainstreamed into all revenant governance activities to support climate change adaptation and climate-resilient practices.

Some countries also have climate change governance committees or groups at local levels making advisory decisions on locally led climate initiatives. Weather and climate services will support climate change adaption to integrate cities and human settlements with upstream safety, preventive and civil protection management practices and infrastructure to minimise the effects of disasters.

WMO and the members of the Alliance for Hydromet Development are establishing a Systematic Observations Financing Facility (SOFF) as they recognise the need for financial and technical assistance to address the challenges of sustaining observing infrastructure in Africa. SOFF will provide long-term support for the collection and sharing of meteorological observations in compliance with the WMO Global Basic Observing Network.

Various regional economic commissions across Africa have committees established to oversee policy development in meteorology and are establishing regional climate centres to support national meteorological and hydrological services (NMHS) within their regions.

(Filipe Lucio is the Director of the Global Framework for Climate Services, World Meteorological Organization)

forestry and other land use (AFOLU). These together accounts for 95 per cent of global climate mitigation finance. The top three sectors receiving adaptation finance across all African countries were agriculture ($2 billion annually), water ($1.3 billion annually) and forestry and land use ($551 million annually). The environmental risk is likely to be greater in the sub-Saharan African AFOLU sector where only 3 per cent of cropland is irrigated, meaning that agricultural production is highly vulnerable to weather patterns.

In another assessment by a group of scientists for CPI, the projected total cost of implementing nationally determined contributions (NDC) for climate action in African countries is to be $2.8 trillion for 2020-2030. The countries are relying on external financial support for around $2.5

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trillion of the cost. Governments of African nations have committed $264 billion in domestic public resources — about 10 per cent of the total cost.

Mitigation accounts for the largest share (66 per cent) of reported climate finance need in four out of the five African sub-regions. Individually, it accounts for 77 per cent of the total need in western Africa, 75 per cent in southern Africa, 70 per cent in central Africa and 57 per cent in eastern Africa. The transport sector was projected to require the largest share (41 per cent, $657 billion) of climate finance. Agriculture, forestry and other land-use sector, which is the biggest emitter of greenhouse gases, only accounts for 7 per cent of total needs ($108 billion). South Africa, Ethiopia, Nigeria and Egypt have the highest need for yearly finance, together representing almost $151 billion per year, they added.

The total cost projection includes loss and damage estimation provided by 51 out of 53 African countries, the authors noted. The climate finance figures are probably underestimations due to a lack of capacity and data from sub-national governments and vulnerable communities, the researchers said in the report. The gap in climate finance data is making implementation of climate goals increasingly difficult in South Africa, according to a report published by GreenCape, South Africa-based green energy advocacy, and the Bertha Centre for Social Innovation and Entrepreneurship, an educational institution part of University of Cape Town, in partnership with CPI.

Adaptation to climate change in Africa accounted for only 24 per cent of total climate finance needs identified, despite the continent being highly vulnerable to climate change. In countries that provided sector-specific data, adaptation needs were mainly reported for agriculture (25 per cent), water (17 per cent), infrastructure and building (12 per cent), disaster prevention and preparedness (10 per cent) and health (8 per cent). As much as 10 per cent of total climate finance was allocated to dual benefit actions which cover both mitigation and adaptation. Northern Africa is the only sub-region where adaptation and mitigation needs were almost

equally distributed. The report stated that the private sector has significant potential to meet Africa's climate finance needs, but NDCs rarely discuss its role. However, most current climate financing in Africa is from public actors (87 per cent, $20 billion), with limited finance from private actors, as stated in the report. The authors urged the United Nations Framework Convention on Climate Change (UNFCCC) to develop guidance at an international level to support countries for determining and estimating their needs in a more comprehensive way. At the national level, the determination of needs can be done through national investment plans related to NDCs, as well as through strategies on climate finance related to national policies.

"Policy innovations to unlock climate finance for resilient food systems" in Africa, published December 5, 2022, called for action to plug the climate adaptation finance gap, estimated at $41.3 billion annually. The report was launched by a panel of experts from the Malabo Montpellier Forum in Dakar, Senegal. The panel convenes 18 leading agriculture, engineering, ecology, nutrition and food security experts. It aims to facilitate policy choices of African governments to accelerate progress towards food security and improved nutrition.

Africa is ambitious in its emission reduction, or going "Net Zero" on emissions. The IPCC's Special Report on Global Warming of 1.5°C says "Net Zero" is – conceptually – a state in which "human activities result in no net effect on the climate system". This will involve balancing all residual emissions with emission (carbon dioxide) removal. This will also involve accounting for regional or local bio-geophysical effects of human activities that affect local climate or surface albedo (light reflected by a surface). The IPCC says the world must reach Net Zero emissions by 2050. This target has become a new marker of climate "ambition", with the world now divided into countries with net zero targets, and those without.

Africa has the potential to reach Net Zero carbon emissions and climate resilience within the timelines proposed by the United Nations Intergovernmental Panel on Climate Change. Countries in the continent increased their target to reduce GHGs by 1-54 per cent in comparison to their earlier Intended Nationally Determined Contributions

As of October 2021, 38 of 54 African nations submitted their updated NDCs, according to Africa NDCs Hub in its report November 8, 2021. It was launched by the Africa Development Bank at the 26th Conference of Parties (COP26) to the United Nations Framework Convention on Climate Change in Glasgow. The Africa NDC hub has been established by the AfDB's Climate Change and Green Growth Department (PECG). It aims to coordinate activities of various sectors with a view to fulfilling obligations related to the Paris Agreement.

Africa has the potential to reach Net Zero carbon emissions and climate resilience within the timelines proposed by the United Nations Intergovernmental Panel on Climate Change. Countries in the continent increased their target to reduce GHGs by 1-54 per cent in comparison to their earlier Intended Nationally Determined Contributions. These have also taken into account more sectors and are inclusive of women and youth, said Africa NDC hub citing Namibia's NDCs, 2021. Most countries have improved adaptation targets through quantitative analyses, increased the sectoral scope and aligned targets with national climate policies.

For example, Rwanda's plans for adaptation are linked to the national long-term climate action policy called the Green Growth and Climate Resilience Strategy. Thus, the NDCs and the country's long-term strategies are aligned. Ethiopia and Nigeria also have improved their NDCs. Water resources sector and other nature-based solutions missing in the previous NDCs of Nigeria are part of the updated ones.

However, less progress is observed in long-term low greenhouse gas emission development strategies (LT-LED) and national adaptation plans (NAP). This is due to the lack of desired capacity to develop adaptation measures and inadequate systems to collect, analyse and predict adaptation

impact scenarios, the report showed. Many countries use probability or likelihood assessments to guide adaptation planning. Al Hamndou Dorsouma, officer-in-charge of climate change and green growth, AfDB, said: "Under the fourth pillar of the African Development Bank's new Climate Change and Green Growth Strategic Framework (2021-2030), the Bank will support regional member countries to strengthen policy and regulatory environments to facilitate five-year NDC revisions, long-term low-carbon and climate-resilient development strategies and NAPs." But despite these limitations, 44 African nations have started developing their NAPs, according to the AfDB report referring to the UN Progress report on adaptation plans. At least 12 countries in the continent have begun work on drafting LT-LEDS, it said.

The updated NDCs indicate the desired road map and the potential of the continent for achieving climate resilience. But monitoring, reporting and verification (MRV) systems to track climate action and progress has been flagged as a key challenge by the Africa NDC hub. MRV refers to all measures taken by the countries for collecting data on emissions, mitigation actions and support. Climate-related investment plans also are inadequate in the updated NDCs and this will especially affect adaptation. The report highlighted the growing need for climate investment planning and raising climate-related financial ambitions at the national level in African countries.

Most countries have not enhanced this factor in their NDCs despite the significance of climate finance for NDCs implementation and, especially, for adaptation. This becomes even more important, since the continent has not received its due share of climate finance. Between 2016 and 2019, around $73 billion has been received by Africa as climate-related development finance, according to the most recent Organisation for Economic Co-operation and Development estimates of September 2021. Climate finance amounting to an annual average of about $ 18 billion is insufficient, it said. The wide gap in climate finance is a failure of the developed countries, the report noted, while underscoring the disparities in the ability of African countries to attract climate finance. ■

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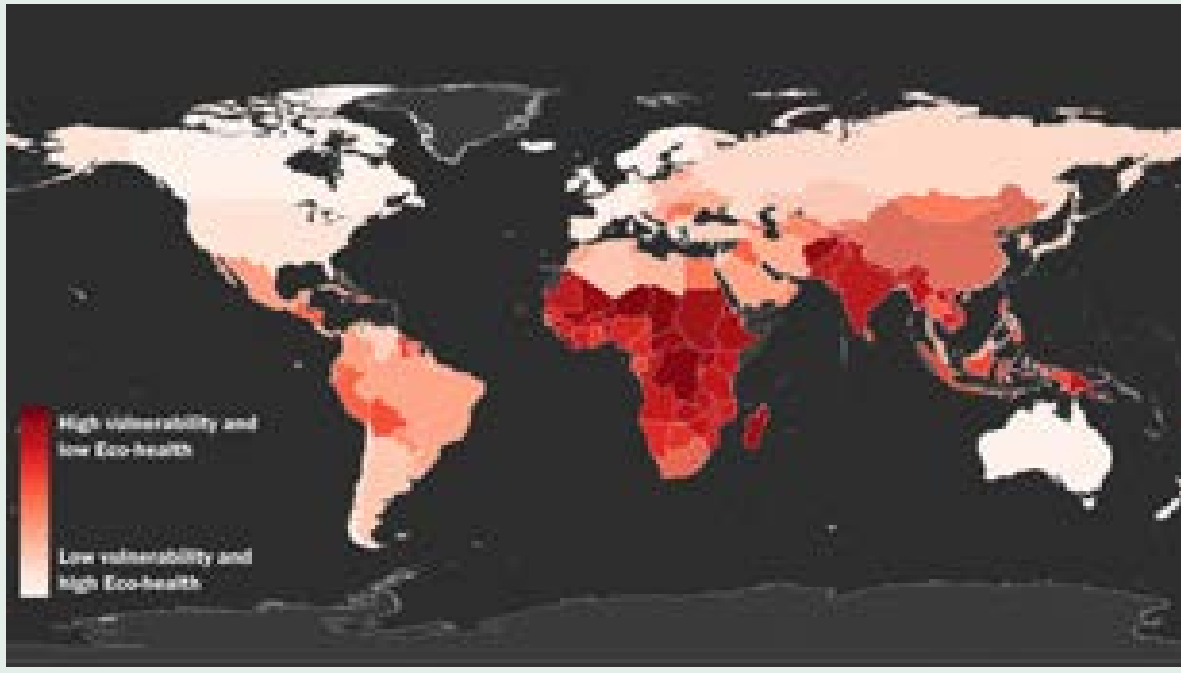
SIDE EFFECTS

Forty-six countries in the Sub-Saharan Africa will have the greatest burden of mortality attributable to climate change in the next decade

THE AFRICAN climate is a natural incubator of many tropical diseases, such as malaria, cholera, Rift Valley Fever (RVF), meningitis, yellow fever, dengue and chikungunya. These diseases are caused by pathogens that are temperature-sensitive. It is predicted that the frequency of these anomalous events will increase as the planet becomes warmer. The most dramatic impacts of climate change and variability in Africa were probably best observed in the 1990s when multiple El Niño and La Niña events occurred. These events were associated with a temperature rise of 2-5°C and excessive flooding. During these events malaria cases increased between 100 and 700 per cent while RVF caused significant livestock mortality and economic losses in Ethiopia, Somalia and Kenya to the tune of US $132 million due to a ban on exports of livestock products to West Asia.

Over 90 per cent of the global malaria burden occurs in Africa and is associated with

NO GAIN VULNERABILITY AND EPI ECO-HEALTH



COUNTRIES THAT face the greatest health risks from toxic pollution are also the most at risk from the impacts of changing climate, according to a new report.

Most at risk of the combined effect are some of the poorest and least-developed countries: Democratic Republic of the Congo (DRC), Burundi and the Central African Republic which placed 179th, 185th and 188th among 189 countries on the United Nations Human Development Index.

Source: Global distribution and coincidence of pollution, climate impacts, and health risk in the Anthropocene published in *Plos One.*

Inequities in pollution production, economic status and institutional readiness are interconnected and increase the risk for countries already in the highest risk categories for both toxic and nontoxic (greenhouse gas) pollution, according to an analysis in Plos One published July 21, 2021.

Data measuring global climate risk and institutional capacity from the Notre Dame Global Adaptation Index, environmental quality from the Yale Environmental Performance Index and mortality caused by toxic pollution from the Global Alliance on Health and Pollution for 2018 was collated and analysed to explore the distribution of human-produced or exacerbated environmental risks in 176 countries.

The study found that the highest climate and toxic pollution risks appear in the same countries and they are geographically concentrated across the African continent and Southeast Asia.

Deaths resulting from toxic pollution were the highest where the distribution of toxic pollution is greatest and impacts of climate change pose the greatest risk, according to the report.

SIMULTANEOUS RESOLUTION

The researchers created two target lists: One of the top 10 countries most likely to generate a high rate of return on effort in the reduction of pollution and climate change impacts, the other of the bottom 10 countries that are most likely to require attention to governance issues before pollution can be effectively addressed.

considerable mortality and morbidity. Climate scenario indicates that the geographic range of these diseases may contract in some areas and expand in others. Of particular concern are African highlands where the temperatures for a long time were below 18°C, prohibiting malaria transmission. For example, malaria became endemic in the Central Kenya highlands after 1993 when the mean temperature permanently exceeded 18°C. Prior to the ongoing

PHOTOGRAPH COURTESY: USAID

malaria control efforts, severe epidemics occurred in the East African highlands during El Niño years, resulting in 100 per cent increase in hospital admissions.

In the 1990s, it was recognised that malaria control in Africa required a global effort and special programmes were initiated. The prevalence of asymptomatic malaria fell by 50 per cent and that of symptomatic clinical cases fell by 40 per cent between 2000 and 2015. In the highlands of Western Kenya, the prevalence of infections fell by 80 per cent. Among other strategies, the development of malaria epidemic early warning systems made it possible to minimise the impacts of the epidemics. Cholera, a water-borne disease, is also associated with climate variability. The largest epidemics observed in eastern Africa were associated with El Niño that causes water temperatures in lake and coastal waters to elevate. Cholera bacteria thrive under such conditions.

In most countries in Africa, water and sanitation programmes have contributed significantly towards the quantity and quality of drinking water. RVF, a viral disease transmitted by several types of mosquitoes, is associated with flooding. It is endemic in East Africa, Mauritania in North Africa and South Africa and disease transmission occurs during periods of extreme flooding. Recent observations suggest that its geographic range is expanding. The most effective control strategy is vaccination but this was restricted because the vaccine was being produced only in South Africa. Now, it is being produced in other countries such as Kenya. Since mass vaccination began in Kenya, no major outbreak has been reported. Meningococcal meningitis is associated with dry conditions and 350 million people are at risk. In 2010, a vaccine was deployed in Bukina Faso, Mali and Niger, and was found to be suitable for public health use. Vector control, effective medicines and vaccines have had success in reducing the impacts of climate sensitive diseases. These efforts must be sustained through investments in health and research. It must be recognised that climate

About 47 African countries had, in 2011, recognised the health impacts of climate change and adopted a framework to link it to public health. However, 10 years after, only 29 countries have developed and implemented the health-related National Adaptation Plan

change impacts are increasing and must be addressed robustly.

The WHO had, earlier, projected that 46 countries in the Sub-Saharan Africa will have the greatest burden of mortality attributable to climate change in the next decade (by 2030). About 47 African countries had, in 2011, recognised the health impacts of climate change and adopted a framework to link it to public health. However, 10 years after, only 29 countries have developed and implemented the health-related National Adaptation Plan (HNAP). The HNAP ensures that both health issues and health authorities are represented in every country's efforts to build resilience to climate change. Between 2017 and 2019, 19 more countries conducted vulnerability and adaptation assessments and 12 developed HNAPs to climate change.

Other than the cost to human health, these diseases also impact the country's economy. The Ebola outbreak resulted in US $2.2 billion in gdp losses for Guinea, Liberia and Sierra Leone. It has often been pointed out that climate change can also reverse the gains made in controlling diseases. Regions with the triple combination of high exposure to climate change impacts, extensive poverty and dense populations will most probably face major adaptation challenges. Malawi, Mozambique, Zambia, Zimbabwe and the Lake Victoria region in East Africa are examples of places which will face these problems. ■

2 BIODIVERSITY

HIGHPOINTS

Africa loses **4 million** hectares of forests every year

An average of **33,630** elephants per annum have been lost during 2010-2012 to meet the increased demand for ivory

Africa recorded a **66%** fall in its wildlife populations during 1970-2018

Protected forest areas in Africa lack fund up to **90%** of the required budget

ISTOCK PHOTO

IN AND OUT OF AFRICA

Species extinction rate in Africa is higher than the rest of the world

WE, THE *Homo sapiens*, are ancestral African. Sometime 80,000 years ago, our ancestors decided to move out of Africa. Before this, we had been evolving for some 1, 20, 000 years in the continent. A complex play of ecological permutations and combinations – most importantly rapid change in climate – forced us to move out and keep doing what a species is primarily meant to do: keep procreating to sustain the chain of existence. We were already an independent species daring to seed our own tree of life. That time must have been an epochal one for the planet and also for us. This is because it was an end of evolutionary chain.

Modern humans branched out of their ancestral lineage. Some 5-6 million years ago, *Homo sapiens* separated from the chimpanzees as a new species. Humans and chimpanzees still share around 99 per cent of our DNA. Humans left behind the chimpanzees who still call Africa their only habitat.

In this blink on the evolutionary scale, we have become an equivalent of an invasive species to the planet; humans colonise the planet, literally. Outside our world is playing out what is widely believed to be the planet's Sixth Mass Extinction of species. And Africa is the place to watch it closely. The world's second largest and second most populous continent also hosts a quarter of the planet's animal and plant species. Africa has one-sixth of the world's forests. Africa hosts nine of the world's 36 biodiversity hotspots. Such hotspots are defined "as regions with more than 1,500 endemic plant species which have lost at least 70 per cent of their primary native vegetation." The Congo Basin, known as the world's second green lung that absorbs 4 per cent of the global carbon emission annually, has 240-million-hectare rainforest across eight African countries and supporting the livelihoods of 80 million people.

On the other hand, environmental degradation inflicts the continent the most. For instance, every year 4 million hectares (Ha) of forests is chopped in the continent which is double the rate of global average. "Every year more forest disappears, costing the continent a 3 per cent loss of GDP," said Abebe Haile-Gabriel, Food and Agriculture Organization's (FAO) Assistant Director-General and Regional Representative for Africa. Over 50 million people could have moved from the desertified areas of sub-Saharan Africa to North Africa and Europe by 2020. Up to 65 per cent of productive land is degraded, while desertification affects 45 per cent of Africa's land area, as per the "Review of Forest and Landscape Restoration in Africa 2021" published by FAO. According to UN, desertification is happening at an estimated 20,000 hectares per year. At least 70 per cent of Ethiopia is prone to desertification. While in Kenya, around 80 per cent of the land is threatened by desertification. According to various studies including that of the UN's Intergovernmental Panel on Climate Change (IPCC) and African Development Bank, the continent is most vulnerable to climate change impacts under all scenarios simulated.

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MASS EXTINCTION

News of species extinction from Africa comes at regular frequency. First, let's look at our closest ancestor – the chimpanzees. There are only 1, 50, 000 to 2, 50,000 of them in the continent. Most of them are limited to the central Africa - mainly Gabon, Democratic Republic of Congo (DRC) and Cameroon. Populations are no longer found in Gambia, Burkina Faso, Benin, or Togo. They are heading to extinction fast. Among the rarest subspecies is the Nigeria-Cameroon Chimpanzee—less than 6,000 are left in the forests north of the Sanga River in Cameroon and in southwestern Nigeria. It has been designated as a critically endangered species by the International Union of Conservation for Nature (IUCN), and if urgent steps are not taken, scientists say it will become extinct within the next two decades.

There are many threats to their existence. In the drier parts of their habitat range such as the Mbam Djerem National Park, the Bamenda Highlands in Cameroon and Gashaka Gumti and Mambilla in Nigeria, pastoralists have encouraged forest fires to provide more grazing land for their livestock, which are subsequently being converted to farmlands. Habitat destruction has increased noise disturbances, forcing the Nigeria-Cameroon Chimpanzees to move into areas occupied by other chimpanzee communities, where they face aggression, resulting in fatalities. Conservation biologists Jennifer Arubemi Agaldo, Gwom Thomas Gwom and Paul Tersoo Aperverga conducted a survey in 2011-2012 and found the habitat areas littered with spent cartridges, wire snares and logged trees. This indicates that chimpanzees are under serious threat from hunting and poaching activities, and the presence of logged wood indicates habitat destruction and degradation. "It is somewhat of a familial tragedy therefore, that we humans are

LANDMARK RESOLUTION AFTER 50 YEARS

Every person, everywhere, has the right to eat, breathe and drink without poisoning their bodies

EVERY PERSON on the planet has the right to live in a clean, healthy environment, declared the United Nations (UN) in a historic resolution adopted on July 28, 2022. Climate change and environmental degradation are the most critical threats awaiting humanity in the future, underlined the resolution. The landmark development demonstrates that the member states can unite in the collective fight against the triple planetary crisis of climate change, biodiversity loss and pollution. These together account for the death of around 9 million people every year, according to scientists.

"The resolution will help to reduce environmental injustices and protection gaps. It can empower people, especially those in vulnerable situations, including environmental human rights defenders, children, youth, women and indigenous people," the UN Secretary-General, António Guterres, said in a statement. The declaration sheds light on almost all the rights connected to the health of our environment.

"Every person, everywhere, has the right to eat, breathe and drink without poisoning their bodies," said UN High Commissioner for Human Rights, Michelle Bachelet. Society should transform by adopting sustainable means, which includes a shift to renewable energy and circular economy. "This right was not included in the Universal Declaration of Human Rights, 1948. So, this is a historic resolution that will change the very nature of international human rights law," said David Boyd, UN special rapporteur on Human Rights and Environment. Some 51 years ago, the United Nations Conference on the Environment in Stockholm concluded with a resolution placing environmental issues at the global forefront. Over 176 countries have adopted environmental framework laws on the basis of it. "From a foothold in the 1972 Stockholm Declaration, these rights have been integrated into constitutions, national laws and regional agreements. In October 2021, it was recognised by the UN Human Rights Council. Today's decision elevates the right to where it belongs: Universal recognition," said Inger Andersen, executive director of the United Nations Environment Programme.

July 28, 2010, the UN general assembly recognised the right to water and sanitation through its resolution. It stated that clean drinking water and sanitation "are essential to the realisation of all human rights". In response to this, governments across the world have changed their laws and regulations related to water and sanitation. So, the right to a healthy environment is one of the essential requirements for leading a dignified life. People have to hold their governments accountable to get these rights delivered.

The declaration adopted by over 160 UN member nations, including India, is not legally binding. But, it will encourage countries to incorporate the right to a healthy environment in national constitutions and regional treaties, stated UN. Russia and Iran abstained from voting. India voted for the resolution and pointed out that the General Assembly resolutions do not create binding obligations. Only through conventions and treaties do state parties undertake obligations for such rights. The words' `clean', `healthy' and `sustainable' lack an internationally agreed definition. The text fails to refer to the foundational principle of equity in international environmental law, added the country's representative. Nevertheless, this has given more power in the hands of environmental activists to question environmentally destructive actions and policies, according to the United Nations.

the cause of so much difficulty for this amazing species, both in captive situations and in the wild. About a century ago, there were hundreds of thousands more chimpanzees roaming throughout central Africa than exist today. Their populations have been and continue to be assailed by human encroachment and its associated outcomes: disease risk, habitat loss and the illegal and unsustainable bushmeat trade. Without significant change, wild populations are in serious danger of disappearing," wrote Stephen Ross, the Director of the Lester Fisher Center for the Study and Conservation of Apes at Lincoln Park Zoo at Chicago, USA, in *Down To Earth* magazine, a science and environment fortnightly published from India.

The latest assessment by IUCN in 2022 has also added dugongs and pillar coral to the IUCN Red List which now includes 150,388 species, of which 42,108 are threatened with extinction. Over 1,550 of the 17,903 marine animals and plants assessed are at the risk of

extinction, with climate change impacting at least 41 per cent of threatened marine species. Dugong populations in east Africa and New Caledonia have entered the IUCN Red List as Critically Endangered and Endangered respectively; the species remains Vulnerable globally. Their population is a victim to unintentional capture in fishing gear and destruction of their food (sea grass) due to chemical pollution, oil and gas exploration and production, bottom trawling and unauthorised coastal development.

Giraffe, the world's tallest mammal with height up to 19 feet, has been put under "vulnerable" category by IUCN in 2016. According to Giraffe Conservation Foundation, a Namibia-based non-profit engaged with conservation of this species, there are about 1, 17, 000 giraffes left in Africa. This is a 40 per cent dip from the population of giraffe recorded 35 years ago, going by the data of the Giraffe Conservation Foundation. Seven African countries don't have any giraffe anymore. "In the last 300 years, giraffes have lost almost 90 per cent of their habitat to human development including agriculture and infrastructure building," said the Foundation in a note.

In 2021, IUCN moved Africa's forest and savanna elephants to "critically endangered" and "endangered" category from "vulnerable". This was due to population declines caused primarily by poaching and habitat loss. The population of African forest elephants plummeted by 86 per cent in the last 31 years while that of the savanna elephants dropped by 60 per cent in the last 50 years, according to IUCN. The population of the two species combined is around 4, 15,000. Both species suffered sharp declines since 2008 due to a significant increase in poaching that peaked in 2011 but continues to threaten populations.

Forest elephants occur in the tropical forests of Central Africa and in a range of habitats in West Africa. They rarely overlap with the range of the savanna elephant, which prefers open country and is found in a variety of habitats in sub-Saharan Africa including grasslands and

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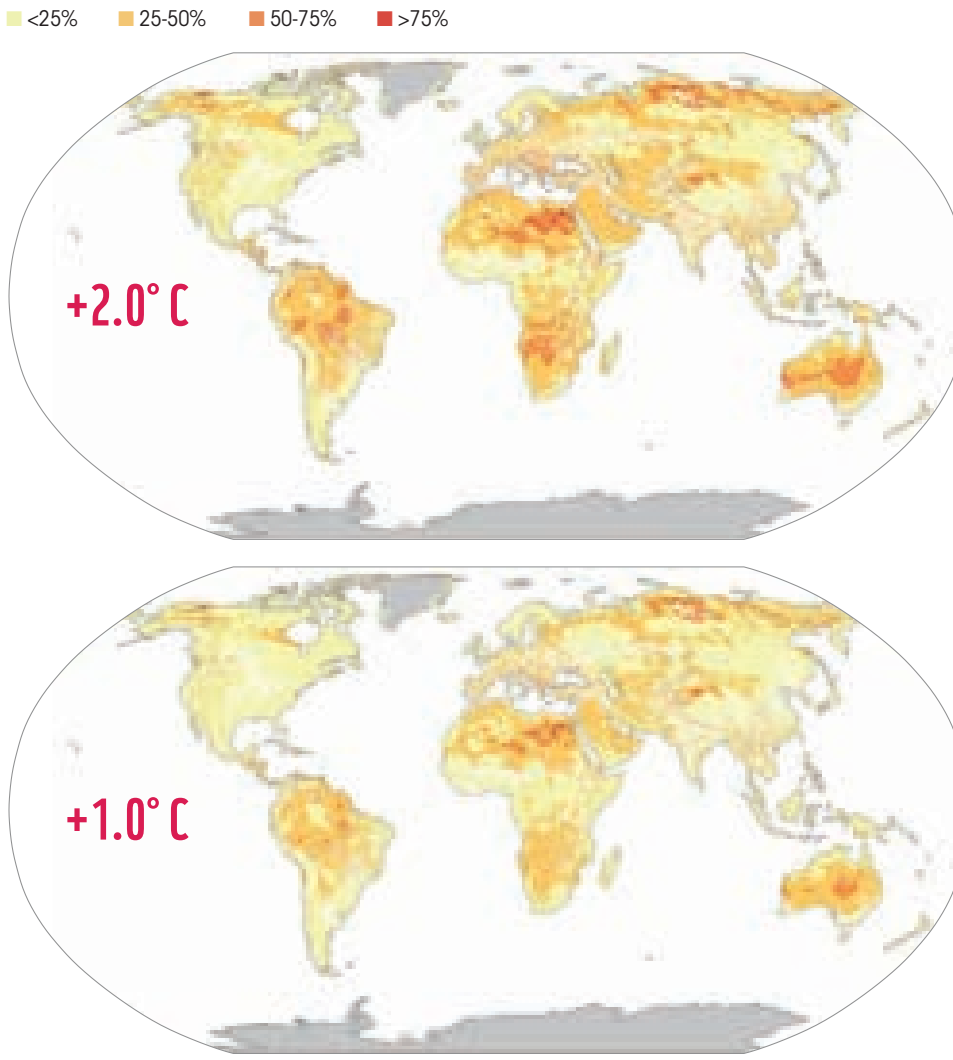
deserts. The forest elephant, which has a more restricted natural distribution, is thought to occupy only a quarter of its historic range currently, with the largest remaining populations found in Gabon and the Republic of the Congo.

The ongoing conversion of their habitats, primarily to agricultural and other land uses, is another significant threat. "Several African countries have led the way in recent years, proving that we can reverse elephant declines and we must work together to ensure their example can be followed," Bruno Oberle, IUCN director-general was quoted as saying in a press statement by the organisation. Poaching and land use changes remain prominent challenges to African elephant populations. However, the IUCN assessment also pointed out that there had been successful conservation programmes that had led to the stabilisation of the elephant populations in a few areas. Forest elephants had stabilised in well-managed conservation areas in Gabon and the Republic of the Congo, the assessment said. The numbers of Savanna elephants had also been stable or growing for decades, especially in the Kavango-Zambezi Transfrontier Conservation Area, which harboured the largest subpopulation of this species on the continent, the assessment added.

"Poaching for ivory has been the scourge of African elephants over the past several decades. As both males and females possess tusks, the impact of ivory poaching is especially severe," said R Sukumar, honorary professor of ecology at the Indian Institute of Science and a member of India's National Board for Wildlife. "The decline of the forest elephant (*Loxodonta cyclotis*) is especially extremely worrying. While savanna elephant populations can bounce back given

Projected loss of terrestrial and freshwater biodiversity
(compared to pre-industrial period)



Source: WWF Living Planet Report 2022

sufficient protection, the forest elephant is likely to recover much more slowly. Law enforcement is also more problematic in many Central African countries which are home to the forest elephant," he added.

Ivory consumption is unsustainable and is causing a dramatic decline in the number of African elephants, according to a new study, "Illegal killing for ivory drives global decline in African elephants", published in the *Proceedings of the National Academy of Sciences (PNAS)*. An estimated 100,000 elephants (*Loxodonta Africana*) were killed by poachers across Africa between 2010 and 2012, said the new study, led by George Wittemyer, professor in the Department of Fish, Wildlife and Conservation Biology at Colorado State University's Warner College of Natural Resources. An average of 33,630 elephants per annum were calculated to have been lost over the three years to meet the increased demand for ivory, especially from China and other Asian nations, revealed the report. In contrast to the rest of Africa, this study concluded that central African forest elephants experienced decline throughout the last decade. According to Wittemyer, "The real-world impact could be even direr than the [study] model predicts because poachers target the largest adults [for their bigger tusks], whose deaths decrease birth rates and disrupt social networks." Elephant populations in eastern and southern Africa were in

good shape until 2008, but then started to decline. Currently, about 75 per cent of the populations across the continent are shrinking.

AFRICA AND THE SIXTH MASS EXTINCTION

In October 2022, the extent of species decline came to focus when WWF released its flagship "Living Planet Report 2022". Africa recorded a 66 per cent fall in its wildlife populations during 1970-2018. The report also featured the Living Planet Index (LPI), analysing about 32,000 populations of 5,230 species across the world. Africa shows almost equal proportions for habitat degradation and overexploitation as the reason for population change, the assessment reasoned. In another assessment based on many studies, IUCN said that over 6,400 animals and 3,100 plants in Africa are at risk of extinction. Surveys of Africa's bird populations show declines over the past 25 years, a pattern likely matched by fish and plant populations, though data is limited. Overall, populations of vertebrate species in Africa are estimated to have declined by 39 per cent since 1970.

Earlier, in 2019, the UN backed Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) brought out the first global assessment of species extinction in the planet. "The actions of mankind could lead to the extinction of half of African birds and mammals by the end of 2100," said the assessment.

A study published in the *Nature Communications* in January 2023 revealed that a wave of extinction is sweeping Madagascar, one of the world's biodiversity hotspots. The study led by Luis Valente, assistant professor at the University of Groningen, and senior researcher at the Naturalis Biodiversity Center estimated that in just a decade – 2010 to 2021 – "the number of Madagascar's

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mammal species under threat of extinction increased from 56 in 2010 to 128 in 2021." The researchers said, "If current threats were not mitigated, recovering the species lost since humans arrived in Madagascar would take up to three million years. It would take more than 20 million years if species currently at risk of extinction were lost as well."

The history of life on Earth is a random collation of the evolution, multiplication and extinction of new species. Of the 4 billion species that have evolved over the last 3.5 billion years, some 99 per cent have disappeared in a series of extinctions, estimate Michael Novacek, senior vice president and provost of science at the American Museum of Natural History, in his 2001 research book "The Biodiversity Crisis: Losing What Counts". New species have evolved after each bout of mass extinction.

Scientists have tracked extinctions since the Cambrian period that began some 540 million years ago, when life forms diversified exponentially triggering the start of what we now call biodiversity. The Earth has experienced five mass extinctions so far; one every 100 million years on average. Each extinction period has lasted from 50,000 to 2.76 million years.

Does this mean we are currently experiencing the sixth mass extinction? Robert Cowie of the Pacific Bioscience Research Center, University of Hawaii, believes so. "Drastically increased rates of species extinctions and declining abundances of many animal and plant populations are well documented, yet some deny that these phenomena amount to mass extinction," he said when his January 2022 study on mass extinction was published. In the 1980s, scientists defined mass extinction as "any substantial increase in the amount of extinction (lineage termination) suffered by more than one geographically wide-spread higher taxon during a relatively short interval of

"EXTINCTION RATE IS HIGHER THAN PREVIOUSLY THOUGHT"

The extinction crisis is really a part and parcel of climate change

THE WAVE of extinction of species underway across the globe might be more intense than previously thought, a new research led by the University of Minnesota indicated. Nearly 30 per cent of the species have been facing global extinction since 1500, according to the survey published on July 18, 2022, in the *Frontiers in Ecology and the Environment* journal. "The extinction crisis is really a part and parcel of climate change," Noah Greenwald, Director for endangered species at Center for Biological Diversity, told News Wise. The survey received 3,331 responses from biodiversity scientists across 187 countries.

The study had also recognised essential demographic and geographic variations in experts' perspectives and estimates, said a press note released by the University of Minnesota. "Since biodiversity is highly regional, the attempt of our study to bring together the opinions of regional experts from around the world is unprecedented," said co-author Akira Mori, University of Tokyo in Japan. The experts believe that substantially growing conservation investments and efforts could put off the risk of extinction for one in three species that can be threatened or extinct by 2100.

"Those are the very species, which help us in purifying air, filtering water and maintaining the health of our soils," Healy Hamilton, Chief Scientist at the non-profit research group, Nature Serve told Star Tribune. It is one of the first studies to bring together diverse geographical and demographic data from thousands of international biodiversity experts. Each expert's perspective contributed to a comprehensive assessment of biodiversity loss and the most influential factors affecting the world's ecosystems. The paper included the perspectives of a very wide range of experts, who were underrepresented in the global literature, claimed scientists. The experts who identified as women and who are from the Global South had provided significantly higher estimates for past biodiversity loss and its impacts. Wealthy countries have provided lower estimates for biodiversity loss in the past and more pessimistic estimates for the future, noted the scientists.

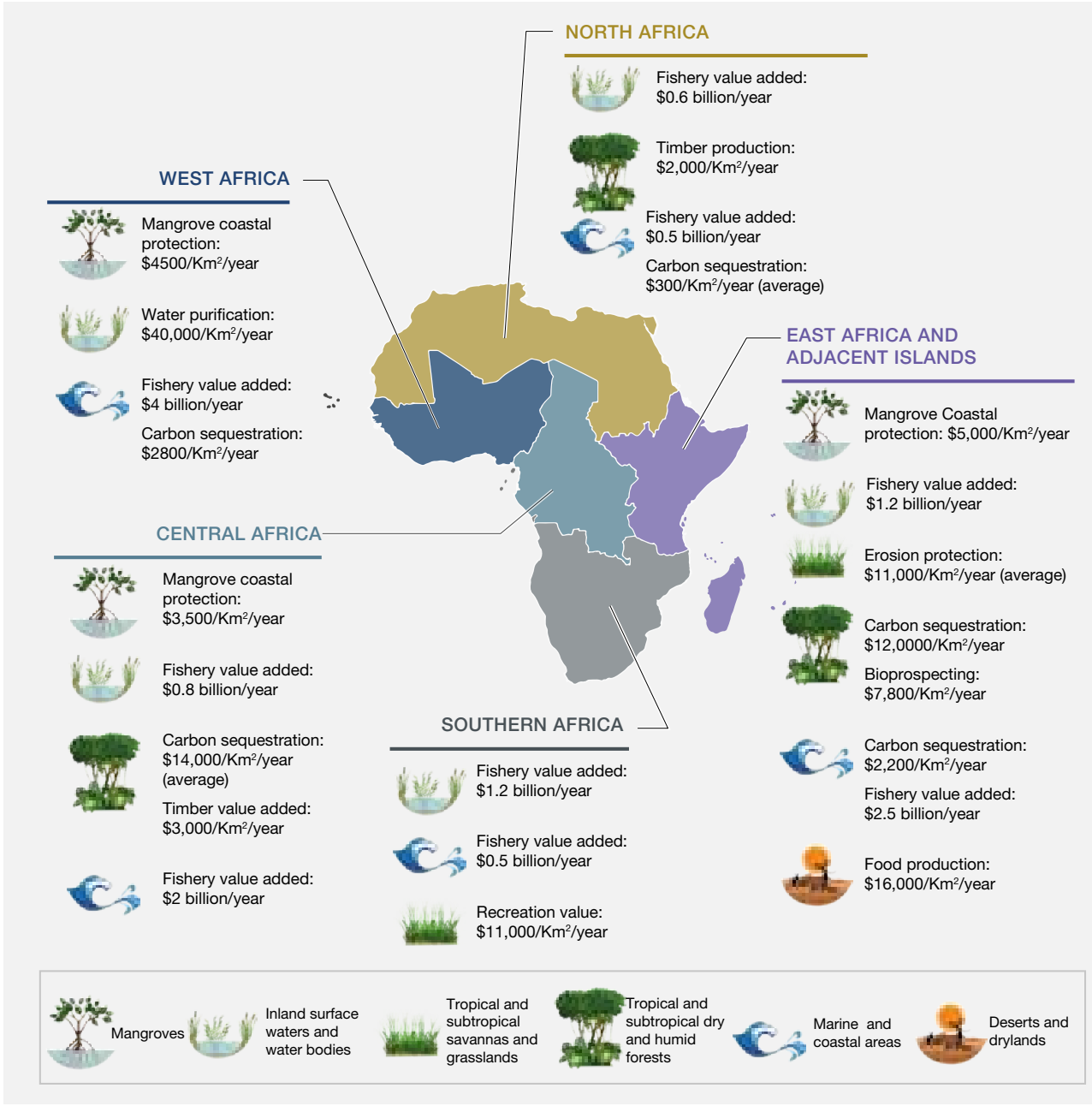
geologic time, resulting in an at least temporary decline in their standing diversity". The "short interval of geologic time" is further defined as a period less than 2.8 million years.

Fossil records of earlier species and extinction studies suggest a species exists for around million years before it goes extinct. This is called the background extinction rate, and is expressed as "one species extinction per million species-years". It is used to establish whether an extinction rate is unusual or faster. "If we use the same approach to estimate today's extinctions per million species-years, we come up with a rate that is between 10 and 10,000 times higher than the background rate," academics Frédérik Saltré and Corey J A Bradshaw of Flinders University, Australia, said in a 2019 article in portal *The Conversation*. Some scientific studies infer that given the current rapid rates, a mass extinction period could also be reached in just 240 to 540 years. The ongoing sixth mass extinction is different from the previous events. While the earlier extinction periods were triggered by the planet's warming, the Ice Age or even volcanic eruptions, the current one is being driven by just one species—Homo sapiens, or us.

In 2017, some 15,364 scientist signatories from 184 countries warned in a paper in the journal *BioScience* that humans had unleashed the Sixth Mass Extinction "wherein many current life forms could be annihilated or at least committed to extinction by the end of this century". From an evolutionary perspective, this phase is not just drastic but also unique, for the simple fact that it revolves around one super colonising species.

Evolutionary scientists say the "age of humans" or the Anthropocene (*Anthropos* is Greek for human and *-cene* is a substantial geological time period within the current 66-million-year-old Cenozoic era) is the third and fundamentally new stage of evolution for the planet. Simple single-cell microbial organisms were at the core of the first stage of evolution, spanning over 3.5 billion to 650 million years ago. The second stage started some 540 million years ago with multi-cellular life springing widespread biodiversity. The third stage is all about the *Homo sapiens* that have not only colonised the planet but have also decided which species and diversity will survive and thrive here. Our species are now distributed across the globe and our user-centric existence has

INDICATIVE LISTS OF ECONOMIC VALUES OF NATURE'S CONTRIBUTIONS TO PEOPLE IN AFRICA



Source: The Regional Assessment Report on Biodiversity and Ecosystem Services for Africa, IPBES

led to hominisation of flora and fauna.

This becomes clear from a recent census of the biomass on Earth. The one-of-its-kind exercise was conducted in 2018 by scientists Ron Milo and Yinon M Bar-On of Israel's Weizmann Institute of Science, and Rob Phillips of the California Institute of Technology, US. The census involved deciphering the composition of the 550 gigatonnes of biomass distributed across all kingdoms of life on Earth. The results not only highlighted the devastating changes in the planet's biodiversity but also brought out the impacts of the Anthropocene. "It is definitely striking, our disproportionate place on Earth," Milo had said at the time. According to the census, the 7.6

billion humans account for just 0.01 per cent of all biomass on Earth. In contrast, bacteria account for 13 per cent of the total biomass; plants 82 per cent and all other forms of life just around 5 per cent.

The census also attributes humans to the annihilation of 83 per cent of all wild mammals and half of all plants. Of the birds left in the world, 70 per cent are poultry chickens and other farmed birds. And of all the mammals, 60 per cent are livestock (cattle and pigs), 36 per cent are humans, and a mere 4 per cent are wild, it says. "When I do a puzzle with my daughters, there is usually an elephant next to a giraffe next to a rhino. But if I was trying to give them a more realistic sense of the world, it would be a cow next to a cow next to a cow and then a chicken," Milo had said while explaining the findings.

The planet is losing species at unprecedented rates, with thousands likely to go extinct within decades. The first-ever Global Assessment Report on Biodiversity and Ecosystem Services by Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) rings alarm bells on the state of the planet's biodiversity. "Nature is declining globally at rates unprecedented in human history — and the rate of species extinctions is accelerating with grave impacts on people around the world now likely," said the report.

According to the global assessment, 1 million animal and plant species are under extinction. More to it, thousands of these would extinct within decades. "More than ever before in human history" is how the assessment report has termed the extinction rate. Since the beginning of the last century (1900), availability of native species in most of the land-based habitats has declined by 20 per cent. Similarly, 40 per cent of the amphibian species are threatened with extinction.

If one tracks back extinction of species to the 16th century, 680 vertebrate species have been

The 7.6 billion humans account for just 0.01 per cent of all biomass on Earth. In contrast, bacteria account for 13 per cent of the total biomass; plants 82 per cent and all other forms of life just around 5 per cent

pushed into extinction since then, while 9 per cent of all domesticated breeds of mammals used for food and agriculture went extinct by 2016. Add to it, 1,000 more such breeds are under threat of extinction. The assessment report said, "Almost 33 per cent of reef-forming corals and more than a third of all marine mammals are threatened." "Ecosystems, species, wild populations, local varieties and breeds of domesticated plants and animals are shrinking, deteriorating or vanishing. The essential, interconnected web of life on Earth is getting smaller and increasingly frayed," said Josef Settele (Germany) who co-chaired the assessment.

"This loss is a direct result of human activity and constitutes a direct threat to human well-being in all regions of the world," he said. The Global Assessment Report on Biodiversity and Ecosystem Services is termed as the first-ever such comprehensive report. It took three years for a group of 145 expert authors from 50 countries to prepare this report based on more than 15,000 scientific and government documents. It primarily looked or analysed the impact of economic development on nature and ecosystems. The assessment was released on May 6, 2019.

"The health of ecosystems on which we and all other species depend is deteriorating more rapidly than ever. We are eroding the very foundations of our economies, livelihoods, food security, health and quality of life worldwide," said Robert Watson, the IPBES chair. On the human-induced loss in ecosystems, the assessment is precise. Three-quarters of the land-based environment and about two-thirds of the marine environment have been significantly altered by human actions, says the assessment. Nearly 75 per cent of all freshwater resources are now used for crop and livestock rearing activities. The impacts are equally scary. For example, productivity in 23 per cent of global land has reduced due to land degradation. "Up to $577 billion in annual global crops are at risk from pollinator loss and 100-300 million people are at increased risk of floods and hurricanes because of loss of coastal habitats and protection," said the assessment. The assessment added that this decline would continue till 2050.

15.6 BILLION YEARS OF EVOLUTIONARY HISTORY WILL BE LOST

Around 30 per cent of forest-dwelling reptiles are at risk of extinction

NEARLY A fifth of all reptile species globally are at risk of extinction. Habitat loss due to agriculture, deforestation and urban development are few of the greatest threats to reptiles all over the world, according to the "Global Reptile Assessment" published in the journal *Nature* on April 27, 2022. The authors of the report analysed 10,196 reptile species following the same criteria as the International Union for Conservation of Nature Red List of Threatened Species and found at least 1,829 are threatened.

Earlier, reptiles were omitted from conservation-prioritisation analyses because of lack of global assessments. Reptiles are threatened by the same major factors that threaten other tetrapods (a superclass of animals that includes all limbed vertebrates): Agriculture, logging, urban development and invasive species, according to the authors of the report. They added: "Reptiles inhabiting forests, where these threats are strongest, are more threatened than those in arid habitats, contrary to our prediction."

Around 30 per cent of forest-dwelling reptiles are at risk of extinction, compared with 14 per cent of reptiles in arid habitats, they added. The threat posed by climate change remains uncertain, the report said. Reptiles in the study include turtles, crocodiles, lizards, snakes and tuatara (the only living member of a lineage that evolved in the Triassic period around 200-250 million years ago). Many threatened species of reptiles are concentrated in places where other vertebrates are also threatened, according to the assessment. Threatened reptile species are concentrated in Southeastern Asia, West Africa, northern Madagascar, the northern Andes and the Caribbean, the researchers found. Some parts of southern Asia and northeastern United States have twice the number of reptile species in a threatened category than other tetrapods, it added.

Around 15.6 billion years of evolutionary history will be lost from the face of the earth if these 21 per cent species of reptiles go extinct in the coming years, the study stated. "Southeastern Asia, India, West Africa and the Caribbean comprise the top 15 per cent areas of phylogenetic (reconstructing the past evolutionary history of existing/surviving species) diversity loss, with high concentrations of threatened and evolutionarily distinct species." The results of the study signal the need to ramp up conservation efforts globally, said Neil Cox, co-leader of the study and Manager of the IUCN-Conservation International Biodiversity Assessment Unit.

Reptiles face a wide range of threats across a variety of habitats because the species is so diverse, he told NatureServe, a network of 60 governmental and non-governmental programs located in the United States and Canada, working for protect and conserve the plants, animals, and ecosystems. "A multifaceted action plan is necessary to protect these species, with all the evolutionary history they represent." Land protection is a critically important conservation effort to buffer many threatened species from the dual threats of agricultural activities and urban development, the report read. It suggested halting "unsustainable harvest and stem the spread of invasive disease" to prevent more species of reptiles from becoming threatened.

SAVING THE MARINE WORLD

Loss of species afflicts all ecosystems — from land to oceans, from sea surface to the yet-to-be-fully-explored seafloors, from forests to desert, and from swamps to rivers. Scientists are now bringing out specific studies to declare extinction of species almost on a daily basis, which makes clear that the planet is hurtling towards mass extinction.

On the deep seafloors, believed to be the harshest habitat, the extinction process is setting in. Elin A Thomas, a doctoral candidate at Queen's University, UK, researching the state of species in the hydrothermal vents, said this ecosystem is yet to be studied and species fully identified. "Our research found that of the 184 species (of Molluscs) assessed, 62% are listed as threatened: 39 are critically endangered, 32 are endangered and 43 are Vulnerable." In the Indian Ocean vents, 100 per cent molluscs are already listed as critically endangered, Thomas said. This shows the urgent need to protect them from extinction. Yet, International Seabed Authority, a Jamaica-based intergovernmental body, is allowing deep sea mining contracts.

In freshwater bodies like lakes and rivers that occupy less than 1 per cent of the planet's surface space but host 25 per cent of all vertebrate species, making them the densest biodiversity,

one in three fish species is on the verge of extinction. Freshwater fishes account for over half of the world's total fish species. IUCN's Global Species Programme and Species Survival Commission are currently assessing the state of extinction among freshwater fish. "The fact that freshwater biodiversity is declining at twice the rate of that of terrestrial or marine species, is not just an alarming statistic for the environment, it is also highly concerning for people's health and job security," said James Dalton, director, IUCN Global Water Programme. "Freshwater fisheries provide the main source of protein for 200 million people across Asia, Africa and South America, as well as jobs and livelihoods for 60 million people. And yet here we are, documenting more declines on our watch." Populations of migratory freshwater fish have fallen by 76 per cent since 1970 and large freshwater species, such as the catfish, by a catastrophic 94 per cent.

Losing species at such alarming rate has far-reaching consequence on the landmass. Some 300 million years ago, trees started sprouting on the planet. This was an evolution that made food possible for us. Most of our food crops originated from these trees. Every fifth tree species is used by humans for food, fuel and medicines, among other uses. In 2021, Marseille, France, hosted the World Conservation Congress — held every four years and regarded as the largest such congregation — during which conservationists heard with shock the findings of a study: "Over 70 wild relatives of some of the world's most important crops are threatened with extinction." The findings, published in the journal *Plants, People, Planet*, assessed 224 plants closely related to maize, potato, bean, squash, chilli pepper, vanilla, avocado, husk tomato and cotton crops. According to this paper, 35 per cent of these wild species are on extinction mode. The genetic materials from these wild varieties are still used to develop new crops, resilient to changing climate and other needs. Without these trees, we will lose biodiversity altogether disabling us

In freshwater bodies like lakes and rivers that occupy less than 1 per cent of the planet's surface space but host 25 per cent of all vertebrate species, making them the densest biodiversity, 1 in 3 fish species is on the verge of extinction

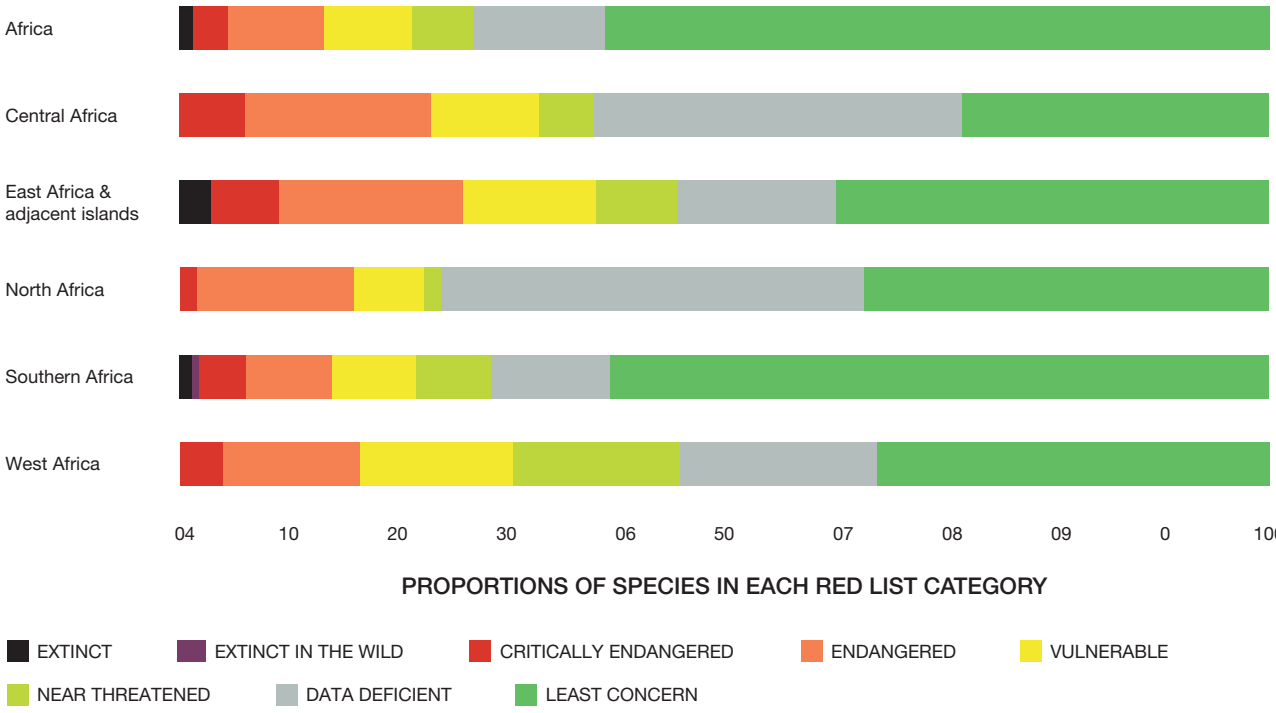
from evolving food crops varieties.

In just the last three centuries, global forest areas have shrunk by 40 per cent. Every year, to meet the timber needs from natural sources, the Earth is stripped of 100 million trees. They store 50 per cent of the world's terrestrial carbon and provide a buffer from extreme weather, such as hurricanes and tsunamis. In 2022, the Botanic Gardens Conservation International, a charity based in London, published its five-year assessment called "State of the World's Trees". The assessment evaluated 60,000 tree species and found that 30 per cent are at the risk of extinction. Extinction in the plant kingdom is "twice the number of threatened tree species globally than threatened mammals, birds, amphibians and reptiles combined". Over 440 tree species are on the brink of extinction, meaning they have fewer than 50 individuals remaining in the wild, the report revealed. These species are found all over the world, from the Mulanje cedar in Malawi, with only a few remaining individuals on Mulanje Mountain, to the Menai white beam found only in North Wales, which has only 30 trees remaining.

In its latest report, "Climate Change 2022: Impacts, Adaptation and Vulnerability", the Intergovernmental Panel on Climate Change (IPCC) has, for the first time, mentioned the extinctions taking place due to climate change. "In terrestrial ecosystems, 3 to 14% of species assessed will likely face very high risk of extinction at global warming levels of 1.5°C, increasing up to 3 to 18% at 2°C, 3 to 29% at 3°C, 3 to 39% at 4°C, and 3 to 48% at 5°C," warns the IPCC, reflecting other similar forecast. Species have evolved while the Earth experienced extreme colder and warmer periods.

Nick Longrich, senior lecturer in evolutionary biology and palaeontology, University of Bath, UK, said it is the migration of *Homo sapiens* out of Africa and the arrival of modern humans led to the extinction of other human species. Nine human species lived on Earth 300,000 years ago. "By 10,000 years ago, they were all gone. The disappearance of these other species resembles a

EXTINCTION RISK OF SPECIES ENDEMIC TO AFRICA AND ITS SUBREGIONS



Source: The Regional Assessment Report on Biodiversity and Ecosystem Services for Africa, IPBES

mass extinction. But there's no obvious environmental catastrophe—volcanic eruptions, climate change, asteroid impact—driving it. Instead, the extinctions' timing suggests they were caused by the spread of a new species, evolving 260,000-350,000 years ago in Southern Africa: Homo sapiens," he says in a November 2019 article in The Conversation. His reasoning? "Humans reproduce exponentially, like all species. Unchecked, we historically doubled our numbers every 25 years. And once humans became cooperative hunters, we had no predators. Without predation, controlling our numbers and little family planning beyond delayed marriage and infanticide, populations grew to exploit the available resources," he said in the article.

NO MORE 'NATURAL WORLD'

Hence, the concept of a "natural environment" no longer makes sense, as there is nothing on this planet, animate or inanimate, that humans have not tinkered with. Soon, we will be the first *Homo sapiens* to witness the Earth entering into a new geological epoch that is named after us. This is not a fortunate event, but rather a call of urgent attention to our irreversible impacts on the planet's ecosystems. In 2016, for the first time, the International Geological Congress held in Cape Town, South Africa, informally voted to declare the arrival of the Anthropocene. In May 2019, a 34-member panel of scientists called the Anthropocene Working Group (AWG)—set up by the Subcommission on Quaternary Stratigraphy, part of the International Commission on Stratigraphy that oversees the geologic time chart—voted to declare the descent of the new epoch. AWG will soon put forth a formal proposal for this to its parent body. The AWG on July 11, 2023 proposed that the new era started just after World War II. The unique reference point for the Anthropocene is Crawford lake near Toronto in Canada's stems from the fact that it shows traces of the radioactive element, Plutonium.

This will mark the end of the current epoch called the Holocene, which started approximately 11,700 years ago. This age, retrospectively designated by contemporary scientists, tentatively coincides with humans adopting settled agriculture after a change in the planet's climate. At the

start of the Holocene, the planet had a new geography, demography and ecosystem as the Paleolithic Ice Age came to an end and a warm season set in. Glaciers melted, new forests came up in vast areas, mammoths and woolly rhinoceros succumbed to the warm climate and humans decided to quit food gathering and hunting for more settled lives. This also led to more growth in human population.

In terms of the Anthropocene, 29 of the 34 members of AWG have supported the proposal to declare the mid-20th century as the beginning of this epoch. Scientists argue that the Anthropocene started to set in with the advent of the industrial revolution that led to industrial production, discovery of chemicals and their cascading effects on the natural systems. Scientists are already scoping for sites to look for evidence of such human intervention in our ecosystems. In particular, they are looking at radionuclides (atoms that emit radiation as they undergo radioactive decay) released during the first nuclear weapons tests in 1945 in the US. These particles have scattered across the globe and become a part of the Earth's soil, water, plants and glaciers, leaving permanent human imprints on the planet. Plastic—an all-pervasive human invention—is being proposed as another marker of the Anthropocene.

"Ecosystems, species, wild populations, local varieties and breeds of domesticated plants and animals are shrinking, deteriorating or vanishing. The essential, interconnected web of life on Earth is getting smaller and increasingly frayed," Josef Settele, professor at the Helmholtz Centre for Environmental Research, Germany, who co-chaired the assessment, had said at the time. "This loss is a direct result of human activity and constitutes a direct threat to human well-being in all regions of the world," he added.

On the human-induced loss in ecosystems, the assessment is precise. Three-quarters of land-based environment and about two-thirds of the marine environment have been significantly altered by human actions. Nearly 75 per cent of all freshwater resources are now used for crop and livestock rearing activities. The impacts are scary. For example, productivity in 23 per cent of global land has reduced due to land degradation. "Up to US $577 billion in annual global crops are at risk from pollinator loss and 100-300 million people are at increased risk of floods and hurricanes because of loss of coastal habitats and protection," said the assessment. It added that this decline would continue till 2050.

The world may miss the UN Sustainable Development Goals (SDG) targets by a wide margin if the human civilisation does not pull up its socks and promptly acts to protect the natural order. Close to 80 per cent (35 of 44) assessed targets under the goals will remain unmet. Biodiversity loss will impact the SDGs related to poverty, hunger, health, water, cities, climate, oceans and land. The current trajectories used for conserving nature and achieving sustainability, such as those embodied in the Aichi Biodiversity Targets and the 2030 Agenda for Sustainable Development, cannot be met. Although there has been progress in the implementation of various policies and actions to conserve nature and manage it more sustainably, they are not sufficient to stem the direct and indirect drivers of nature deterioration.

The Anthropocene is a strange phase in the geological scale where the dominant species fundamentally alters the ecosystem, and its biggest preoccupation now would be to look for ways to fix it as well. Here comes the tussle between *Homo sapiens* and the rest of the species on the planet.

But the current period of human-induced warming is turning out to be a situation which organisms may find unadoptable. For nearly all the planet's surface, the warmest period of the last 2,000 years was experienced in the late 20th century and in the first two decades of the 21st century. The current warming is 1.2°C above the pre-industrial levels. This means, from the evolutionary perspective, humans are already moving out of the Holocene environment that ensured the right temperature for us to evolve and take up farming. The IPCC report has reiterated that "in the coming 50 years, 1 to 3 billion people are projected to experience living conditions that are outside of the climate conditions that have served humanity well over the past 6000 years". The IPCC report cites that half of all species are moving towards the poles or to a higher elevation to adapt to the new planetary climate. At the sea, due to the warming, species have travelled pole-ward at the rate of 59 km per decade on average. ■

PHOTOGRAPH COURTESY: YUKINO IWAI / GLOBALEJOURNAL.ORG

NEW CALL OF ACTION

Protected areas in Africa if sustainably used can eradicate poverty and bring peace

DELEGATES AT the Africa Protected Areas Congress (PCA) adopted the "Kigali Call to Action" for the establishment of a special fund to compensate communities affected by human-wildlife conflict. The six-day conference, organised by International Union for Conservation of Nature (IUCN), culminated with the adoption of the Kigali Call to Action on July 23, 2022. This was the first continent-wide gathering of African leaders, citizens and interest groups to discuss ecosystem services that underpin human welfare and livelihoods. Protected areas must be considered by Africa as the first option for climate adaptation and mitigation and must be reflected in the next revision of Africa's Nationally Determined Contributions (NDC) to the Paris Agreement, the delegates unanimously said in the "Kigali Declaration". "It was a congress by Africans for Africa –

celebrating and acknowledging the skills and commitment of Africa towards conservation, sustainable use of nature and human well-being," read the declaration.

The participants of the congress suggested various measures to resolve the human-wildlife conflict in Africa. "Human-wildlife conflict is real, and it affects our people directly," said Najib Balala, minister of tourism and wildlife, Republic of Kenya at the Congress. In fact, such conflicts between man and animals are already on the rise across most of African countries, an international team of scientists said in a study titled "*Pan-African Spatial Assessment of Human Conflicts with Lions and Elephants, 2021*".

Protected areas are spread across over 6 million square kilometres and they have the potential to address poverty and build resilient communities, according to IUCN. They support human welfare and well-being by providing various benefits. This include food and water security, erosion and flood control, disease control, climate regulation, carbon sequestration and a host of other critical ecosystem services. So, it is important to assess the effectiveness of protected areas and other conserved areas, including their governance and management. For this, they must be benchmarked against universal standards such as the IUCN Green List Standard and actions must be taken accordingly, said the participants in the declaration.

This is because any protected and conserved area under "Green List" status indicates recognition and respect for the local community. It has also demonstrated its success in conserving nature for the people. "Nature conservation" must be integrated to the curriculum across all disciplines, including humanities, physical, biological and social sciences, technology and innovation. For this, the curriculum needs to be transformed, said the participants who represented the voice of youth in Africa.

Protected areas in Africa are grossly underfunded despite their enormous economic value. The region is short of 80 to 90 per cent of available funds for management of protected areas, as per the IUCN statistics

Protected areas in Africa are grossly underfunded despite their enormous economic value. The region is short of 80 per cent to 90 per cent of available funds for management of protected areas, as per the IUCN statistics. It is therefore important to increase investments and raise funds using innovative ways, which includes the Pan-African Conservation Trust (A-PACT) fund launched on July 18, 2022 at the congress.

The conference asked the governments of African nations to consider Protected areas as the first option for climate adaptation and mitigation. This should be reflected in the implementation of Africa's Nationally Determined Contributions (NDCs), they said in the "Kigali declaration". The participants, through this, committed to address the biodiversity, climate change, health crises and human development related issues.

They called for supporting Africa's indigenous people and local communities for effective conservation of nature, culture, livelihoods and human well-being. It is important to acknowledge the past and ongoing injustices experienced when indigenous peoples and local communities have not been accorded their rights in the pursuit of conservation goals. These injustices must be halted now and in the future, they said. The participants also suggested a pan-African collaboration for protected and conserved areas. The Declaration called for supporting and financing of rangers, including community rangers, accountable to communities to conduct their critical and diverse work professionally, responsibly and accountably.

Communities should be involved in protecting species as some animals in Africa spend most of their time outside protected areas, suggested Alphonce Mallya, programmes director for Northern Tanzania at The Nature Conservancy, an environmental organisation. Mallya said, "The best strategy to do that is to work with the communities on their traditional and historical knowledge. Wildlife still exists in Africa only because of the strategies deployed by the local community. So, work with them, identify the strategies and promote them." Put

CENTRAL AFRICA CAN ATTAIN SUSTAINABILITY

Governments in the region accelerated oil extraction and diversified national economies, especially toward mining and forestry industries

CENTRAL AFRICA, which is rich in natural resources, can develop itself sustainably provided the resources are shared equitably and the region's environment is protected. Development based on respect for the environment and social equity will be the only way to prevent poverty and war, said a report titled "Protected Areas in Central Africa 2020", published by the Central Africa Forest Observatory (OFAC), a specialised unit of the Central African Forests Commission (COMIFAC).

Central Africa is rich in petroleum, copper, manganese, iron, diamond, cobalt and coltan. Macroeconomic forecasts for 2020 for central African countries indicated a growth rate of between –2.5 per cent and –4.3 per cent. The decline in the price of oil per barrel since late 2018, coupled with the global health crisis stemming from the novel coronavirus disease (COVID-19) had led to a deteriorating economic situation. Consequently, governments in the region accelerated oil extraction and diversified national economies, especially toward mining and forestry industries.

Natural ecosystems in the region are being exposed to: Wildlife poaching; expansion of transhumant pastoralism; increase in mining permits; industrial agriculture and family farming; the exploitation of timber, fuel wood; and conflicts over land. There are 206 protected areas in the region, covering 799,000 square kilometres or 14.8 per cent of the land area and 5 per cent of the marine exclusive economic zone of central African countries.

Some 24 African countries have adopted Extractive Industries Transparency Initiative (EITI) standards. The initiative aims to promote more inclusive and transparent management of mineral resources. This, it aims to do by improving governance systems, making information about mining and drilling available to the public and building greater trust among stakeholders.

EITI has led to some progress in transparency in the sector in central African countries such as Cameroon, the Democratic Republic of the Congo and Chad. Cameroon established SONAMINES, its national mining company in December 2020, with the aim of developing the mining sector sustainably. However, there is still a long way to go. In 2009, the African Union adopted a general framework for the development of mining resources called the Africa Mining Vision (AMV), complemented in 2011 by an action plan. AMV recommends improving the conditions for negotiating mining contracts, paying more attention to the environment and ensuring the best use of natural resources. Unfortunately, the implementation of AMV at the national level has been slow to materialise.

Only five member countries of COMIFAC have ratified the revised Maputo Convention on the Conservation of Nature and Natural Resources, which was adopted on March 7, 2017. This Convention provides obligations to protect natural habitats, their fauna and flora as well the preservation and restoration of these habitats.

communities in the forefront of implementation and make sure there's ownership and ensure that conservation-based revenue schemes are in place. So that, they can sustainably generate revenue out of the resources they're conserving, he added. He also stressed the importance of ensuring transparency in governance. Communities should be informed of the distribution of benefits arising out of biodiversity. They should know about the operationalisation of the conservation practices taking place in Africa, said Francis Oseigyan, who works with the Amedzofe community in the Volta region of Ghana.

"You need to think about how you can support their livelihood. They kill the animals for survival. Some kill them for food, whereas others sell them. So, if you're asking them not to kill animals, what alternative livelihood do you have for them? " said Francis. One of the programmes we have in this regard is the "wildlife guardian program" and with it, the community reserve is managed with the help of converted hunters. People who used to hunt animals and those who put down trees have now been able to be convinced to conserve these animals and plant species, he explained.

"We have built a canopy walk-way, where tourists come and the revenue that is generated is used to support the community and their protected area management," he added. Poaching has reduced by 85 per cent in the Volcanoes National Park, Rwanda, over the past 15 or 20 years.

This is because communities were involved in conservation measures, said Francis. "In 2005, we introduced a revenue-sharing scheme to ensure that the communities benefited from tourism. 10 per cent of tourism revenues were given to the community members," said Prosper Uwingeli, chief warden of Volcanoes National Park. In 2019, Volcanoes National Park earned revenue of $26 million with the contribution from "gorilla trekking". By 2020, Rwanda Development Board distributed over $5 million to 647 community-based projects. In 2019 alone, $2.85 million was shared with the community, said Uwingeli. Communities also benefitted from infrastructures such as water supply, electricity, schools and health centres. "Sustainability of wildlife depends on recourses and commitments that people put in for protecting local communities," told Professor Patience Gandiwa, director of the International Conservational Affairs at the Parks and Wildlife Management Authority in Zimbabwe. "Nothing can be done for communities without the participation of its members. So, the communities must be at the center of the strategy for the conservation of our natural resources." she added. Local communities have been conserving wildlife from time immemorial, she said.

We have to acknowledge their efforts and their way of life in terms of sustainable use of wildlife resources. So, we cannot alienate them. Africa and Africans have always lived in harmony with nature and that's the future we want, Patience said. The issues of poaching can be addressed only when Africa fully funds protected and conserved areas. So that, the real value of wildlife is realised by the communities, said Fulton Mangwanya, Director General for Zimbabwe Parks and Wildlife Management Authority. "We want sustainable funding, so that we will be able to manage the protected areas. The communities should be engaged in eco-tourism projects which benefits them," he added.

Patience and Fulton shared their experience with CAMPFIRE – a community-based wildlife conservation program in Zimbawe. It aims to approach wildlife as a renewable and profitable resource. Communities are involved in the decision making and planning and benefit sharing from wildlife resources in their areas. They benefit through tourism both consumptive and non-consumptive initiatives and they decide for themselves how to use the revenue. In Ghana, they have come up with several programmes to be able to effectively manage their reserves, said Francis. One of them is called "behavior change program". Local volunteers were recruited and trained to reach out and inform communities. ■

PHOTOGRAPH COURTESY: U.S. EMBASSY NAIROBI

A WILD TRADE

Sustainable use of wildlife can eradicate poverty and also help conserving species

WILDLIFE TRADE can benefit wildlife populations and people but can drive biodiversity loss if not effectively regulated, according to a report by the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). CITES is an international agreement that aims to ensure international trade in wild animals and plants does not threaten the species' survival. The report was released in the 19th Conference of the Parties to CITES in November 2022. The report gave insights and analysis into the global trade in animals and plants regulated under the treaty.

Trade in the CITES-listed species can have a wide range of conservation impacts, the report highlighted. The most commonly documented type of positive impact was population increase. It was often associated with a recovery from an earlier decline driven by unsustainable or illegal harvest and trade. Species population gets a boost and helps in its stabilisation by regulated trade. The report gave examples of crocodile ranching programmes established in Tana County, Kenya and Zambezi valley in Zimbabwe. The programmes aimed to generate incentives for crocodile conservation and provide livelihood benefits to locals. The programme had the added effect of

decreasing poaching pressure on other species. Common species for game, like small antelope, and commercially valuable species, such as elephants poached for income, also benefited.

Populations of the American alligator saw a decline by the 1960s due to hunting and over-exploitation. The species was officially protected in 1967 and the only option for producing alligator leather was farming. This has proved to be a huge business success, but also a conservation success, with populations recovering to such an extent that they are now classified on the IUCN Red List as "Least Concern".

Poorly managed trade can result in local and widespread population declines, as noted by the CITES Review of Significant Trade process. Approximately 3.5 million CITES shipments were reported in direct trade by exporters from 2011-2020. This amounted to over 1.3 billion individual organisms (1.26 billion plants and 82 million animals) and an additional 279 million kg of products reported by weight (193 million kg of plants and 86 million kg of animals), according to the first-ever World Wildlife Trade Report. The majority of trade involved individuals or parts and derivatives that were artificially propagated (for plants) or captive-produced (for animals bred or born in captivity). Trade in wild-sourced individuals accounted for 18 per cent of all trade and was dominated by plants (81 per cent of global wild-sourced trade).

The report revealed that the proportion of wild-sourced plants in trade has decreased over the past 10 years to 4 per cent in terms of the number of individual plants. The vast majority of plants

Populations of the American alligator saw a decline by the 1960s due to hunting and over-exploitation. The species was officially protected in 1967 and the only option for producing alligator leather was farming. This has proved to be a huge business success

in trade is artificially propagated and is no longer "wild". For animals, while captive breeding is increasing, a substantial proportion of trade is still in wild-sourced animals and this will require constant monitoring to improve our understanding of the world's wildlife trade, the report cautioned. The estimated export value of trade in CITES-listed species of $11.1 billion per year is comparable to trade in mainstream agricultural commodities such as cocoa beans valued at$8.5 billion in 2020. Over half of the seizures in the last decade involved Appendix II species, indicated data from the CITES illegal trade database.

Addressing the causes that lead to these would promote the sustainable use and conservation of CITES-listed species. It would also benefit indigenous people, local communities and others involved in the supply chains and would enable more effective and focused law enforcement efforts. "Sustainable and legal trade in wildlife can be a critical contributor to the conservation of wild species and their habitats, to the livelihoods of rural communities that live with wildlife, as well as to national economies," said Inger Andersen, United Nations under-secretary-general and executive director, UN Environment Programme. CITES works by regulating trade in the over 38,700 species that are listed in its three appendices. The vast majority of these species, around 97 per cent, are in Appendix II. These are species that are not necessarily threatened with extinction but in which trade must be controlled in order to avoid over-utilisation and a future threat to their survival.

A STRONG PUSH

Sustainable use of wildlife is the best approach to conservation in the long run. This is the latest scientific assessment by the UN-backed Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES). The assessment was in part conducted at the request of CITES. After four years, when the intergovernmental body IPBES released the summary of its much-awaited "Assessment Report on the Sustainable Use of Wild Species" on July 8, 2022 many knew that it would provoke animal rights groups. Adopted at the ninth plenary session of

IS CITES SUCCESSFUL?

Many challenges still lie ahead of us but CITES has provided a step in the right direction

JOHN E SCANLON

CITES WAS designed 50 years ago to regulate trade in certain species, not fight transnational organised crime. We must now embed tackling it into the international criminal law framework.

The signing of CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora) in Washington DC in 1973 is intertwined with a great story of strong, inclusive and effective United States leadership to help bring CITES into existence — and this evening I'd like to briefly reflect on the rich history of CITES, and to then make some remarks on the present and the future.

This story starts long before 1973. It starts back in 1963 in Nairobi, Kenya at the IUCN (International Union for Conservation of Nature) General Assembly where a resolution was adopted on the need for an international convention to regulate international wildlife trade. It was this resolution that got negotiations underway.

Around the same time, the US Congress was conducting a major review of the Lacey Act, and, after several years of hearings, the Congress amended the Lacey Act in 1969. These amendments directed the Secretaries of Interior and State to "seek the convening of an international ministerial meeting" to conclude "a binding international convention on the conservation of endangered species" and Congress also appropriated funding for the meeting. For a variety of reasons progress in convening a meeting concluding a convention was slow and two competing draft convention texts had emerged, one from the IUCN and the other from Kenya.

The process was reinvigorated in 1972 at the UN Conference on the Human Environment in Stockholm, Sweden, which adopted a recommendation that a plenipotentiary conference be convened "as soon as possible" to prepare and adopt an international convention on wildlife trade.

The US Congress had already supported such a conference, and the US Government agreed to host a Plenipotentiary Conference here in Washington DC in February 1973. It was co-hosted by the US Department of State, with the Department of the Interior, and called 'the World Wildlife Conference'. But the US did not just host the Conference. It played a lead role in getting a successful outcome.

It presented a compromise draft Convention text, which Delegates from the 88 States in attendance chose to move ahead with as the basis for negotiations.

It also shared its own figures on imports into the US in 1969 to help make the case for why an international convention was needed — and these figures were nothing short of staggering. They included the import of just under 8,000 leopard skins, close to 1 million live birds and over 1.4 million live reptiles — and the import of almost 99 million live fish.

The CITES text was concluded and signed on March 3, 1973, and since 2014, March 3 has been celebrated as UN World Wildlife Day — so it's also the 10th anniversary of World Wildlife Day. We are here to celebrate this significant achievement, which happened during a time of great geopolitical tension. It was the height of the Cold War. Notwithstanding, States reached an agreement — and we pay tribute to the negotiators from across every region for agreeing on a text that has stood the test of time.

CITES entered into force just over two years later, on July 1, 1975 — and the US was the first State to join the Convention, which today has 184 Parties.

So, looking at the present, has CITES been a success? There has been a lot of international environmental law making over the past 50 years, with varied levels of success. Looking at CITES, it is still far from perfect — there remain some serious gaps in national legislation, with scientific capacity, reporting, enforcement and with the paper permitting system.

However, notwithstanding these imperfections, CITES is rightly regarded as one of the most successful of all international environment-related agreements — and after 50 years we can say that CITES efforts to ensure legal and sustainable wildlife trade, have benefited elephants, rhinos, whales, sea turtles, parrots and thousands of other species of wild animals and plants threatened by illegal, unregulated and unsustainable trade.

These successes in addressing wildlife trade need to be measured against the enormous challenges that still lie ahead of us, with one million species predicted to go extinct over the coming decades — including through over exploitation, the heightened risk of further wildlife-related pandemics, and the scourge of wildlife crime, the impact of which is valued by The World Bank at between $1-2 trillion annually.

CITES was designed 50 years ago to regulate trade in certain species, not fight transnational organised crime. The stakes are high and to end wildlife crime we must now embed tackling it into the international criminal law framework. It's not a trade issue. It's a crime issue.

As in 1973, making this happen requires ambition and leadership and, just two weeks ago, the American Bar Association adopted a Resolution encouraging the US to take a lead in developing a new international agreement to tackle wildlife crime under the UN Convention against Transnational Organised Crime.

Many challenges still lie ahead of us but CITES has provided a step in the right direction. It is fitting to commemorate the 50th Anniversary of CITES here at the US Congress, to acknowledge the leadership role played by the US, recognise the progress we have made over the last 50 years, and to also take this opportunity to encourage a renewed sense of ambition and leadership in taking the bold steps that are needed to finally end the scourge of wildlife crime.

(John E Scanlon is Chair, UK Challenge Fund on Illegal Wildlife Trade as well as Chair, Global Initiative to End Wildlife Crime. He was Secretary-General, CITES Secretariat 2010-2018. This is the text of John E Scanlon's speech on 'International Wildlife Trade: Past, Present and Future' delivered at the Dirksen Senate Office Building, Washington DC on February 28, 2023. It has been reproduced here with Scanlon's permission.)

IPBES or the Intergovernmental Science Policy Platform on Biodiversity and Ecosystem Services in Bonn, Germany, the summary has been prepared by nearly 300 social and natural scientists from across the world who examined 6,200 scientific studies and repositories of indigenous knowledge. It is the most detailed scientific summary, to date, on the benefits of wild species and lists pathways for using them sustainably.

Suggesting greater integration of species conservation and food security, the summary states that billions of people worldwide rely on some 50,000 wild species for food, energy, medicine and income. Roughly, 33,000 of the species are plants and fungi; 7,500 are fish and aquatic invertebrates; and 9,000 are amphibians, insects, reptiles, birds and mammals. Of these, more than 10,000 species are used directly for human food. Sustainable use of the wild species is, therefore, fundamental to maintaining biodiversity and ecosystem functions in the long term, while achieving food security and improving nutrition across the globe. About 70 per cent of the world's poor directly depend on wild species for survival. In many cases, wild species are symbols of cultural identities.

The report states that sustainable use of wild species would bolster the UN's Sustainable Development Goals (SDGs). It can help achieve 80 per cent of the SDG1 and SDG2 goals each that aim at eradicating poverty and hunger. This is apart from contributing to the achievement of 15 other SDGs that include ensuring good health and well-being; reducing inequality; providing access to affordable clean energy; and promoting economic growth.

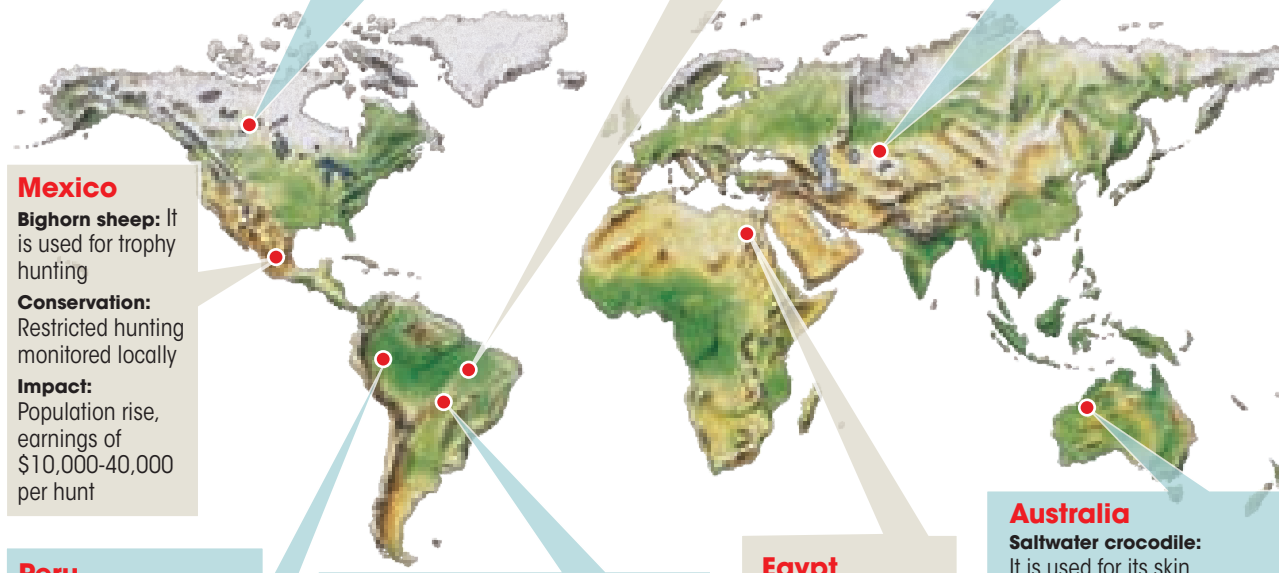
Speaking at the release of the summary report, Jean-Marc Fromentin, a French scientist and one of the co-chairs of the assessment, explained what sustainable use of wild species means. "It has been mentioned several times that we should stop fishing. If we do, it'll mean that we are going to stop having 80 million tonnes of fish every year. A significant part of the fish is coming from small fisheries and a large population and many communities are dependent on it every day," said Fromentin. "And if they don't have fish or the protein that is coming from fish, it means they will need to cut natural forest and plant soya and new crops to substitute their protein needs. So here, the better and obvious solution might be to have sustainable fishing." Sustainable use of wildlife is not a new concept. A 2022 paper in *Frontiers in Conservation Science* said the idea dates to the 1600s. But it was only in the mid-1800s and more actively since the 1960s that legal frameworks for wildlife management emerged. 'Sustainable Management of Wildlife Resources in East Africa', a 2005 report by Swiss non-profit International Environmental Law Research Centre, notes that wildlife treaties present the oldest references of international environmental law that have conservation of wild species at their core.

ANTHROPOCENTRIC VIEW?

Several conservationists, however, have decried IPBES' latest approach as anthropocentric and a stark departure from previous such assessments. The IPBES assessment builds on an exhaustive

Win-win strategy

Countries across the world have identified and adopted measures to conserve wild species that can help develop sustainable livelihood opportunities



Canada
Polar bear: It is used for food, clothing and is culturally important to local communities

Conservation: Regional and provincial laws regulate subsistence harvesting

Impact: Subsistence harvest has generated benefits worth US $0.46 million. Sport hunts are also conducted, creating income and jobs for local people

Brazil
Pirarucu: It is used for meat and skin

Conservation: Rules and laws support community rights to fishing, monitor populations

Impact: Population rose nine-fold, enabling food security. Each family earns $700- 1,350

Tajikistan
Ibex and Markhor: They are used for trophy hunting

Conservation: Traditional, modern knowledge to manage populations

Impact: 2,500 ibex and 2,000 markhor conserved. Each hunted ibex generates $2,000, and markhor $19,500

Mexico
Bighorn sheep: It is used for trophy hunting

Conservation: Restricted hunting monitored locally

Impact: Population rise, earnings of $10,000-40,000 per hunt

Peru
Yellow-spotted River Turtle: It is used for food and as a pet

Conservation: Ranching programme

Impact: Population rose five times in 2012-17, generating $741,738 for 1,000 families

Bolivia
Vicuña: Its fibre is traded

Conservation: 1969 law banned hunting. Wool is sheared from live animals

Impact: Rise in population led to ban being lifted. Numbers up from 3,000 in 1969 to 163,331 in 2018. Fibre trade generated $3,720,000 in 2007-14

Egypt
Nile Crocodile: It is used for its skin

Conservation: Sustainable collection of eggs

Impact: Rise in population. Generated $9,162 in 2018

Australia
Saltwater crocodile: It is used for its skin

Conservation: Sustainable harvesting of wild eggs

Impact: Population growth helped develop $74.6 million industry

Source: "CITES and Livelihoods Report 2019", Convention on International Trade in Endangered Species of Wild Fauna and Flora

2019 report by the same platform that said humans had altered the natural world so drastically that 1 million plant and animal species were at risk of extinction. A year later, another UN report declared that nations had made little progress on international commitments made in 2010 to tackle catastrophic biodiversity collapse. The IPBES assessment "underestimates the harm that exploitation of wildlife does to nature and it exaggerate the benefits," said biologist Daniela Freyer, co-founder of conservation organisation Pro Wildlife in Germany, as quoted in the journal *Nature*. Researchers also question the decision to not prioritise the impact of wildlife exploitation on outbreaks of zoonoses. Replying to a query from *Down To Earth*, People for the Ethical Treatment of Animals (PETA), animal rights non-profit, said, "If we want to protect ourselves from another pandemic, we will leave wildlife alone." Members of the organisation say many experts have warned that the international trade in skins of "exotic" species such as pythons,

stingrays and crocodiles for fashion accessories also increases the risk of dangerous viruses spreading to humans. "The US Centers for Disease Control and Prevention warns that approximately 75 percent of recently emerging infectious diseases affecting people began as diseases in animals," wrote PETA.

The line between sustainable use and exploitation is extremely thin. Overharvesting of wildlife for meat has been identified as an issue only since the 1960s, as populations and economies continued to grow, and has remained an intractable challenge. The impacts of hunting are generally greater in places where it is done commercially. The researchers of the 2021 study in Annual Review of Environment and Resources identify factors that lead to unsustainable hunting. Commercial opportunity, increased ease of movement between rural and urban areas, widespread availability of inexpensive hunting tools and low barriers to entering the trade in wildlife for food such as lack of lucrative wage labour opportunities, may increase hunting pressure or prompt families in rural areas to hunt for trade. They further state that a string of literature since the 1990s shows that consumption of wildlife in urban areas may be a conservation issue. Tropical forests are estimated to sustainably support a maximum of one person per square kilometre if he or she depends solely on wild meat for protein, which is highly likely to be exceeded if an area is also supplying urban markets. In many urban areas, by contrast, alternatives such as fish and meat from domesticated species are often available and cheaper, and trade in wild meat is driven by demand from consumers who can afford to choose the more expensive option, the researchers note.

A number of countries have enacted CITES measures to regulate trade in wildlife. Yet IPBES in 2020 estimated that the global illegal trade in wildlife is worth US $7-23 billion per year—nearly 25 per cent of the value of the legal market

Unfortunately, such unsustainable use of wild species has cascading consequences for people whose subsistence and livelihoods are tied to wild meat; depletion of wildlife additionally risks reducing food security and income and can cause social conflict. According to a 2021 report by the UN's Convention on the Conservation of Migratory Species of Wild Animals, availability of firearms, high financial incentives and better transportation are driving access to wild meat for the urban population. For example, in western and central Africa, meat of straw-coloured bat and chimpanzees in Cameroon and Nigeria is found in large quantities in urban markets. It further said the wild meat that is often consumed by urban dwellers as "luxury food" can serve as a crucial source of nutrition to the rural population.

However, governments and intergovernmental bodies tend to overlook this aspect, and in the name of conserving wild species, ban or restrict hunting or trade of at-risk wild species. The concept is seductive—a ban appears to deliver instant results—and is easier to implement. But wild species could also be dying because of reasons such as fragmentation of habitat, degrading ecosystems, invasive species and changing climate. A ban can barely help in such scenarios. Consider CITES, one of the largest and oldest agreements on conservation and sustainable use, which curbs overexploitation of select species by banning or regulating their trade. "Fifty years later, sustainability is more important than ever," said Ivonne Higuero, Secretary General, CITES, in response to the IPBES' latest report. A number of countries have enacted cites measures to regulate trade in wildlife. Yet IPBES in 2020 estimated that the global illegal trade in wildlife is worth US $7-23 billion per year—nearly 25 per cent of the value of the legal market.

Across the world, there are innumerable examples of species thriving because of traditional knowledge. At least 34 per cent of the 10,098 wild species that humans use in some way and that also appear on the "red list"—those listed as threatened by IUCN—experience stable or increasing population trends, according to a study cited in the IPBES report. "Sustainable use" is the reason these species have returned from the brink of extinction. The report thus noted that future policies governing wild species will need to take into account the social and historical dimensions of

sustainability. When conservation is coupled with livelihood, especially in areas where there are no viable alternatives, communities respond positively and wildlife management is successful.

GAME CHANGING STORIES

One such success story is vicuña, a relative of the llama, found in the high altitudes of Chile, Ecuador, Peru, Bolivia and Argentina. Prized for their high-quality wool, vicuñas were exploited to near extinction until in the 1960s, when the Latin American countries imposed a trade ban on their wool. In 1975, vicuña was listed in Appendix I of CITES Convention, which further prohibited its international trade. Subsequently, vicuña populations recovered; their numbers in the wild increased from 3,000 in 1969 to 163,000 in 2018. Since then, cites has downgraded several of its subspecies to Appendix II, which allows for a resumption of a regulated trade in sheared wool. The population of vicuña has now risen to more than 250,000. Between 2007 and 2014, communities have earned $11,535,000 from trade of vicuña wool. Another example is from Canada, which is home to 16,000 polar bears. The species is protected under the country's Species at Risk Act as it is threatened by long-term effects of climate change. It is also protected under the provincial and territorial legislation by which harvesting is regulated and man-aged. But the Inuit, a group of indigenous people living in the Arctic and sub-Arctic regions, have legally protected rights to harvest and use wild species in Canada. They harvest polar bears to meet their nutritional needs, livelihood and cultural demands. Some of the harvest is also retrieved from Inuit-guided sport hunting. It is estimated that the overall value of benefits in 2011 was US $0.46 million. The population of saltwater crocodiles had severely declined between the 1940s and

PHOTOGRAPH COURTESY: WWF

1960s across the world because of unregulated and excessive hunting for skin, used to make high-value leather products. It was listed in cites Appendix II in 1975, then in Appendix I in 1979. In 1985, the restrictions were eased for Australia. Crocodile population of the region was transferred to Appendix II and allowed to be grown in ranches. In 1994, unrestricted use and trade of saltwater crocodiles was permitted. It is now assessed as an animal of "Least Concern" in the iucn Red List with 80,000-100,000 adult and sub-adult individuals in 2019 in the Northern Territory of Australia. The economic value of the crocodile farming industry in the region has been estimated to be $75 million. This transformation has been made possible because of several native Australian communities, which have strong cultural associations with crocodiles. They were included in the conservation efforts and their traditional knowledge systems like the timing of egg harvest, location of crocodile nests and management of habitats were utilised in recovering the declining population.

Almost 20 years ago, the population of the African elephant was collapsing and the world banned the ivory trade. Today, several African countries have enough elephants to force culling. Hunting tourism is now a major source of revenue. On July 6, as IPBES was negotiating its latest assessment report at the ninth plenary session in Bonn, Germany, more than 135 conservation and animal protection groups demanded that governments around the world impose a ban on the import of hunted trophies. Mona Schweizer of German conservation organisation Pro Wildlife said in a statement: "Trophy hunting is one of the worst forms of wildlife exploitation and is neither ethical nor sustainable. In the face of human-caused global mass extinctions, it is unacceptable that exploitation of wild animals is still permitted just for the acquisition of a hunting trophy and those trophies can continue to be legally imported." Opposing this call,

Almost 20 years ago, the population of the African elephant was collapsing and the world banned the ivory trade. Today, several African countries have enough elephants to force culling. Hunting tourism is now a major source of revenue

Rodgers Lubilo of Communities Leaders Network (CLN), which represents hundreds of communities involved in wildlife conservation across nine Southern African countries, issued a press statement that reads: "There is a lot of misinformation on trophy hunting circulating publicly. Misinformed citizens do not realise that hunting can be an effective tool for conservation and for supporting rural livelihoods in Africa as well as the likely impact that a trophy import ban might have."

Trophy hunting has the potential to create incentives for wildlife conservation and community development in multiple African countries, including those where ecotourism may not be viable. So the proposed ban could have devastating, unintended consequences for conservation programmes. First, the proposed bans would deter hunting and reduce critical revenue that communities rely on for their social development and wildlife conservation programmes. Thereby, it will undermine the incentives for local people to keep wildlife on their land. Second, it could trigger human-animal conflicts. For example, after suspending trophy hunting in 2014, there was an increase in human elephant conflicts. Predators caused a lot of damage and killed livestock. Finally in May 2019, Botswana decided to allow sport hunters to kill elephants. Tanzania, similarly, allows hunting tourism, but in areas outside national parks and conservation areas. The country has set aside almost one-fourth of its land for wildlife conservation and none of that area is fenced. This attracts tourists from within the country and from abroad. Serengeti National Park and Ngorongoro Conservation Area are notable tourist sites. According to government statistics, the tourism sector contributes about 17 per cent to the GDP (gross domestic product). As of September 2019, there were 22 national parks spanning 99,306.5 sq km under the Tanzania National Parks Authority.

The country's tourism authority states that legal hunting in game reserves and game controlled areas usually takes place from July to December each year. Residents are also allowed to hunt for

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bushmeat. But hunting is based on a quota system set out annually to ensure that species are not overexploited. Pindi Chana, Tanazania's Minister of Natural Resources and Tourism, told the country's parliament in May 2022 that the government is creating a conducive environment for investment in hunting tourism. Revenue from hunting tourism has increased from Sh4.294 billion ($1.84 million) in 2021 to Sh22.109 billion ($9.48 million) in April 2022. A 2004 paper in the journal Game & Wildlife Science highlights that a few species in Tanzania, such as lions, are being affected by trophy hunting; however, the vast majority do not see any impacts. It says that though there is a decline in wildlife populations in several areas, it is due to increased settlements and illegal off take of bushmeat. "There is no evidence that the regulated tourist hunting industry has contributed to the general decline of wildlife populations, but there is plenty of evidence that the presence of a regulated hunting industry contributes significantly to reducing the illegal activities of poachers and provides an economic incentive to protect vast areas," the study says.

Sustainable use of wildlife has been recognised in other African countries. Namibia, for instance, has linked communal wildlife conservation to poverty eradication as a result of its Community-Based Natural Resources Management (CBNRM) programme launched in 1998. Under CBNRM, the government establishes communal conservancies and gives rural communities the rights and responsibilities to manage and derive benefits from the sustainable use of wildlife and natural resources in their environment. The government also gives wild animals such as elephants, rhinoceroses, springboks and oryx to conservancies, and these animals are from time to time approved for trophy hunting by selected professional hunters who pay the conservancy. The meat is given to conservancy members for domestic consumption or trade. Funds generated from all these activities are deposited into the conservancy fund, which is later used for development programmes. Due to community conservation through the CBNRM, Namibia's

elephant population grew from around 7,600 to around 23,600 between 1995 and 2016. The country also currently boasts of the largest free-roaming population of black rhinoceroses in the world. According to the government's "State of Community Conservation in Namibia Report, 2020", from the beginning of 1990 to the end of 2020, community conservation in Namibia contributed N$10,753 billion ($642 billion) to Namibia's net national income while 3,870 jobs were facilitated by community conservation in 2020. Conservancy residents earned a little more than N$56 million ($3.3 million) from enterprises wages, which included joint venture tourism, conservancies, conservation hunting and small and medium enterprises such as craft shops. Like Namibia's CBNRM, Zimbabwe in 1989 launched the Communal Areas Management Programme for Indigenous Resources (campfire) for community-led development and sustainable use of natural resources. Under this model, rural communities living with wildlife benefit from a share of the revenue that is earned through safari hunting, sale of animal products and tourism contracts; in return, they must protect wildlife from poaching.

"Masoka, Chisunga, Gonono and Kanyemba communities in the Mbire (Rural) District Council [in the Zambezi valley, some 200 km north of Harare] have seen a lot of development from campfire generated revenues. Several members of these communities are employed as game rangers, clerks, drivers, security guards and in various other capacities," said Ishmael Chaukura, the chairperson of the Community campfire Association of Zimbabwe. The revenue can reach up to $2 million per year, Chaukura says. This money has over the years been used in construction of schools, clinics, roads, bridges and other infrastructure in rural areas and created employment opportunity. Wildlife numbers are now booming. But this is also resulting in human-wildlife conflict. Zimbabwe's elephant population is now 100,000, more than twice the country's carrying capacity of 45,000. Addressing this growing burden was the theme of the Hwange Elephant Conference that Zimbabwe hosted in May.

The summit, attended by representatives of 14 African countries, China and Japan, was the third such regional meeting in recent years to discuss the problems that are being caused by elephant overpopulation. Last year, the government of Zimbabwe also indicated that it was considering an elephant cull. In Rwanda, over the past 15-20 years, poaching has reduced by 85 per cent in the Volcanoes National Park as communities got involved in conservation. It gave them a source of income. "In 2005, we introduced the revenue sharing scheme which has helped to bring on board communities in conservation because they benefit from 10 per cent of tourism revenues," said Prosper Uwingeli, Chief Warden of Volcanoes National Park. In 2019, the park accounted for 91.7 per cent or $26 million of the $28.5 million in revenue from three parks, with the contribution from gorilla trekking. Between 2005 and 2020, more than $5 million had been distributed by Rwanda Development Board to 647 community-based projects. Under the revenue sharing scheme, indigenous communities also benefitted from infrastructure such as water supply, electricity, schools, health centre, income generating projects and other amenities. Some of the revenue was also employed in fighting poaching, says Uwingeli. ■

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CARE AND SHARE

Giving access to biodiversity and sharing benefits with local communities is missing from global environmental discourse

THE YEAR 2023 began with a new blueprint for conservation of biological diversity, its sustainable use and fair and equitable sharing of benefits arising from its use. As many as 188 nations, gathered at Montreal, Canada in December 2022, adopted the Kunming-Montreal Global Biodiversity Framework at the 15th Conference of the Parties (COP15) to the Convention on Biological Diversity (CBD) after 13 days of negotiations. "We have reached a historical, iconic outcome document, the Kunming-Montreal Global Biodiversity Framework. I believe that this document can guide us all in our efforts to hold and reverse biodiversity loss and put biodiversity on the path to recovery for the benefit of all humanity, especially our children and grandchildren," said Huang Runqiu, minister of ecology and environment of China and president of COP15.

Implementation would be the key to ensuring that the world meets the 23 targets identified

in the framework by 2030, along with the four overarching goals that have to be reached by 2050. It will not be an easy road as Inger Andersen, executive director of the UN Environment Programme, pointed out. "I will be honest. Time is not on our side. We have backed nature into a corner, and it is time to ease the pressure." However, she added that nature will bounce back if given a chance. This makes implementation of the framework an urgent call.

Finalisation of the roadmap was already delayed by two years because of the COVID-19 pandemic, and members have to scramble fast to make up for the lost time. Despite three decades of work, countries have failed to meet the objectives of CBD, and the framework provides an opportunity for a fresh start.

30 BY 30

The new targets are ambitious, and among them, the 30x30 target can be called the most ambitious. The 30x30 target is considered ambitious given that the world did not even fully meet Aichi target 11 for the conservation of 17 per cent of terrestrial and inland water and 10 per cent of coastal and marine areas by 2020. Only 17 per cent of land and 8 per cent of the ocean are protected currently, as per the UN Environment Programme and International Union for Conservation of Nature's "Protected Planet Report 2020".

The call for 30x30 began with a report published in the journal *Science Advances* in 2019. The study, led by researchers from US-based health and environmental non-profit Resolve, identifies regions with high and moderate potential to meet the 30x30 goal. However, many of these areas lie in countries which are yet to join the High Ambition Coalition for Nature and People, an inter-governmental group focused on protecting biodiversity.

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More than 100 countries are part of this group, but biodiversity-rich nations like Brazil, Bolivia and Argentina in Latin America; South Africa, Namibia and Cameroon in Africa; China, Russia and Vietnam in Asia have not joined. Experts say the 30x30 target could give way to "land-grabbing" in biodiversity-rich areas. While launching a campaign against the target on April 22, 2021, London-based human rights non-profit Survival International said it would take away land and livelihoods from 300 million people, many of whom belong to tribal and indigenous communities. "Protection" of land reduces access for communities. For instance, the Kani tribe of Kerala could not benefit from the arogyapacha plant, known for its energising properties that grew in their region, despite an agreement in the 1990s to sell it to an Ayurvedic manufacturer in Tamil Nadu. Since the plant grew in a "protected" area, the people were not allowed to transport it.

Target 3 advocates that 30 per cent of land, inland water, coastal and marine areas need to be protected by 2030. At present, barely 17 per cent and 10 per cent of the world's terrestrial and marine areas are protected, which was the level of ambition under the Aichi biodiversity targets that expired in 2020. "Just as Paris produced an agreement to keep global temperatures below 1.5°C, in Montreal we have reached an agreement that commits to the protection of 30 per cent of global land and water by 2030," Steven Guilbeault, Canada's minister of environment and climate change, said after the framework was finalised on December 19, 2022.

Efforts have been made to ensure that the world delivers on Target 3. For one, the final text of the Global Biodiversity Framework clearly mentions that these areas need to be managed recognising indigenous and traditional territories and identifying and respecting the rights of

PHOTOGRAPH COURTESY: IISD.ORG

indigenous peoples and local communities. Besides, countries have pledged more finances for biodiversity conservation under Global Biodiversity Framework, as compared to Aichi target.

The International Indigenous Forum on Biodiversity praised the final text for its strong language on respect for the rights of indigenous peoples and local communities. But after their last-minute call for indigenous territories to count towards the 30 per cent target was rejected by European countries, the activists said the framework was a demonstration of the colonial mentality in conservation, which advocates that Western conservationists know best. In a statement, international human rights organisation Survival International also said that the framework has failed indigenous people by not recognising that they are the best conservationists and that the best way to protect biodiversity is to protect their land rights. According to the International Union for Conservation of Nature (IUCN), about 80 per cent of the biodiversity is located on the territories of indigenous peoples and local communities.

To help achieve the 30x30 target, the framework has additional objectives that propose the restoration of 30 per cent of degraded terrestrial, inland waters and coastal and marine ecosystems along with reducing the loss of areas of high biodiversity importance to near zero. Risks to biodiversity are also being lowered through reduction in use of nutrients and pesticides and highly hazardous chemicals by half. There is a plan to phase out or reform subsidies that harm biodiversity by US $500 billion per year along with a target to reduce food waste by half and significantly reduce overconsumption and waste generation—all of which lead to biodiversity loss.

A NEW, DEDICATED FUND

COP15 had some success in increasing the availability of funds for biodiversity conservation. Target 19, which calls for increasing financial resources, prescribes that at least $200 billion per

year needs to be mobilised from all sources and that developed countries need to provide to developing countries at least $20 billion per year by 2025 and $30 billion per year by 2030— this too is a 30x30 target.

But Goal D of the framework accepts a finance gap of $700 billion per year would still remain. To increase funding, private industry and initiatives such as the High Ambition Coalition for Nature and People, an intergovernmental group of more than 100 countries; Leaders' Pledge for Nature, supported by 70 countries to reverse biodiversity loss by 2030 for sustainable development; and 10 Point Plan of the UK have been roped in. This is a cause for worry as private interests can hamper the work on biodiversity protection, activists say.

A dedicated fund for biodiversity, the Global Biodiversity Framework Fund, is slated to be created in 2023 under Global Environment Facility, with its own governing body to support the implementation of Global Biodiversity Framework. The Facility was established in 1992 along with CBD at the Rio Summit and is the world's largest funder of biodiversity protection, nature restoration, pollution reduction, and climate change response in developing countries. The Global Environment Facility would also handle the funds generated through the implementation of Goal C and Target 13 on access and benefit sharing of biological resources, including those from the use of digital sequence information on genetic resources.

Delegates have agreed to establish within the Global Biodiversity Framework a multilateral fund for equitable sharing of benefits between providers and users of digital sequence information on genetic resources, to be finalised at COP16 in Türkiye in 2024. Benefit sharing on digital sequence information is a new concept in the framework. "Over years as more and more of this genetic information is digitised and stored in global databases this can undermine the requirement

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of benefits sharing," explained David Cooper, deputy executive secretary, CBD. "Decision on digital sequence information is a landmark shift," he said in the final press meeting for CoP15. The agreement on digital sequence information sets a precedent for access and benefit sharing in health and agriculture.

By COP16 in 2024, governments have a lot of homework to do to turn the agreed goals and targets into actions at home. Countries will now have to update their national biodiversity strategies and action plans to reflect the Global Biodiversity Framework and how they will contribute to achieving it. Countries will monitor and report every five years or earlier on a large set of indicators related to progress. CBD will combine the national information submitted by late February 2026 and late June 2029 into global trend and progress reports. "The real hard work of implementing it begins now. What we are trying to do is not easy, we hope this framework would make the path a little easier," said Cooper.

BENEFIT SHARING

Three decades of discourse to protect the world's biodiversity and benefit from its use has not achieved much outside of discussion rooms. Access and benefit sharing is a key objective of CBD. To ensure effective implementation of this objective, CBD in 2010 put in place the Nagoya Protocol which sets clear mandates for potential users of genetic resources to obtain prior informed consent (PIC) from the communities associated with the resource and negotiate mutually agreed terms (MAT) for its utilisation. However, analysis of such agreements, available with online platform Access and Benefit-sharing Clearing-House, indicates that these measures have not had a large-scale impact.

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As of November 15, 2022, only 25 countries had provided 4,344 internationally recognised certificates of compliance (IRCCs) to access resources in accordance to CBD guidelines. These certificates indicate that agreements are in accordance with the Nagoya Protocol. The fact that a few countries have issued the certificates suggests that nations lack capacity to deal with such requests. Moreover, the pace at which the certificates are issued is tardy and inconsistent. The first IRCC was issued in 2015 by India. By the end of 2019, countries had issued 1,118 IRCCs. Over the next three years, despite the COVID-19 pandemic, issuance picked up—some 1,016 IRCCs were issued in 2020, 1,176 in 2021 and 1,034 in 2022 (till November 15). There are no clear indications of the reasons behind this surge, but most IRCCs were issued by India. The data also indicates that 1,281 of the overall 4,344 IRCCs are for commercial purposes and have been issued by 16 of the 25 countries. The remaining are for non-commercial purposes like research (that do not benefit communities immediately or directly), or for purposes not indicated in the IRCCs (and hence their benefits remain unknown).

Africa, for instance, has issued only 169 IRCCs. All IRCCs of Kenya are for non-commercial agreements. South Africa which began with commercial agreements has now shifted to non-commercial agreements. Similarly, the biodiversity-rich region of Latin America and the Caribbean has issued just 165 IRCCs. Peru leads the region, followed by Argentina and Panama. Only four IRCCs in Peru are for commercial utilisation—for food plants cocoa and quinoa and medicinal plants maca and yacón—all issued in 2021-22. In Argentina, all except two certificates (issued this year), are related to access for non-commercial purposes, while in Panama, only one certificate is for commercial purpose, issued in 2021. The platform does not provide details of transactions. dte also looked at some agreements on benefit-sharing across countries to understand the situation on the ground. These include agreements that are not part of Access and Benefit-sharing Clearing-House. The findings do not inspire confidence; communities managing

and providing biodiversity resources do not get benefits, while users evade restrictions, rules and cost of access.

In July 2021, Cameroon's government introduced a law governing access to genetic resources, their derivatives, traditional knowledge and benefit-sharing, and has since negotiated five benefit-sharing contracts with French and Swiss companies. The law mandates that local councils will get 20 per cent of the benefits while communities will get 10 per cent. "Cameroon understood the economic stakes involved," said Dingom Aurelie Taylor Patience, the country's focal person for implementation of Nagoya Protocol.

NO PAYMENT IN SIGHT

Kenya has issued the most IRCCs in Africa. However, all its certificates are for non-commercial purposes. The country's efforts to promote commercial deals appear to be hindered by inadequate awareness or knowledge on the terms of such agreements. For example, French company V Mane Fils sought to purchase Mondia whitei from here as well. In 2018, the company entered into partnership with Kenya's Kakamega Natural Forest Catchment Conservation Organisation (KANFCCO), a conservation group, for 10 tonnes of Mondia whitei per year. The community established nurseries to meet the demand. In 2021, the group signed a deal for supply of 100 tonnes of the root per year. "We signed a prior informed consent (PIC) agreement under Nagoya Protocol, but the company reneged on signing the other statutory pacts for material transfer," KANFCCO secretary James Ligale told to media. There are instances of communities sharing critical information for a paltry sum, says Ligale, only for "people to publish papers, get PhDs and other honours", with-out even mentioning the contributors. "We are trying to educate the

Kenya has drafted a Natural Resources (Benefits Sharing) Bill 2020 to establish "a system of benefit sharing in natural resources exploitation between exploiters, the governments and communities for connected purposes". However, it is pending before the Senate for last four years

community not to share traditional knowledge with researchers without first knowing what the information will be used for and what benefits they could receive," Ligale added. Experts in Kenya point out that unless the communities understand their rights and negotiate for benefits, they will continue missing out. "The major problem, however, is that they lack the capacity to sit at the table, while governments, which could speak for them, are not accountable," said Violet Matiru, who leads the Millennium Community Development Initiative, an organisation that works with indigenous communities on critical environmental and livelihood challenges.

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BEYOND CBD

Some countries, like Namibia, have taken steps outside of CBD to ensure that communities receive their share of benefits due to biodiversity use. Namibia, though party to both CBD and Nagoya Protocol, has not issued a single IRCC; rather, it introduced the Namibia Community-Based Natural Resources Management (CBNRM) Programme in 1996, which is hailed as an example of linking conservation with poverty alleviation and job creation. According to the government's "State of Community Conservation in Namibia" report for 2020, community conservation under CBNRM contributed N $10,753 billion ($722.14 billion) to Namibia's net national income and

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facilitated 3,870 jobs.

Profits from sales of devil's claw (Harpagophytum procumbens), a cactus traditionally used to treat arthritis, reduce inflammation and pain and to stimulate digestion, exemplify the success of the system. The plant is protected under law and can be harvested and exported only through a permit. In August 2022, some 186 members of Mpungu community in Kavango East region generated N$129,000 ($8,663) by selling devil's claw to EcoSo Dynamics, an exporter in the country. Romeo Muyunda, spokesperson of Namibia's Ministry of Environment, Forestry and Tourism, says the sale demonstrates the ministry's commitment to its constitutional mandate, which provides for the protection of the country's natural resources to benefit citizens. Despite the success of CBNRM, the country in 2021 enacted the Access to Genetic Resources and Related Traditional Knowledge Act to meet global commitments. This year, it opened the Biological and Genetic Resources and Associated Traditional Knowledge Office under the environment ministry, which will be responsible for regulating access to biological and genetic resources and associated knowledge while ensuring compliance with the provisions.

Overall, success stories are few and far between. Hartmut Meyer, team leader of the multi-donor abs Capacity Development Initiative implemented by German development non-profit GIZ, said complete cases from the user entering a country to access the resource to the negotiation of agreements to the flow of benefits are still rare. But the few successes are enough to prove that a system can be put in place, Meyer said.

Rooibos, pronounced "roy-boss", makes a deep red brew with a flavour that is deliciously unique, assert drinkers of this herbal tea. The potential benefits of this mountain bush, endemic to South Africa, are equally unique. Studies show that rooibos, devoid of caffeine and low in

tannins, is a healthy alternative to coffee or tea. It also comes loaded with anti-oxidants that can boost immunity, reduce risks of heart diseases, protect from viral infection and has anti-ageing properties. Little wonder, then, that multinational corporations have come up with ways to profit from the tea as well as products made using chemical derivatives of the shrub, called Aspalathus linearis in scientific lexicon. One such attempt was by Swiss company Nestlé that in 2010 claimed five patents on products prepared from rooibos such as medicines to treat inflammatory diseases and probiotic foods. But this time, the San and Khoi indigenous communities of South Africa opposed the move and Nestlé's patent applications were rejected. The South African government asked the company to share benefits arising from the use of this resource with the communities.

The San and Khoi were the first to learn health benefits of rooibos' needle-like leaves that grew widely on their land, but have remained marginalised in its trade that began in early 20th century during the colonial regime. Today, rooibos is a widely traded and exported commodity, sold to over 30 countries, with the US and Europe being the biggest importers, but the San and Khoi control less than 7 per cent of the land under the shrub. In 2014, Nestlé agreed to share 3 per cent of its net sales with the community and the South African government initiated a process to identify true owners of the knowledge around rooibos. To ensure that communities benefit from other industries profiting from rooibos, the government in 2019 facilitated an agreement between 10 processors and the San and Khoi, wherein the communities would receive 1.5 per cent of the farm-gate price (net price after cutting marketing costs) annually.

"This is the first industry-wide agreement in which benefits from rooibos would be shared with San and Khoi, and is significant as it recognises the communities as traditional knowledge-holders of the benefits of the tea," said Amelia Heyns, programme manager at Natural Justice, a

There have been only a few such success stories under CBD, since it was adopted three decades ago—at the 1992 Rio Earth Summit in Brazil, along with the UN Framework Convention on Climate Change (UNFCCC) and the UN Convention to Combat Desertification—and despite multiple plans in place for its implementation

human rights and environmental law non-profit in South Africa that represented the communities in negotiations. In July 2022, the industry paid 12.2 million rand (around US $709,000) to organisations that represent the communities. Discussions are now underway to ascertain how the money would be used to benefit the communities.

This deal shows the potential of the UN Convention on Biological Diversity (CBD), the only international legal instrument for the conservation of biodiversity, sustainable use of its components, and fair and equitable sharing of the benefits arising from the use of genetic resources. But there have been only a few such success stories under CBD, since it was adopted three decades ago—at the 1992 Rio Earth Summit in Brazil, along with the UN Framework Convention on Climate Change (UNFCCC) and the UN Convention to Combat Desertification—and despite multiple plans in place for its implementation. In 2010, the 196 countries party to CBD, adopted 20 conservation targets by 2020, known as Aichi targets, to safeguard biodiversity and the benefits it provides to people. But assessments in recent years show an unimpressive progress on the objectives of CBD. For one, biodiversity loss is continuing unabated. The "Living Planet Report 2022" by the World Wide Fund for Nature, released on October 13, 2022 shows an average decline of 69 per cent in species populations between 1970 and 2018.

In 2019, the UN Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) cautioned that up to 1 million of the estimated 8 million species are at risk of extinction—more than ever in human history. There is no doubt that urgent action needs to be taken, and this has raised expectations from the 15th Conference of the Parties to the UN Convention on Biological Diversity (COP15), set to begin in Montreal,

Canada, on December 7. The focus here is on the Post-2020 Global Biodiversity Framework, which will replace the Aichi targets.

The post-2020 framework, conceptualised in 2018 at CoP14 in Sharm el-Sheikh, Egypt, has four long-term goals related to the 2050 Vision for Biodiversity. It also has 22 targets for reducing threats to biodiversity, meeting people's needs through sustainable use and benefit-sharing as well as for developing tools and solutions for implementation and mainstreaming of biodiversity by 2030. Over the past three years, negotiations on developing the post-2020 framework have been slow due to the COVID-19 pandemic, leaving out numerous points of concern that need to be resolved or, at least, addressed at COP15.

Then there is the issue of digital sequence information or genetic data of biological resources. According to CBD, each country has sovereign rights over its genetic resources, but the free availability of their genetic data undervalues the resources and traditional knowledge. At the working group meeting in June, African countries said they would delay finalisation of the post-2020 framework unless a suitable solution is identified to share benefits arising from the use of genetic sequences.

The issue of access and benefit sharing is also missing from the biodiversity discourse. "There is frustration that this system has not worked as well as it should," David Cooper, deputy executive secretary, CBD, said at a press meeting on November 10, 2022. "We have seen benefits in non-monetary terms. We have seen collaborations between developed and developing countries in terms of research, but we have not seen monetary benefits as much as negotiators of the Nagoya Protocol had expected," he added. Nagoya Protocol is a legal framework under CBD that aims at sharing the benefits arising from the utilisation of genetic resources with the communities in a fair and equitable way. ■

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3 LAND & AGRICULTURE

HIGHPOINTS

Africa has **65%** of the world's arable lands that are yet to be cultivated

If cultivated, it could feed over **9 billion** people, more than the world's population

Africa imported about **85%** of its food (2016-2018) from outside the continent

Africa has **33%** of the world's underfed population

Desertification affects **45%** of the continent

PHOTO COURTESY: WFP

A RECIPE FOR DISASTER

Why Africa is food insecure

THE YEAR 2023 started with the Horn of Africa facing a double whammy of drought-induced poor harvests and an acute white maize shortage. Regional and global surpluses that used to plug deficits in the region were dwindling, according to official projections and expert analyses. Exports from Uganda and Tanzania have often plugged the white maize deficit in other countries across the Horn of Africa, both formally by governments and aid organisations and informally by border communities and unscrupulous traders. Uganda and Tanzania have a fairly large arable landmass of approximately 34 per cent and 15 per cent, respectively and slightly better farming climatic conditions. The two countries are often self-sufficient in white maize, especially after adequate rainfall and good harvests. Unfortunately, this had not been the case for several months in 2022, with prices set to skyrocket in 2023.

Over 80-90 per cent of the landmass in the rest of the countries in the Horn of Africa was either arid or semi-arid and therefore not arable, especially in Somalia, Kenya, Ethiopia, Sudan, and South Sudan. With the worst drought in 40 years ravaging the entire region, the projected deficits had been increasing slowly but surely, even as the surpluses dwindle significantly, according to United States Department of Agriculture (USDA) data. As per the USDA data, the surplus drop was not only happening in Uganda and Tanzania, where, for example, a 16 per cent drop was expected but across sub-Saharan Africa and around the globe. Public policy and food security experts were worried that such drops in surplus would leave very little or almost nothing for Horn of Africa's maize needs, a staple food in the region.

For instance, Kenya, the largest maize importer in the Horn of Africa during the 2021-22 marketing year, was projected to require the importation of between 700,000- 900,000 tonnes (roughly 10 million bags) between January and August 2023. Kenya's projected deficit accounts for slightly over 20 per cent of the region's expected white maize imports of 3.4 million tonnes, according to the International Grains Council's statistics. Kenyan-based public policy and food security expert Robert Shaw was particularly concerned with the effects of the prolonged drought and several failed rain seasons on the region's maize needs. "One country outside the Horn of Africa that is likely to have surpluses throughout the 2022-2023 marketing year is Zambia. Unfortunately, the southern African country has two major challenges. One, they have an unusually high demand from their neighbours, Zimbabwe and Malawi, whom they will give preference to for ease of transportation and other geopolitical considerations," he said. Besides the trouble of getting millions of bags of maize from landlocked Zambia to the Horn of Africa without the benefit of sea transport, Shaw said, there was a big challenge in

Food security experts are not amused that governments in the Horn of Africa have refused to acknowledge the white maize market was getting thinner worldwide by the day. Many of them were, in fact, calling for urgent exploration of other options, including embracing gmos like South Africa and others to boost maize production to control prices and save lives

using the land. This would result in a logistical nightmare, especially in Tanzania, which has a heavy-handed bureaucracy and strict restrictions on maize movement, particularly by long-distance truckers.

South Africa, another major global maize exporter with a projected output of 14.7 million tonnes and over 3.2 million tonnes surplus for export in the 2022-23 seasons, was not a potential supplier to the Horn of Africa. It has a complex bureaucracy of distinguishing Genetically Modified/Engineered Organisms (GMOs) and non-GMO exports to eastern Africa and governments had declared total war on GMOs.

Food security experts are not amused that governments in the Horn of Africa have refused to acknowledge the white maize market was getting thinner worldwide by the day. Many of them were, in fact, calling for urgent exploration of other options, including embracing GMOs like South Africa and others to boost maize production to control prices and save lives. A few other white maize-producing countries across the globe, such as Mexico, Argentina and the United States could ordinarily have been potential suppliers of the much-needed commodity to the hunger and drought-plagued eastern Africa. Unfortunately, the dynamics in white maize markets across the globe were getting more complex due to several factors, including armyworm infestations, climate change and reduced fertiliser use in some places due to prohibitively higher prices occasioned by the Russia-Ukraine war. "Mexico, for instance, has its challenges and there is a possibility of them having little or no surpluses at all. Particularly now that the country seems keen on keeping enough for their domestic use," said Shaw. Mexico has become stricter with a 50 per cent export tax on white maize. This, Shaw argued, is a huge disincentive

AI, SATELLITE-DRIVEN CROP MONITORING TO HELP KENYA FARMERS BOOST YIELD

Climate crisis making farmers increasingly vulnerable; digital platform will enable farmers and decision-makers to get precise information about soils, crops and forests

KENYAN FARMERS will soon be able to make smart, data-driven farming decisions and monitor crops through satellite imagery and artificial intelligence with the help of an upcoming agri-tech platform. The Directorate of Resource Surveys and Remote Sensing (DRSRS) and agriculture tech firm Agr-vision are jointly developing a Kenya-wide digital programme for satellite and artificial intelligence (AI) crop monitoring and yield forecasting.

DRSRS advises the Kenyan government on matters regarding Remote Sensing and Geographical Information systems (GIS). The institution has signed a five-year memorandum of understanding with Agr-vision. Pilot testing is currently being carried out for the digital crop monitoring platform before the final features are decided. The move aims to boost harvests and food security in the hunger-plagued country.

The platform will necessitate the ability to digitally monitor and classify various crops across the country, DRSRS Deputy Director Charles Situma said. It will also provide an advanced analytics tool for enhancing data-driven decision-making by farmers and authorities, he added. The agricultural sector contributes 30 per cent to the Kenyan economy's Gross Domestic Product (GDP). However, the two organisations expressed worry about the sector's vulnerability amid the ongoing climate crisis. "The digital tool can help the agriculture sector and decision-makers enhance sustainable food security," said Situma. The platform will enable farmers and decision-makers to get precise information about soils, crops and forests in their endeavour to create more sustainable food security programmes, said Agr-vision Chief Operations Officer Oscar Mwai.

Farming is the primary source of livelihood for most Kenyans in terms of food security, employment creation, economic growth, off-farm employment, and foreign exchange earnings. Unfortunately, the sector is extremely vulnerable to climate change largely due to the increasing temperatures, drought and changing rainfall patterns. Other vagaries of extreme weather events like floods, poor agricultural practices, lack of access to knowledge, and low-quality inputs don't make matters any better for Kenyan farmers.

The two agri-tech giants acknowledge these challenges and hence the big steps they have taken to boost food security for Kenya's growing population and also increase foreign exchange through export. "The effects of the climate crisis on the agriculture and forestry sectors are evident and Kenya desperately needs a full transformation in the sectors, including accurate, precise and actionable data. That is where the collaboration between DRSRS and Agr-vision comes in," Situma added.

The platform will have an interactive digital map, real-time analytics, crop monitoring and rotation suggestions and classifying key crops around Kenya. Also included will be real-time soil moisture and weather forecasts, which, besides drones, will be collected from high-resolution satellite imagery. "The crop monitoring platform will collect data from various sources, including satellite and artificial intelligence, and will be subjected to advanced analytics to refine the data into useful predictive and descriptive insights. These insights will be simplified to guide end users," Mwai added.

to African importers and would have to retail at an abnormally high market price in the Horn of Africa to make business sense. The US, like South Africa, is also largely a GMO producer. There being no ready, reasonably priced non-GMO/white maize for the hunger-plagued Horn of Africa, the mainstream expert opinion revolved around embracing GMO science and technology. Another growing body of evidence suggested an assertive policy by governments, allowing duty-free importation of yellow maize for animal feeds, consequently easing demand for white maize.

A HUMANITARIAN CRISIS

The United Nations High Commissioner for Refugees (UNHCR) said in a statement on February 28, 2023 said that the Horn of Africa had entered its sixth consecutive rainy season with no rain. The last five rainy seasons had been deficit and the rains from March-May, 2023 were likely to

be average, according to the joint statement released by multilateral agencies and another report by REACH, a humanitarian initiative. Three countries in the Horn of Africa — Kenya, Ethiopia and Somalia — had been experiencing an ongoing drought since late 2020. A humanitarian crisis had been brewing since then and was more worrying for Somalia. The number of displacements in the country had peaked to a new high of 3.8 million people. Since January 2023, at least 288,000 people had become internally displaced in the country due to conflict and drought according to UNHCR estimates (as of February 28, 2023). This was very close to total 305,000 new displacements during the entire year of 2016, according to UNHCR data.

Failure of rains and conflict in Somalia could further force people to migrate to major cities and towns, especially Baidoa and Mogadishu. Close to 300,000 people could be newly displaced by July 2023, according to the projected the International Organization for Migrants (IOM). Somalia migrants sought refuge in drought-affected areas of Kenya and Ethiopia too, stated UNHCR. "Most of the newly displaced might never go back to their places of origin because the land can no longer provide, and insecurity will only increase as competition for the already scarce resources grows. As a result, entire families will be born and raised in informal settlements amid unsuitable living conditions," said Ugochi Daniels, IOM deputy director general. Daniels called upon donors to invest in solutions to prevent further displacement and address the dire living situation of the millions affected by the ongoing drought and conflict. "There is a need to invest in the places of origin to foster resilience and to prevent further displacement from happening. So, the IOM projects are aimed towards improving their access to land and long-term housing, social services through an inclusive planning process with local authorities and communities. This lays the foundation for long-term development planning", the statement noted.

Climate crisis is exaggerating food insecurity in Africa. Extreme hunger rose 123 per cent in six years (2017-2021) among 10 of the world's climate hotspots. Seven of these countries are in Africa

"An amount of $137 million is needed to help displaced people in the Horn of Africa. As of February 28, 2023, over eight million people require food assistance and around 332,000 urgently need food, otherwise their lives are at risk," stated Olga Sarrado, the UNHCR spokesperson. The UNHCR planned to provide basic relief including emergency shelter and household items to new refugees and displaced people in Somalia, Ethiopia and Kenya. The funds were be utilised for refurbishing the existing water and sanitation systems. This was important as outbreaks of cholera, a water-borne disease, were on the rise in these countries. Cholera was first reported in Kenya in October 2022. It had been compounded and exacerbated by the ongoing drought and food insecurity, the World Health Organization (WHO) Africa said in its weekly health emergencies bulletin in October, 2022.

By March 2023, the cholera outbreak had affected 15 counties, with active transmission in seven. Of the affected counties, three share long porous borders with Somalia, one with Tanzania, and one with Ethiopia. The drought situation in Kenya had resulted in acute water shortage and rationing, leading to poor sanitation and cholera outbreaks in major towns and counties like Nairobi, Kiambu, Machakos and Kajiado. The health authorities in Kenya continued to report elevated cholera activity and a cumulative total of 4,821 cholera cases had been confirmed between October 2022 and February 2023 according to the WHO weekly bulletin dated February 6 to 12, 2023.

CLIMATE EMERGENCY

Climate crisis is exaggerating the food insecurity in Africa. Extreme hunger rose 123 per cent in six years (2017-2021) among 10 of the world's climate hotspots, according to a new report. Seven of these 10 countries are in Africa, noted the report by Oxfam International published on September 15, 2022. Number of people facing acute hunger in the 10 places rose to 47.5 million

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in 2021 from 21.3 million in 2016, according to the findings. Afghanistan, Burkina Faso, Djibouti, Guatemala, Haiti, Kenya, Madagascar, Niger, Somalia and Zimbabwe covered in the study had the highest number of UN appeals related to major weather extremes since 2000, the analysts found. As many as 18 million people in these countries were on the brink of starvation, Oxfam wrote in "Hunger in a heating world: How the climate crisis is fuelling hunger in an already hungry world".

Somalia, Kenya, Madagascar and Zimbabwe were hit by acute hunger in 2021 primarily due to weather extremes, according to the Global Report for Food Crisis by Food Security Information Network. Gabriela Bucher, Oxfam International executive director, said, "For millions of people already pummeled down by ongoing conflict, widening inequalities and economic crises, repeated climate shocks are becoming a backbreaker. The onslaught of climate disasters is now outpacing poor people's ability to cope, pushing them deeper into severe hunger." Oxfam stressed that climate-fuelled hunger was a stark demonstration of global inequality, with the countries least responsible for the climate crisis suffered the most from its impact and also the least resourced to cope with it. Collectively, these 10 climate hotspots were responsible for just 0.13 per cent of global carbon emissions, the findings established. "Each of them sits in the bottom third of countries that are least prepared to cope with climate change and its damages," the authors noted. In contrast, polluting industrialised nations such as those of the G20, which together hold over 80 per cent of the world's economy, emit 650 times more than these 10 worst-hit countries.

The UN humanitarian appeal for 2022 was $48.82 billion, which Oxfam noted was equivalent to less than 18 days of profit for fossil fuel companies considering average daily profits over the last 50 years. Fossil fuel companies' daily profits had averaged $2.8 billion over the last 50 years, the study showed. During 2000-2021, donors provided less than $20 billion of the $31.6 billion UN appeals linked to extreme weather in the 10 climate change hotspots — a shortfall of nearly 40 per cent, according to the analysis.

WORRYING TRENDS

Population increase in urban and rural areas, corresponding food demands and climate crises are some key areas that require urgent attention in Africa, according to a new report on the state of agriculture in the continent. There are six megatrends currently affecting the development of agrifood systems, identified the "2022 Africa Agriculture Status Report" released on September 6, 2022. Alliance for a Green Revolution in Africa (AGRA), an African-led and Africa-based institution, presented the report at the Africa Green Revolution Forum (AGRF) summit in Kigali under the theme Accelerating African Food Systems Transformation. "The 2022 Africa Agriculture Status Report" is an annual publication by AGRA, focusing on emerging issues in Africa.

It urged African governments and development partners to anticipate and respond to six major demographic, economic, environmental and social megatrends. The megatrends identified were:

- Rapid rural population growth and associated rising land scarcity
- Rising urban populations and increasing demand for food
- Economic transformation, including rising wage rates and per capita incomes
- Climate change and increasing incidence of extreme weather events
- Increasingly common global pandemics, civil conflicts and economic disruptions
- The accelerated pace of technical innovation in communications, information and supply chains

Agnes Kalibata, AGRA's president said, "There is an urgent need to repurpose food policies to address the emerging challenges affecting conditions, outcomes and behaviour of our food systems, without compromising the economic, social and environmental fundamentals."

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Rural population is projected to rise by 53 percent in Sub-Saharan Africa from 2017-2050, creating conditions of land scarcity. Africa's urban populations are also rising rapidly, even faster than in rural areas. The average per-person income is also rising in most parts of the continent.The combination of high population growth and rising incomes is explosively increasing the demand for food in Africa. Economic development, including rising incomes, will create both challenges and opportunities for African food systems, the report stated. The growing middle class will lead to a rapid shift in the labour force from farming to non-farm jobs, which may encourage the move to labour-saving farm technologies and practices.

On the other hand, climate change and the increasing incidence of extreme weather events are further exacerbating vulnerabilities in Africa's food systems. Ongoing global health crises, regional conflicts and economic disruptions are also adding to it. The continent showed an 0.3 degrees Celsius per decade increase in warming from 1991-2021 on average. This was faster than the warming of 0.2°C per decade, which occurred from 1961-1990. The warming is causing extreme weather events such as lingering droughts and devastating floods that are hitting African communities, economies and ecosystems hard.

There is a critical need to improve African research, development and extension systems for eliminating ever-widening yield gaps in cereals and oilseeds. A transformation of Africa's food systems will require coordinated leadership, substantial investment by both governments and the private sector and enhanced capacity for change and adaptation, the report stated. Investment needs will require a systematic and purposeful alignment of investments from the public sector and the private sector to trigger and sustain agrifood transformation on the continent. The magnitude of required additional investment is considerable, ranging from a conservative $15 to $77 billion per year from the public sector and up to $180 billion from the private sector.

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THE TOLL

Since the beginning of this year, an additional 260,259 children, or one child every minute, have been suffering from severe wasting in 15 countries because of global food crisis, said the United Nations Children's Fund (UNICEF). The number of children suffering from severe wasting was projected to increase to more than 7.9 million in June 2022 from around 7.7 million in January 2022, said UNICEF. Severe wasting, where children are too thin for their height, was the most visible and lethal form of undernutrition. It was caused by a lack of nutritious food and repeated bouts of diseases such as diarrhoea, measles and malaria, which compromised a child's immunity. Almost 8 million children under five, mainly in African countries, were at the risk of death from severe wasting, the global child protection agency said. Soaring food prices driven by the war in Ukraine, persistent drought due to climate change in some countries combined with conflict and the ongoing economic impact of COVID-19 continue to drive up children's food and nutrition insecurity worldwide, UNICEF noted. This has resulted in catastrophic levels of severe malnutrition in children under five.

UNICEF estimated that within the 15 countries, at least 40 million children were severely nutrition-insecure, meaning they were not receiving the bare minimum diverse diet they need to grow and develop in early childhood. Further, 21 million children were severely food insecure, meaning they lacked access to enough food to meet minimum food needs, leaving them at high risk of severe wasting, the body added. In Sudan, three million children under five were suffering from acute malnutrition. Of them, 618,000 were suffering from severe acute malnutrition at the end of 2021, UNICEFestimated. With food insecurity on the rise in Sudan, the number of children with severe acute malnutrition was expected to increase to at least 650,000 in the coming months. Acute malnutrition case admissions among children under five in Somalia and Somaliland rose by over 40 per cent in January-April 2022 compared to the

same period of last year, according to the Integrated Food Security Phase Classification (IPC). UNICEF had appealed for $1.2 billion to deliver an essential package of nutrition services and care to avert what could be millions of child deaths in 15 crisis-hit countries and also to prioritise the prevention and treatment of severe wasting in all global food crisis response plans by ensuring budget allocations.

WAY AHEAD

South Africa became the most food-secure country in Africa in 2023 despite numerous global threats to agriculture, including climate change, according to a new report. The country's achievement may show the way to other struggling countries in the region. This was the first time a country in sub-Saharan Africa has topped the list across the continent. The country had made a record leap from 70th position in 2021 to 59th on the 2022 Global Food Security Index (GFSI) report by British weekly The Economist. South Africa toppled Tunisia in the continent, which was in second place and 62nd globally among 113 countries eligible for the ranking. "Besides feeding its over 60 million citizens, the farmers of South Africa provided food for millions of people from other countries in southern Africa. Apart from Cape Verde Islands and the Republic of Eritrea, the nation exports her food to every African country," read the report.

From January 2022 through August 2022, South Africa's export of agricultural products rose by more than 20 per cent and 22 per cent for processed foods, the study further stated. The country's agriculture and food industries boosted its trade surplus by a record R10 billion from R51 billion in 2021 to more than R60 billion in 2022 in the process. South Africa's productivity amid the fertiliser crisis brought on by the Ukraine-Russia conflict was impressive and had

South Africa became the most food-secure country in Africa in 2023 despite numerous global threats to agriculture, including climate change. The country's achievement may show the way to other struggling countries in the region. This was the first time a country in sub-Saharan Africa has topped the list across the continent

governments, policymakers and even farmers of other countries in the region curious.

Over reliance on erratic rain-fed agriculture with little or no alternatives like irrigation had led to famine in other countries, according to Jane Wairimu, a small-scale farmer and foodstuff wholesaler in Kiambu County, Kenya, East Africa. "Times have changed terribly (due to climate change) and agriculture is now a trial-and-error affair. We would get an average of 20 bags of maize from an acre piece of land earlier. Today, you will be lucky to get seven bags due to failed rains," said the farmer.

Eggs, onions and other food items stocked by wholesalers are imported from neighbouring Uganda and Tanzania, she added. However, they had already received warnings of higher prices due to an increase in the cost of production. Like Wairimu, other Kenyan food producers, including animal farmers and cereals producers like Henry Ledama from Kajiado County, Kenya, expressed deep worries over the "lack of government involvement." "Government subsidies on fertiliser are a great move, but they must also subsidise other farm inputs like seeds and pesticides. Post-harvest losses are also a major concern. The government must double fund in agriculture to build capacity in us to necessitate large-scale production," said Ledama, an animal farmer.

Experts and regional bodies concerned with food security have warned that governments must employ a deliberate multi-pronged approach to ensure not just affordability but availability, quality and safety of food. The solution to food security must be multi-sectoral and require the involvement of governments and development partners, according to Abebe Haile-Gabriel, the regional representative for Africa at the Food and Agriculture Organization (FAO).

"FAO has a new strategic framework through sub-regional initiatives aimed at helping governments formulate effective agricultural policies, build resilience in agriculture and develop strong agribusiness value chains," said Abebe. The food security expert added that governments must work hand in hand with FAO in developing higher standards to boost food production and quality of produce. Abebe, who is an Ethiopian national, said they must also share best practices in agriculture and food security to eradicate hunger in Africa by 2025. He said having an expanded variety of produce and doing away with trade, tariff, and non-tariff barriers will help reduce high levels of global protectionism. Beyond South African farmers, food producers in sub-Saharan Africa can learn from the best practices in high-income European countries that topped the GFSI list, like Finland, Ireland, and Norway.

"Governments and farmers must innovate to build resilience against threats like climate vagaries. Nations where farmers have higher access to affordable agricultural inputs and financial support or where government invested in innovative technology and had a strong supply chain infrastructure got higher global food security score," read the report in part. The countries in which farmers had access to affordable agricultural inputs had been the biggest gainers in the index since 2019, especially commitments to "empowering female farmers (jumping 18.4 per cent) and access to agricultural technology, education, and resources (up by 10.1 per cent)", the report said. Sub-Saharan Africa must invest in climate-resilient infrastructure and modern technology to ease food transportation and help accurately forecast extreme weather events, experts said. This is key is averting losses during food production. ■

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ANOTHER BATTLEFRONT

The Russia-Ukraine war has spiked food prices threatening reversal of decades of progress in poverty alleviation

AFRICA'S ECONOMIC growth had been crippled by the combined effects of skyrocketing inflation, Ukraine war, massive debts and climate change, according to the World Bank. This would have long-lasting consequences, possibly reversing decades of progress in poverty alleviation, warned the report published in October 2022. Food and fuel inflation was exacerbating food insecurity, especially among the vulnerable in the continent. This might have spiked the already on-the-rise headline inflation in Sub-Saharan Africa, the World Bank highlighted in its biannual analysis "Africa's Pulse". Headline inflation is a measure of the total inflation within an economy. It takes the prices of volatile commodities such as food and fuel into account.

Ukraine war, in the backdrop of an economy recovering from post-pandemic ailments, had

aggravated the situation. Some 29 of 33 countries in Sub-Saharan Africa had inflation rates over 5 per cent. Seventeen countries had double-digit inflation as of July 2022. This came at a time when debt in Sub-Saharan Africa was projected to stay at 58.6 per cent of GDP in 2022. Eight out of 38 countries eligible for International Development Association's (IDA) support in the region were in debt distress and 14 were at high risk. Eligibility for IDA's support depends on a country's relative poverty.

The projected inflation trends could slow down the already hampered efforts to reduce poverty. This could impact Africa's progress in reaching the United Nations-mandated Sustainable Development Goals (SDGs) for ending extreme poverty by 2030. Food inflation is a threat to long-term human development in the continent, the report read. Record high international food and fuel prices — especially during the first quarter of 2022 — triggered a global crisis. It can lead to an increase in extreme poverty, worsening hunger and malnutrition, warned the report. Elevated food prices were detrimental as a vast majority of the population in Sub-Saharan Africa allocates over 40 per cent of total spending to food. Most poverty-struck rural households spend between 57 and 59 per cent of their income on food. More than one in five people in Africa suffer from hunger. An estimated 140 million people faced acute food insecurity in 2022, compared to 120 million people in 2021, according to the Global Report on Food Crises. Food insecurity increased by 17 per cent between 2021 and 2022, the report added. In East Africa alone, an estimated 55 million people were acutely food insecure — up from 41 million in 2021. This implied a 34 per cent increase in food insecure people.

Food security crises are becoming more frequent and more acute in the subcontinent, flagged the World Bank. In east and southern Africa, severe food crisis episodes occurred every

The Russia-Ukraine war had grave implications for the global food security, particularly for the Africa continent. It also brought out how fragile the food system has become in a globalised world when food-self-sufficiency is no more considered a national goal

2.5 years in the 2000s, as opposed to one in every decade previously. Food security is estimated to decline by 5-20 per cent on average with each significant episode of flooding or drought. The situation will deteriorate if no actions are implemented to reverse this trend. The prevalence of undernourishment may reach 29.4 per cent (411.8 million people) by 2030. Some 209.3 million undernourished people will be from the west and central Africa, followed by east Africa with 191.6 million.

The Russia-Ukraine war had grave implications for the global food security, particularly for the Africa continent. It also brought out how fragile the food system has become in a globalised world when food-self-sufficiency is no more considered a national goal. The Russia-Ukraine war has razed the global agriculture system that was once sold as the magic formula to provide food to all. It led to concentration of food production in a handful of countries, making others net importers, and has now fuelled a historic rise in prices.

Into its second year, Russia's Ukraine invasion drags on. Most of the world has taken sides on who the aggressor and the victim is. But there is one front where the world seems united as a victim—the globalised agriculture system, which has been severely hit. The food market is intricately interconnected. "One of every five calories people eat has crossed at least one international border," wrote Maximo Torero Cullen, chief economist of the UN's Food and Agriculture Organization (FAO), in a blog on the FAO website in July 2022. The food market is also extremely fragile, with just six food baskets supplying the major chunk of the world's staple food. It is also highly unequal in terms of production and supply—the poor countries are net importers and the high income countries net exporters, irrespective of their food production potential. Worse, the advanced economies spend just 17 per cent of their earning on food while

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Sub-Saharan Africa forks out 40 per cent on the same, as per FAO data. As a result, even a slight disturbance in the system leads to a major food crisis in the poor countries, as is happening now.

The Black Sea region, which includes Russia, Ukraine and Kazakhstan, is one of the world's six food baskets. Russia is the world's largest wheat exporter while Ukraine is sixth on the list. Together, the two warring countries produced 12 per cent of all food calories traded globally (in January 2022); controlled 29 per cent of global wheat exports, 19 per cent of maize exports, and 78 per cent of sunflower oil exports. Russia was also the world's top exporter of nitrogen fertilisers, the second leading supplier of potassium fertilisers and the third largest exporter of phosphorus fertilisers. Some 50 countries depended on Russia-Ukraine for their food supply, particularly for wheat, maize and sunflower oils. The majority of these are poor and import-dependent countries in Asia and Africa. Of the 53 countries or territories that faced food crisis in 2021, 36 depended on Ukrainian and Russian exports for more than 10 per cent of their total wheat imports, as per an analysis by Washington DC-based International Food Policy Research Institute (IFPRI). In terms of food supply, in 2019 wheat and wheat products represented 408 kilocalories per capita per day in the countries facing food crisis. In east Africa, where wheat and wheat products accounted for a third of the average cereal consumption, 90 per cent of the wheat imports came from Russia and Ukraine, as per UN's World Food Programme (WFP).

A preliminary assessment by the UN Task Team for the Global Crisis Response Group said the war had led to a "three-dimensional" crisis—rising food prices, rising energy prices and tightening finance. Some 1.7 billion people in 107 countries (41 in Africa, 38 in Asia and the Pacific and 28 in Latin America and the Caribbean) were exposed to at least one of the dimensions, said the assessment released on April 13, 2022. Some 69 economies with 1.2 billion of the world's people were "severely or significantly" exposed to the three-dimensional crisis.

Consequently, thousands of kilometres from the war zone, some 70 per cent of Africa's economies were at risk of collapsing, putting millions on the verge of food scarcity. Egypt, for instance, depended on Ukraine and Russia for 60 per cent of its food imports. Its food inflation

rose to 26 per cent in April 2022. Angola—a country that does not produce wheat traditionally but consumes 0.65 million tonnes of it annually—met 30 per cent of its demands from Russia-Ukraine. With the war curbing supply, wheat price at the consumer level had increased by 40 per cent in just a few weeks, said the Association of Wheat Flour Producers of Angola. Lebanon, a country that had not registered growth in the last four years preceding 2022, sourced up to 25 per cent of its average calorie consumption from wheat and sunflower oil imported from Russia-Ukraine. Up to 90 per cent of its wheat demand was met via imports from Russia and Ukraine. As its food inflation got out of control—it was 1,000 per cent in May, 2022—the government deployed over 90 inspectors to check if the retailers were hoarding. "Prices for food, which accounts for about 40 percent of consumer spending in the region, are rising rapidly. Around 85 per cent of the region's wheat supplies are imported. Higher fuel and fertilizer prices also affect domestic food production. Together, these factors will disproportionately hurt the poor, especially in urban areas, and will increase food insecurity," wrote Abebe Aemro Selassie, director of the International Monetary Fund's African Department, and Peter Kovacs, an economist in the Regional Studies Division of the department, in an April 28, 2022 blogpost on the IMF website.

As countries substituted the commodities that were in short supply with others, the prices of the substitutes went up. The World Bank warned that each percentage point increase in food prices would push an additional 10 million people into extreme poverty. The Washington-based Center for Global Development estimated at least 40 million people around the world would have been pushed into extreme poverty— defined as living on less than $1.90 a day—because of the price spike caused by the war.

This is the third global food crisis (after the crises of 2007-08 and 2010-11) in the past 15

Some 50 countries depended on Russia-Ukraine for their food supply, particularly for wheat, maize and sunflower oils. The majority of these are poor and import-dependent countries in Asia and Africa. Of the 53 countries or territories that faced food crisis in 2021, 36 depended on Ukrainian and Russian exports for more than 10 per cent of their total wheat imports

years, but the worst-ever in severity and spread. In all the crises, the world saw how agriculture and food production systems became concentrated on just a few commodities and in a few countries. This made production efficient and drew advantage of scale. But it also made food production vulnerable. It changed how and what we eat, adding to the food system's vulnerability. First, our diet majorly comes from just four grains—rice, wheat, corn and soy. These grains account for 50 per cent of the average daily calories consumption, globally, with wheat and rice contributing a major chunk. Five countries—China, India, Russia, Brazil and the US—control 60 per cent of the global food production. Within these countries, production is further concentrated to a few regions. For example, India is a major wheat producer but more than four-fifths of it comes from five north Indian states. In the last five decades, there is a swift change in the way food is produced and distributed across the world. When agriculture trade becomes free, or globalised, inflation comes down. This thrives on outsourcing production and processing at mass to cheap labour areas in the world. But the character of consumption has changed. In the world, four-fifths of total food consumption is still produced locally. But the share of internationally traded commodities in total food trade is constantly increasing: from 10 per cent in 1985 to 14 per cent in 2017. This coincides with the trend of mostly developing countries becoming increasingly import dependent. According to an estimate by FAO, the demand for imported food products in low- and middle-income countries is not only increasing, but will go up 2-3.5 times by 2050. In 2020 the demand for imported food commodities in lower-income countries made up 80 per cent of the annual rise in the world's

total food import bill. This is both a good and a bad development. Food is available to most vulnerable countries and people, but at the same time it is conditional to situations in countries that process it before it reaches the destination. Ngozi Okonjo-Iweala, director-general of the World Trade Organization, said in a recent event on the impending food crisis that the global trading system has helped drive global growth and provided countries with important goods even during the pandemic.

"Spatially, the shift in the harvested area from food and feed towards processing in the United States is reflective of the evolving role of the country in global crop production and renewable energy targets. Similar but less dramatic changes have occurred in Europe. The changes observed in Latin America from a region oriented to food production, to harvesting feed and processing crops, have been observed since the late 1990s with the expansion of maize and soybean harvests pushed by commodity prices and exchange rate and at the cost of tropical ecosystems. China's movement away from harvesting crops for direct food utilization to processing and feed crops has been mainly driven by the changes in its consumption structure due to rising incomes and population where people demand high-value food products," states a paper published in *Nature Food* on May 12, 2022. There is a polarisation in the food sector around who eats what that is driving a fundamental change in the food production priority. Among the middle- and upper-income people (both in advanced and developing economies) consumption of eggs, meat and milk has gone up drastically. On the other hand, poor populations still depend on rice, corn, bread and vegetable oil. The *Nature Food* paper examines seven uses of crop production—food, feed, processing, export, industrial, seed and losses—over 50 years (1964-2013) to find out how produced food is being used. "I estimate that in 2030, only 29% of

48 countries will not produce enough calories within their borders to feed their populations. Most of these countries are in sub-Saharan Africa, but they also include Asian nations such as Afghanistan and Pakistan and Caribbean countries such as Haiti

the global harvests of 10 major crops may be directly consumed as food in the countries where they were produced, down from about 51% in the 1960s. We also project that, because of this trend, the world is unlikely to achieve a top sustainable development goal: ending hunger by 2030," wrote the lead author, Deepak Ray, in *The Conversation*. The study says that produced food has competing uses like "making biofuels; converting crops into processing ingredients, such as livestock meal, hydrogenated oils and starches; and selling them on global markets to countries that can afford to pay for them." It claims the calorie production in these crops increased by more than 200 per cent between the 1960s and the 2010s. But this would not be used directly for feeding the food-deficit population; rather to meet the feed requirement of livestock that caters to the food demand of middle- and higher income populations. "According to our analysis, 48 countries will not produce enough calories within their borders to feed their populations. Most of these countries are in sub-Saharan Africa, but they also include Asian nations such as Afghanistan and Pakistan and Caribbean countries such as Haiti," the paper states. "Growth in harvests of crops meant for exports, processing and industrial use, together with their higher yields and faster yield gains, stands out globally; at a more granular level, this was driven by specific global regions that are getting increasingly specialized in harvesting crops for these usages," they add. ■

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FOOD IN A SOUP

Africa has 65 per cent of the world's uncultivated arable lands that can feed more than the world's population

AFRICA IS the only continent that imports more food than it produces, despite having the potential to feed the whole world. And the cost of food import is so high that it cannot invest in health and other welfare activities. According to the Alliance for a Green Revolution in Africa (AGRA), "the cost of Africa's annual food imports could go from US$50billion to US$110 billion by 2030." In 2021, the United Nations Conference on Trade and Development said in a statement that "Africa imported about 85% of its food (2016-2018) from outside the continent," that cost it $35bn.

Africa never ceases to surprise the world with its existential contradictions. We know about its "resource curse", the generic term that bundles all these contradictions. But, as the previous article points out, the contradictions in the agriculture sector are stark. The continent has 65 per cent of the world's arable lands that are yet to be cultivated. If cultivated, it could feed over 9 billion people, more than the world's population. Yet, it has one-third of the world's underfed population. By 2030, its agri-business potential would be US $1 trillion, but this will be only because of being the world's only continent to be a net food importer. While Africa has other pressing developmental challenges such as malnourishment, growing health burden and the

threat of climate change, the continent spends the most on importing food, which otherwise could have been spent in such programmes. Moreover, the continent will have the world's largest population in a few years; it already records the fastest population growth. For a continent where agriculture still employs the most, it is no more an existential contradiction, but a real threat to a decent existence. For more than three decades the continent has been a net importer of agricultural products. But what is stifling is the change in the nature of food imports. The continent has been importing basic foodstuffs such as dairy products, edible oils and cereals, implying that food imports have become increasingly important to ensure food security. In the continent's most densely populated region— the Sub-Saharan Africa (SSA)—40 to 60 per cent of smallholder farmers are absolute buyers of staple foods. They spend more on food than they earn from selling agricultural produce.

But it was not always like this. In 1980, despite Frankenstein famines that killed thousands and near non-existent resource in many countries to spend on human goods, Africa reported a near balanced agricultural trade. The continent imported and exported the same worth of agricultural produce—the food import bill was US $14 billion. But that was also the last time the continent witnessed a healthy trade scenario. At present, Africa spends US $35 billion a year on imports of agricultural produce, while exports are negligible The share of intra-African trade is less than 5 per cent. By 2050, the African population is expected to be about 2 billion. To feed this population, and going by the current import trend, the food import bill would be US $110 billion in 2025. Various regions of the continent are emerging as the world's biggest food importers. West Africa, for instance, imports 20 per cent of the world's total rice. Or take Nigeria. While domestic production of rice has stagnated at 28 kg per capita since 1990, consumption has nearly

For more than three decades the continent has been a net importer of agricultural products. But what is stifling is the change in the nature of food imports. The continent has been importing basic foodstuffs such as dairy products, edible oils and cereals

tripled in this period. It now spends more than US $2 billion annually on rice imports. While export growth has not been as high as expected, the value of agricultural imports has increased five times since 1998. "But Africa cannot eat potential," says Akinwumi Adesina, the president of the African Development Bank and Nigeria's former agriculture and rural development minister. "What Africa does with agriculture is going to determine the future of food in the world," he says.

Africa remains a predominantly agrarian economy. The average contribution of agriculture to the national economy of an African country has been about 30 per cent since the 1980s. The poorest countries of the continent are importing the least, even though they are net food importers. This has ramifications for the continent's poor. For example, a comparatively richer country like Nigeria with oil wealth reported the highest per capita food import of US $185 annually between 2000 and 2005 on an average. On the other hand, a poor country in SSA had a per capita annual import of US $17 annually. But the difference between these two scenarios is that in Nigeria's case, the government had the resource to pay for the import through revenue from exporting oil, but in countries in SSA, governments don't have the capacity to pay for the import bill. So parts of the continent with the poorest population have been witnessing uncertain food availability. The pessimists believe that the continent, particularly countries in SSA, will find it more difficult to attain food self-sufficiency. So, the import will continue in greater volumes, further draining the state exchequers. It will be a vicious circle for the rural population who will suffer the most due to the continent's inability to produce more food. And, the result: the much-feared slide on the path to dependency, unemployment, rural exodus and desertification, leading to famine. As we know conflicts just need these types of triggers.

Unlike other continents, Africa will have 60 per cent more rural population in 2050 than

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now. The rural population of Africa is already more than 500 million, 80 per cent of them living in poverty. Rural population depends on agriculture for survival. Even though Africa is witnessing fast economic growth, there seems to be no proportionate impact on poverty reduction. Countries like Ethiopia and Zambia, for instance, outpace India and China in economic growth. It is clear now that without growth in the agriculture sector, pure economic growth doesn't have the capacity to turnaround the situation for the people. Agricultural growth is way behind services and industrial sector in term of growth. During 2000-09, per capita agricultural income reported less than 1 per cent of annual growth. Besides, more people mean more quantity of food for consumption. But without a productive local agriculture, the prohibitive import bill would surely lead to a serious scarcity of food. There is another aspect to this crisis. Africa's urban population is also increasing and the urban Africans are vociferous consumers due to better economically active population. In countries such as Burkina Faso, Guinea, Mozambique, Niger and Rwanda, agriculture provides employment to over 80 per cent of the population. More than 60 per cent of the continent's population is under the age of 25. Some 220 million young people will join the workforce between now and 2035 in SSA. According to projections by UN's Economic Commission for Africa, wage jobs can absorb up to 25 per cent of them. This leaves farming and related self-employment to absorb the employment needs for at least 70 per cent of young Africans entering the labour force (more than half of whom live in rural areas) till at least 2030, says the estimate.

AN ENVIRONMENTAL CRISIS

Africa's agriculture is a victim of both environmental degradation and a lack of political will. Like rural India, the continent too is witnessing land fragmentation due to population rise and rising dependence on farming due to lack of other economic opportunities. Though there are visible

signs that small farmers are responding to this situation by increasing cropping intensity, but this is also limited to a few high-yielding varieties, leaving no time to take up activities like crop rotation to increase soil fertility. It is estimated that 65 per cent of the arable land in SSA is already degraded. This costs farmers about US $68 million annually due to loss in income. According to the Montpellier Panel, a group of African and European experts from the fields of agriculture, trade, ecology and global development which was chaired by Gordon Conway of Imperial College, London, the economic loss due to soil degradation impacts 180 million people, mostly smallholder farmers who are now depending on imported food. Africa is already battling the impacts of climate change. According to a report by the Montpellier Panel, mean temperatures in Africa will rise faster than the global average, and agricultural losses will amount to 2 to 7 per cent of GDP by 2100. "By 2050, hunger and child malnutrition could increase by as much as 20 per cent as a result of climate change, reversing the gains achieved through the Millennium Development Goal (MDG) process whilst jeopardising the success of the Sustainable Development Goals (SDGS)," says the panel's report. Low investment in agriculture is a key bottleneck. Development and distribution of improved seeds, fertilisers, insecticides, improved extension service delivery and market infrastructure require capital investments. Walter Sandow Alhassan, director, Biotechnology and Stewardship for Sustainable Agriculture in Africa (BSSA), says a Green Revolution like that in Asia offers a dramatic increase in food production through the introduction of high-yielding seeds, insecticides, fertilisers, farmer credit and irrigation facilities. Farm yields are still low, at about 23 per cent of global levels. Agricultural productivity in Africa is growing at about half the rate of population growth. This is largely due to the continued low modern input supply—seeds, fertilisers, insecticides, continued reliance on rain-fed agriculture—and less exposure to new management practices.

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In 2003, a definitive step was taken to start a Green Revolution in Africa with the adaptation of the Maputo Declaration. The declaration calls for a minimum investment of 10 per cent of the annual budget into agriculture and rural development, and a target of 6 per cent agricultural growth. The Comprehensive Africa Agriculture Development Programme (CAADP) is Africa's framework to transform the agricultural sector under the declaration. A number of initiatives put into place by development partners have helped considerably. These include the constitution of the African Agricultural Technology Foundation (AATF) in 2003, Alliance of Green Revolution in Africa (AGRA) in 2006 and the Drought Tolerant Maize for Africa (DTMA) programme in 2012. These initiatives did revive interest in agriculture. But after 14 years, only a handful of countries— Ghana, Ethiopia and Burkina Faso—have made the 6 per cent agricultural growth target made under the Maputo Declaration. "In most African countries, progress has not been remarkable as evidenced by the huge portions of national budgets spent on food imports," adds Alhassan. Together, NEPAD and CAADP represent a departure from externally-driven development strategies and programmes characterised by shifting priorities and the absence of the necessary consistency and continuity to produce solid results. CAADP is not a "one-size-fits-all" plan, but a strategic framework that provides a set of shared principles, targets and operational milestones to guide programme planning and implementation by country governments, regional economic communities (RECS), and other stakeholder groups.

Barring a few exceptions, African countries and RECS have embraced the agenda. Major innovations of CAADP include the practice of evidence-based policy and programme planning and implementation linked to mutual accountability through peer review, benchmarking and mutual learning. The 2014, the Malabo Declaration significantly expanded CAADP's agenda in terms of thematic coverage and mutual accountability requirements. In the declaration, African Union (AU) Heads of State incorporated issues dealing with reducing child undernutrition,

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post-harvest losses and vulnerabilities of livelihoods, and reaffirmed their commitment to mutual accountability by calling for a continental agricultural biennial review to assess progress on commitments. The first biennial review is scheduled for the AU Summit in January 2018. With the CAADP implementation agenda now in its second decade, work is underway to incorporate commitments of the Malabo Declaration into CAADP planning, implementation and review, dialogue and the mutual accountability processes.

THE CLIMATE FACTOR

What countries across Africa are experiencing is nothing unusual in this age of Anthropocene. Then why does the continent bear the insurmountable loss and damage? Munich-based reinsurance company Munich Re offers an explanation. While climate change is a global problem, its impacts are unevenly distributed, with poor and developing countries bearing the maximum brunt. The impact of natural disasters is much greater on developing countries—currently 13 per cent of their GDP—than on rich nations, where it is 2 per cent, according to Munich Re. There is also a disparity among different parts of the developing world. While Asia is highly exposed to natural disasters, Africa is most vulnerable to its impacts. According to the Natural Hazards Vulnerability Index by risk analysis and research company Verisk Maplecroft, nine of 10 countries found most vulnerable on the index are in Sub-Saharan Africa. Analysis shows that climate change impacts are more pronounced in Africa because of a few reasons. One, agriculture is largely rain-fed and underdeveloped; two, 90 per cent of the farms are small yet contribute to 80 per cent of the total food production; and three, a majority of the farmers have few financial resources, limited access to infrastructure and extremely limited access to weather and technological information. According to the UN Food and Agricultural

Organization (FAO), in developing countries the agriculture sector, including crops, livestock, fisheries and forestry, absorbs 22 per cent of the economic impact caused by natural disasters. But in Africa, the sector only adds to the impact. Africa's crop and livestock losses caused by natural disasters in 2003-13 were US $26 billion. Kulthoum Omari, Coordinator, Adaptation of African Agriculture (AAA), a 27-nation coalition, cites the enormity of the problem: "About 80 per cent of people in Africa depend on agriculture for their livelihood and sustenance. Therefore, boosting agricultural activities will have a positive impact on local and national economies in Africa. However, this is being hampered by the impacts of climate change." The latest IPCC report also states that climate change is worsening the already deplorable state of agricultural systems in Africa. The white paper on the initiative for the Adaptation of African Agriculture (AAA) to climate change, presented at the Marrakech UN Climate Change Conference in 2016, says the continent has 500 million hectares of severely degraded land—this accounts for 27 per cent of the world's total degraded soils. The paper cites water erosion, chemical degradation and soil compaction as the prime reasons for land degradation. Further, about 66 per cent of African lands are located in arid or semi-arid areas, and suffer from water shortages. Due to uneven distribution of water resources, around 25 per cent of the population faces water scarcity, especially in North Africa and the Sudano-Sahelian region, and only 2 per cent of arable land is irrigated in Africa against 42 per cent in Asia, highlights the white paper. Worse, Africa is least prepared to tackle weather-related risks. Two-thirds of its countries have little or no capacity to manage these risks. According to the AAA white paper, there are only 781 synoptic weather stations (that collect meteorological information every six hours) in Africa as compared to 1,696 synoptic weather stations in Asia. Besides, Africa is the world's lowest

By 2080, arid and semi-arid areas could expand by 60-80 million hectares. Viable arable land is predicted to decline, with 9-20 per cent becoming less suitable for agriculture. Suitable land for corn (maize) and beans—staple crops in the continent—could reduce by 20-40 per cent

consumer of improved agricultural inputs, such as seeds resistant to heat, drought or diseases. Though some farmers are adopting climate resilient agriculture, such attempts are limited to certain pockets. For instance, farmers in Bankass district of Mali are infusing vigour to the degraded soil by growing trees as well as staple food like millets on the same farm. In Northern Ghana, several non-profits are sensitising women farmers about the effects of pesticides on food crops as well as soil. There is an urgent need to replicate such initiatives across the continent as extreme weather will significantly disrupt the agricultural calendar and affect crop yields and livestock production.

Going by the latest IPCC report, changes in average temperature would be greater over northern and southern Africa and relatively smaller over central Africa. This means, Sahara and southern parts of Africa would get warmer in coming years. Extreme precipitation changes, such as droughts and heavy rainfall that eastern African has been experiencing more frequently in last 30-60 years, is likely to batter the region in future. By 2080, arid and semi-arid areas could expand by 60-80 million hectares. Viable arable land is predicted to decline, with 9-20 per cent becoming less suitable for agriculture. Suitable land for corn (maize) and beans—staple crops in the continent—could reduce by 20-40 per cent. Conversely, sorghum, cassava, yam and pearl millet could show little loss, or even gains, in the area suitable for production. Western Africa appears to be a highly vulnerable region, where suitable land for maize, sorghum, finger millet, groundnut and bananas are likely to reduce by 10 per cent. This will impact crop productivity. A study by international research firm CGIAR predicts that because of climate change, maize yield could reduce by 22 per cent, groundnut by 18 per cent, sorghum and millet by 17 per cent and cassava by 8 per cent. Banana production could also decline in

western Africa and in the lowlands of eastern Africa. In arid Egypt, production of paddy would decline by 11 per cent and that of soybean by 28 per cent by 2050. While rising sea levels will affect fisher productivity by 50-60 per cent, substantial reductions in forage availability in some regions would alter productivity of livestock. It is projected that at temperatures above 30°C, cattle, sheep, goats, pigs and poultry reduce their feed intake by 3-5 per cent for each 1°C increase. These impacts will have varying effects on the millions of African farmers who depend on livestock for incomes and food security. "Temperature changes also have a much stronger impact on yields than precipitation changes. It is clear that the economic cost of natural disasters in agriculture sector is expected to increase because of climate change," says Tarfa. An estimation by the UN Environment Programme (UNEP) shows that African countries would face 2-4 per cent annual loss in GDP by 2040 due to climate change. However, there will be a strong regional variability in the degree of loss experienced in the agriculture sector. FAO estimates that parts of Sahara would suffer the maximum agricultural losses, followed by western and central Africa and northern and southern Africa. To increase climate resilience among farmers, several African countries have introduced novel adaptation initiatives. In fact, 50 of the 54 African countries have made these initiatives part of their climate action plans submitted to the UN Framework Convention on Climate Change (UNFCCC). One such initiative is the establishment of African Risk Capacity. The specialised agency of the African Union aims to help member states improve their capacities to plan, prepare and respond to extreme weather events, and thereby improve food security and vulnerability of their populations. The other initiative is setting up Agriculture and Climate Risk Enterprise (ACRE), the largest agricultural index insurance programme in sub-Saharan Africa in which the farmers pay a market premium.

Many African countries still lack comprehensive disaster risk management plans because of reasons, such as lack of guidelines, insufficient capacity at the regional, national and sub-national levels to assess and address loss and damage, and insufficient research in understanding the scope, magnitude and character of the climate risks and impacts

The programme now spans across Kenya, Rwanda and Tanzania. A similar insurance programme in Ethiopia allows farmers to pay the insurance premium through labour. But implementation of these initiatives is still a challenge. Says Omari, "Many African countries still lack comprehensive disaster risk management plans because of reasons, such as lack of guidelines, insufficient capacity at the regional, national and sub-national levels to assess and address loss and damage, and insufficient research in understanding the scope, magnitude and character of the climate risks and impacts." Magenya says unless countries prioritise and integrate climate change programmes into their development plans, the effects of climate change on agriculture in Africa are likely to persist. Seid says there is an urgent need to integrate solutions offered through technologies, institutions and government policies to manage the risks of drought and climate variability in Africa. There is also a need for the international community to safeguard agriculture from climate change impacts. The Paris Agreement, the landmark climate change deal that came into force in November 2016, talks of safeguarding food security and ending hunger, and the vulnerabilities of food production systems to the adverse impacts of climate change in the preamble. But the word agriculture finds a miss in the Agreement. ■

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DRY AND DECAYING

Desertification affects 45% of Africa. It is both an environmental and economic crisis

MOST ASSOCIATE the term "desertification" with alarming images of “deserts moving across the landscape, engulfing fertile lands and leaving starving people in their wake”. While this construction is partially true, the term explains a much more complex phenomenon that has evolved overtimes. Little wonder, there are over 100 definitions of desertification, according to the Glantz inventory. The word “desert” originates from an ancient Egyptian hieroglyph pronounced “tesert”, meaning a place that was “forsaken” or “left behind”. Later, it was used as a Latin verb “deserturn” to signify abandonment. The earliest usages suggest that the deserts were initially vibrant places that eventually became wastelands. “Desertification” was first popularised by French botanist André Aubréville in 1948, who used it to describe how tropical forest regions in Africa were

being transformed into "desert-like regions".

This definition suggested the expansion of deserts to new places as desertification. Strangely enough, this limited understanding played a crucial role in drawing the world's attention towards desertification. In the 1970s, scientists mistakenly believed the long spells of droughts in the Sahel region in Africa was desertification. This prompted the establishment of the United Nations Conference on Desertification (UNCOD) in 1977. On the back of an ineffective UNCOD, in 1994, the United Nations Convention to Combat Desertification (UNCCD) was established, which defined desertification as land degradation in dryland areas due to various factors, including climatic variations and/or human activities. This definition, though widely used even today, has been criticised for being too broad at certain places and too narrow at others. "The definition encompasses things like drought, overgrazing, and inadvisable cropping," said British biogeographer Stephen Prince. "All of these conditions suppress the ability of the land to support plant growth. But if it starts to rain and vegetation returns, what do you call it? Is the land still desertified?" he asked. Scientists now say desertification is reduction in the productivity of the land that is not reversible. This means a desertified land can no longer support the same plant growth it had in the past, and the change is permanent on a human time scale. The irreversibility sets it apart from droughts, where the productivity of land is lost for a season or even few years.

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AFRICA UNDER DESERTIFICATION

On August 17, 2019, Sudan's military council and civilian opposition leaders signed a landmark peace agreement, paving the way for democracy in the most impoverished and volatile country that was under dictatorship for nearly 30 years. As preparations for signing the agreement were still on in capital Khartoum, violence erupted in the country's far-west wilayat or state, North Darfur. About 25 armed herders, riding camels and motorcycles, opened fire on people working on farms next to an internally displaced persons camp in Shangil Tobaya locality. According to people in the camp, it was a "revenge attack". A few days earlier, the farmers had impounded the herders' camels and other livestock as they trespassed on the farms and handed over the animals to the police. Soon after the incident, the African Union-United Nations Hybrid Mission in Darfur (UNAMID) — a joint peacekeeping mission trying to bring stability to the war-torn Darfur region since 2007 — issued a statement calling on both farmers and pastoralists to exercise restraint.

While confrontations in Darfur are commonly framed as "ethnic hatred", UNAMID links such incidences to farmers attempting to access land for farming and being prevented from doing so by armed pastoralists. It said the incidences particularly increase during the rainy season. According to media reports, at least 37 such confrontations have been reported from Shangli Tobaya in July 2019 alone.

Water and fertile land are valuable resources in a country where arid and semi-arid lands cover 170 million hectares (ha), or 72 per cent of the area, shows an estimate by Abd Almohsin Rizgalla Khairalseed, professor at the University of Sinnar, Sudan. The study, published in *ARPN Journal of Science and Technology* in 2015, identified Sudan as "one of the most seriously affected countries by desertification in Africa". While droughts and insufficient rainfall are characteristic of western Sudanese territories, primarily in North Darfur, research shows a link

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between armed clashes and prolonged droughts in the region. Between 1950 and 1990, the region witnessed three periods of droughts — mild in the mid-1960s; relatively heavy between 1972 and 1975; and, almost of catastrophic proportions in 1982-84. These periods of drought were accompanied by the outbreak of armed clashes. The most severe and intense of these clashes occurred in the mid-1980s. Over time, those skirmishes turned into a full-scale war, according to a paper presented at 2018 WASD (World Association for Sustainable Development) 16th International Annual Conference held in Geneva.

While isolated drought years have little permanent effect on environment, almost two decades of drought within the last half-century have certainly had a major influence on the vegetation profile and soil conditions, aggravating desertification, fuelling conflicts and increasing the number of war and climate refugees in the region.

In this period of Great Acceleration in the Anthropocene epoch, Sudan holds a grim lesson for the world. Some 110 countries are at the risk of desertification. The World Atlas of Desertification, prepared by the Joint Research Centre (JRC) of the European Commission and the United Nations Environment Programme (UNEP), released in 2018, shows that more than 75 per cent of Earth's land area is already degraded and some 418 million ha, or half of the size of the European Union, is getting degraded every year.

Most of this is happening in Africa and Asia, which account for almost 67 per cent of the degradation occurring in dryland areas. By 2040, over 70 per cent of the big cities (housing 0.3 million population) currently in non-dryland areas will grow drier. In contrast, 43 per cent of the big cities in dryland areas will be hit by desertification.

As a consequence of accelerated deforestation, which is a major driver of land degradation and desertification, it will become more difficult to mitigate the effects of climate change, observes JRC. Together, land degradation and climate change could lead to a 10 per cent loss in global crop yield by 2050, says a press release issued by the European Commission. Most of this will occur in India, China and sub-Saharan Africa, where land degradation could halve crop production. By 2050, more than 90 per cent of the global land could become degraded and 700 million people displaced. The figure could reach up to 10 billion by end of this century. Soon, there could be many more countries grappling with North Darfur-like bloody violence.

LAST CALL

In May, 2022, the 15th Conference of Parties (COP15) to the UN Convention to Combat Desertification (UNCCD) warned that the planet is undergoing desertification like never before, throwing the food production system upside down. UNCCD is the only legally binding international agreement that mandates the member parties to "take various actions; including reporting on measures they have taken to implement the Convention." According to the UNCCD's second Global Land Outlook (released just before the 15th COP), "some 16 million square kilometres of land — the size of South America — will be degraded if current trends continue." According to this assessment, up to 40 per cent of all ice-free land is already degraded. "Human beings live on land, but we also live off the land. We cannot take it for granted," said UNCCD's Executive Secretary Ibrahim Thiaw. "We have already reached a breaking point: There is no longer a balance between our needs and the capacity of the land to regenerate and produce," he said.

A third of the Earth's total landmass has become a victim of desertification, threatening the livelihood of a billion people in over 100 countries. The Intergovernmental Panel on Climate Change (IPCC), the global body for assessing the state of climate change and its impacts, echoed the UNCCD's finding. IPCC sounded a clear warning for the world: adopt sustainable land management practices or face the consequences of land degradation, climate change and desertification.

Its "Special Report on Climate Change" defines desertification as land degradation occurring in drylands — arid, semi-arid and dry sub-humid areas. And the way we use land is rapidly turning large tracts dry. Three-quarters of the Earth's ice-free land is already under stress. Nearly 50 million hectares (ha) of forest land have been acquired since 2000, mostly

While isolated drought years have little permanent effect on environment, almost two decades of drought within the last half-century have certainly had a major influence on the vegetation profile and soil conditions, aggravating desertification, fuelling conflicts and increasing the number of war

for agriculture, in Sub-Saharan Africa, Southeast Asia, Eastern Europe and Latin America. As natural grasslands have been replaced with pasturelands, forests with cropland, and wetlands have dried up, greenhouse gases (GHG) in the environment have peaked.

During 2007-2016, human activities added 13 per cent carbon dioxide (CO_2), 44 per cent methane and 82 per cent of nitrous oxide to the environment. This was largely due to deforestation, wood harvesting and agricultural practices. In most regions, global warming due to GHG accelerated desertification and land degradation. Since 1961, the world has lost 11-14 per cent of its biodiversity due to land use changes. These have had drastic social and environmental impacts, yet there is no sign of stagnation in land acquisitions in the foreseeable future. By 2050, climate change will lead to a 29 per cent spike in cereal prices, warns the report. It found that increased concentration of CO_2 in the atmosphere will reduce nutritional quality of food. Crop yield, too, is expected to fall in tropical and semi-tropical areas due to rising temperature.

The IPCC report does not clearly show the link between climate change and desertification but it does say that desertification is a "function of both human activity and climate variability and change". Different methods have been adopted to measure desertification, and an agreement has not yet been reached on either historical or projected numbers. Trends, however, suggest a clear link. Average temperature increase over drylands has doubled the global average. In fact, some temperate drylands may be converting to sub-tropical drylands as a result of increased drought frequency. Human activities-induced warming has played havoc with climatic zones:

OVER 70% OF AFRICA'S GRAZING LAND DEGRADED

Introduced as a viable reforestation solution, *Prosopis juliflora* is causing land degradation in Africa and has put pastoralists at risk as grasslands are turning into deserts

WHEN KENYA'S agriculture ministry introduced *Prosopis juliflora*—a thorny weed native to South America—to arrest soil erosion in Baringo County in the Rift Valley, 30 years ago, it was viewed as a viable solution. However, this particular step to combat land degradation backfired with fatal consequences for the local populace and livestock. The noxious weed spread quickly, displaced native flora and destroyed biodiversity. It formed impenetrable thickets, blocking people's access to fresh waterbodies.

The "irresponsible" act enraged the pastoral Ilchamus community, which sued the Kenyan government in 2006 and sought compensation for innumerable damages: loss of rich pasture lands, destruction of water sources and damage to livestock. Though the court ordered the government to clear the weed, nothing was done to contain its spread. The community was not compensated either. The weed is still expanding, forcing herders to abandon their lands. There have been other cases also related to the weed, but nothing has happened so far. Invasive species like *Prosopis juliflora*, which thrive on degraded lands, were introduced in Africa as reforestation solutions, says Arne Witt, an expert on alien species, at the Centre for Agriculture and Biosciences International, a Nairobi-based non-profit. Even in India, it is threatening bird population in Tamil Nadu. "Invasive alien plants reproduce faster and have few or no natural enemies. They impact the productivity of croplands and give rise to human-wildlife conflicts due to gradual land erosion," Witt explains.

At present, sub-Saharan Africa (SSA) is under threat from wild sage (*Lantana camara*), *Chromolaena odorata*, a tropical flowering shrub native to the Americas and rubber vine (*Cryptostegia grandiflora*). These species threaten the future of pastoralism in Africa, where over 70 per cent of 500 million hectares (ha) of grazing land is facing degradation. Scientists warn that these degraded landscapes, incapable of supporting either farm animals or wildlife, will soon resemble deserts.

To counter these harmful species, Witt advises land restoration. One sure shot way is to ensure that only indigenous plants are used for reforestation. Land degradation is a serious issue in Africa. According to the Food and Agriculture Organization of the United Nations, the continent loses about 2.8 million ha of forests each year, and about 50 million ha are affected by degradation. To tackle this, 20 African countries have committed to restore 100 million ha of degraded forestland by 2030 under the African Forest Landscape Restoration Initiative.

The Great Green Wall Initiative, which is part of the United Nations Convention to Combat Desertification, aims to halt the southward spread of the Sahara desert. This would help sequester 250 million tonnes of carbon, create millions of jobs in rural areas and benefit more than 232 million people in the Sahel region of Africa. Under this, some 8,000 km-stretch of land will be restored from Senegal in the west to Djibouti in the east. Founded in 2007 by 21 countries, the initiative has restored about 15 per cent of land till now.

But while these are commendable efforts, the reality is that more eco-systems are being lost each year, says Rwanda's Lands and Forestry Minister Francine Tumushime. "Land restoration in Africa is a huge challenge, but a holistic approach using land and forestry governance tools would help accelerate the process," Tumushime says. In Rwanda, a small country in East Africa, reclamation of 13 million ha of land has started. Women have been made a crucial part as they own 24 per cent of land. In Malawi, about 80 per cent of agricultural land is degraded. According to Tangu Tumeo, a senior forest officer at Malawi's Ministry of Natural Resources, the government has already embarked on restoring about 8 million ha through improved agricultural technologies, agroforestry and conservation of riparian lands. In Kenya's Mau forest area, more than 5,000 ha of forest has been restored, says Kenya's Environment Minister Keriako Tobiko.

An estimated 2 billion ha of global land needs urgent restoration, according to Robert Nasi, the director general of the Centre for International Forestry Research, an Indonesian non-profit. The global economy loses up to US $4.5 trillion annually due to land degradation while the economic benefits of restoration amounts to $84 billion a year. "Continued loss of forests and other vital ecosystems are affecting the well-being of an estimated 3.2 billion people globally, the most vulnerable of them are found in SSA. Degradation is a pervasive, systematic phenomenon that the world must tackle urgently," he adds.

Land is an important source of livelihood for the rural poor, especially grazers. In SSA, more than 50 million herders are at risk at present due to severe land degradation. "However even if commitments to restore land-scapes are turned into concrete action, strategies to halt further degradation need to be put into place to ensure that the gains already made are not wiped out," Witt adds.

dry climates have increased, while polar climates have decreased.

The ongoing warming will result in new, hot climates in the tropical regions. Unprecedented heat waves will further intensify in Europe, North America, South America, Africa, Indonesia, West Asia, south and Southeast Asia and Australia. Already, incidences of drought have increased in the Mediterranean, North Africa, West Asia, sub-Saharan Africa, central China, southern Amazon, India, east and south Asia, eastern Australia and parts of North America. "Drought is not degradation as the land productivity may return entirely once the drought ends. However, if droughts increase in frequency, intensity and/or duration, they may overwhelm the vegetation's ability to recover, causing degradation," the report said. Reduction in crop yield in major production areas can trigger cropland expansion elsewhere, either in natural eco-systems or in marginal arable lands. Farming can also be intensified in already cultivated lands. This can further lead to increase in land degradation.

Climate change may have brought down rainfall over the years, but it has increased the intensity of rain. The IPCC report shows a three-fold increase in extreme rain events in central India during 1950-2015. This has influenced several land degradation processes, including soil erosion. A study published in the *Soil Science Society of American Journal* in November 2004 found that high-intensity rain resulted in the breaking up of low-moisture soil much more than high-moisture soil. The breaking up of soil increased its erosion by water.

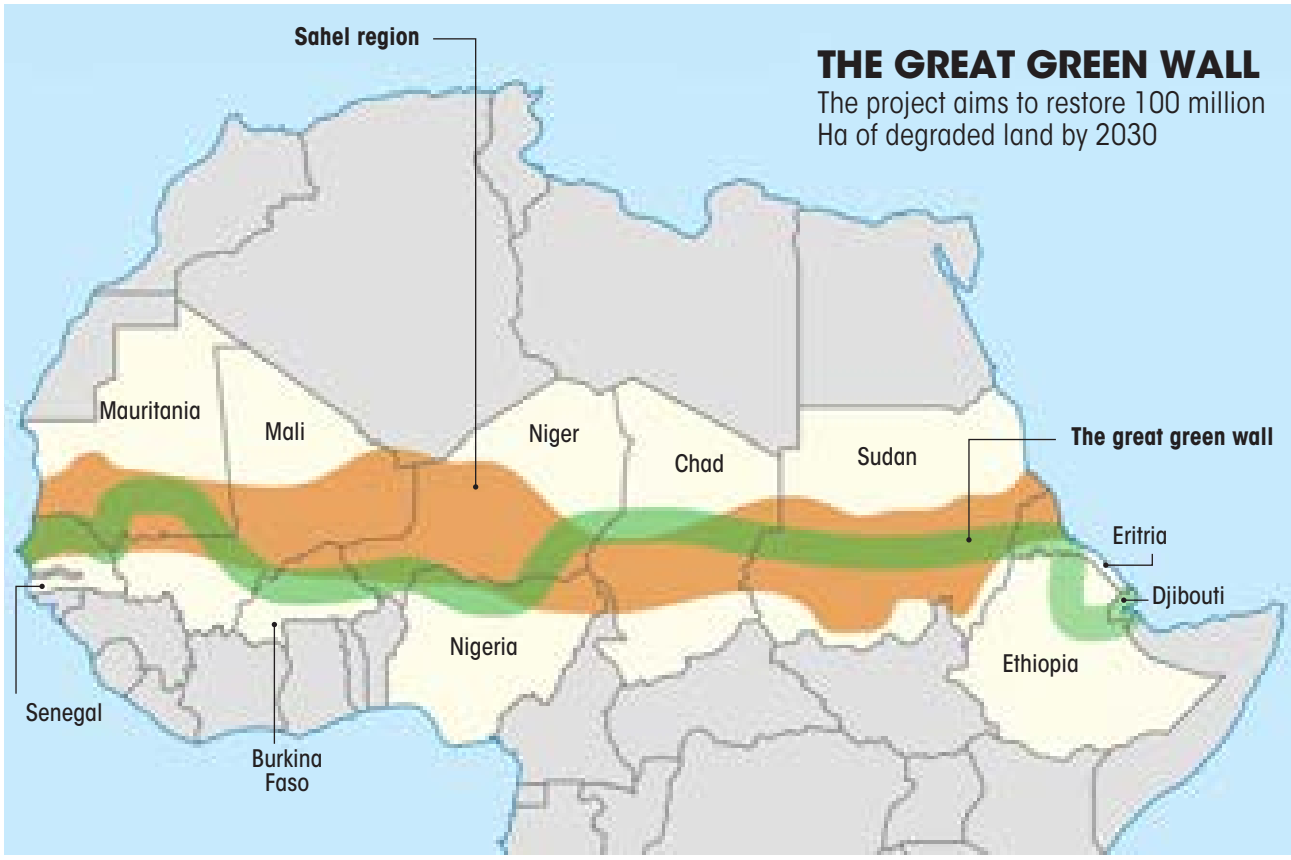
Changes in rainfall regime can change vegetation cover and composition. This, in itself, may well be an important cause of land degradation. A study published in *Elsevier* in 2005 used climate change projections and found that rainfall patterns play a more significant role in soil erosion than land cover — be it cropland, forests or habitation. In future, however, this

Wildfires are another significant driver of desertification. They reduce vegetation cover, increase runoff and soil erosion, decrease soil fertility and affect the soil microbial community. The predicted increase in temperature and the severity of drought events across some dryland areas can increase chances of wildfire occurrence

relationship will get reversed, it said. Clear-cutting forests during slash-and-burn operations can reduce land cover from 100 per cent to 0 per cent. Obviously, this will hugely impact soil erosion, said the report. Then again, if forested slopes are clear-cut for farming, the incidence of increased occurrences of intense storms as a function of climate change will certainly exacerbate the erosion problem. Climate change also impacts the biodiversity of plants, making historically cultivable areas no longer suitable for cultivating crops. This process, too, has an effect on land.

In many dryland areas, invasive plants have contributed to desertification and loss of ecosystem in the past century. Extensive woody plant encroachments have resulted in soil erosion because the bare soil between shrubs is susceptible to water erosion during high-intensity rains. Rising CO2 levels due to global warming favour rapid expansion of some invasive plants in some regions. In the Great Basin region of North America, 20 per cent of the ecosystems have been significantly altered by invasive plants, especially exotic grasses and invasive conifers. This has resulted in drastic reduction in forage availability, wildlife habitat and biodiversity.

Wildfires are another significant driver of desertification. They reduce vegetation cover, increase runoff and soil erosion, decrease soil fertility and affect the soil microbial community. The predicted increase in temperature and the severity of drought events across some dryland areas can increase chances of wildfire occurrence. In semi-arid and dry sub-humid areas, fire can have a profound influence on observed vegetation, particularly the relative abundance of grasses to woody plants, the report says. A 2006 study published in the journal P*roceedings*



Source: UNCCD

of the National Academy of Sciences of the USA found a link between human-induced climate change and wildfires in California in western United States. It estimated that human-caused climate change added 4.2 million ha of forest fire area between 1984 and 2015, nearly doubling the forest fire area expected in its absence.

One big threat posed by climate change is the worldwide rise in sea level, particularly in tropical and subtropical regions. This process, combined with scarcity of water in rivers, has led to the intrusion of highly saline seawater inland. This has increased soil salinity and its degradation. Around 480,000 ha of the 600,000 ha fertile land in the Indus delta, located in the southeastern coast of Pakistan in the North Arabian Sea, one of the six largest estuaries in the world, is now affected by seawater intrusion, says the IPCC report.

Soil salinity varies seasonally, depending largely on the river discharge. During the wet season, the annual average salinity reaches 24 km upstream, while during the dry season, it reaches 84 km upstream, the report said. The freshwater aquifers have been contaminated with sea water, rendering them unfit for drinking or for irrigation. Lack of clean water and sanitation has caused widespread diseases, of which diarrhoea is the most common.

The IPCC report proposed securing land rights of the indigenous communities so that sustainable land use can be ensured. "Land titling and recognition programs, particularly those that authorise and respect indigenous and communal tenure, can lead to improved management of forests, including for carbon storage," the report said. Local people should be involved to identify land use pressures, species decline, habitat loss, food production and forestry, as well as in decisions-making. This will prevent, reduce and restore degraded land, the report said.

HITTING THE WALL

As of 2022, it is estimated that 60 per cent of the African population lives in arid, semi-arid, dry sub-humid and hyper-arid areas. Africa's economy today relies on agriculture, with many Africans making high profits from harvesting and exporting crops such as cowpea, millet,

maize, cocoa and cotton. However, it is estimated that as much as 65 per cent of productive land in Africa is degraded – with desertification being the main culprit affecting 45% of the continent and the remaining 55 per cent being at high risk of further degradation. According to the African Forest Landscape Restoration Initiative (AFR100), Africa loses 3 million hectares of its forests a year, leading to a 3 per cent loss of GDP associated with soil and nutrient depletion. Due to the inevitable loss of land productivity, Africa has spent more than $43 billion on annual food imports, and farmers are losing out on profits due to soil infertility. "Despite our efforts, every year more forest disappears, costing the continent a three per cent loss of GDP", said Abebe Haile-Gabriel, Food and Agriculture Organization's (FAO) Assistant Director-General and Regional Representative for Africa.

More than 13 years after the Great Green Wall (GGW) initiative was started by the African Union to address desertification, land degradation and climate change in the Sahel region, the project had hit a wall due to funds crunch. The project aims to restore 100 million hectares of degraded land by 2030 across 11 countries in the region; only 4 million hectares had been restored between 2007 and 2019. GGW, as conceived by 11 countries located along the southern border of the Sahara and their international partners, is aimed at limiting the desertification of the Sahel zone.

The GGW countries, according to a United Nations report released in September 2020, need to speed up the current pace of land restoration to an average of 8.2 million hectares every year. And France has rushed to help: President Emmanuel Macron on January 11, 2021 announced $14 billion to scale up work. The amount is nearly 42 per cent of $33 billion needed to achieve the GGW's ambitions by 2030. Macron made this announcement at a forum held on the margins

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of the fourth One Planet Summit for Biodiversity co-organised by France, the United Nations and World Bank. According to UN estimates, the amount would cost between $3.6 billion and $4.3 billion a year. The World Bank, too, in a statement January 11 pledged $5 billion for greening and development of the degraded lands in the Sahel region. PROGREEN, a World Bank global fund dedicated to boosting countries' efforts to address landscape degradation, will also invest $14.5 million in five countries in the Sahel region: Burkina Faso, Chad, Niger, Mali and Mauritania.

The GGW initiative, launched in 2007 by the African Union, aims to transform the lives of 100 million people by growing an 8,000-kilometre-long and 15-km-wide mosaic of trees, grasslands, vegetation and plants. The initiative aims to make Sahel green again by restoring degraded lands and providing decent livelihoods to its people, snaking the Sahel all the way from Senegal in the West to Djibouti in the East, providing jobs and opportunities for millions of people in Africa, according to the United Nations.

In a post-novel coronavirus disease (COVID-19) world, as Sahelian countries struggle with budgets and funding, the grant would help meet financial requirements and fast track achievement of its goals, the UN said. This will contribute to the GGW goals with a target of restoring 100 million hectares of degraded land, sequestering 250 million tonnes of carbon and creating 10 million green jobs. The GGW goals will also contribute to 15 of the 17 UN-mandated Sustainable Development Goals. One of the key objectives of the United Nations Convention to Combat Desertification is to reach Land Degradation Neutrality by 2030, a target also included in the SDG 15. It will also contribute to implementation of the post-2020 global biodiversity framework. UN Secretary General António Guterres said nature-based solutions such as GGW are especially promising in post-COVID-19 recovery. The funding announced under GGW was lauded by Mohamed Cheikh El-Ghazouani, President of Mauritania and current chair of the

NIGERIA SHOWS WAY TO REVERSE LAND DEGRADATION

Launched in 2015, an initiative has successfully restored gullies, along with catchment planning, soil and water conservation, as well as livelihood enhancement activities

NIGERIA, WHERE about 35 per cent of the total land area was affected by desertification by 2015, has rehabilitated over 1,558.62 hectare (ha) of degraded land and lifted more than 8,000 people out of poverty, through a World Bank project aimed at reducing vulnerability to soil erosion. The programme NEWMAP (Nigeria Erosion and Watershed Management Project) — an eight-year intervention project launched in 2015 with the help of World Bank — has shown the way in reversing land degradation, focusing on major gully erosion sites, said Salisu Dahiru, national coordinator of the project. He was speaking during a side event at the the United Nations Convention to Combat Desertification's (UNCCD) 14th session of the Conference of Parties (CoP14) on September 4, 2019. The NEWMAP programme has three operational components: Gully restoration, catchment planning and management and livelihoods.

The gully restoration component was designed in parallel with catchment planning, soil and water conservation, as well as livelihood enhancement activities such as grants to community members to implement selected community sub-projects. This generated income and/or provided skills that lead to employment opportunities or new start-ups, according to Dahiru. "The project supported over 5,159 beneficiaries via grants. The people are now engaged in businesses such as livestock farming, small shops, trading, and honey production, etc," he said. To ensure sustainability, NEWMAP established soil and water conservation zones that communities will directly contribute to reducing erosion while conserving biodiversity and supporting sustainable forest management.

Nigeria, known for the highest rate of deforestation in the world, had between 50 per cent and 75 per cent of the land mass in 11 northern Nigerian states under desertification in 2015. As a result of the extreme land degradation, there was formation of gullies and ravines, particularly in southeastern parts of the country. These gullies are the largest ecological challenge that the region is experiencing, Dahiru said. "Some of these gullies can be as deep as 100 metres and as wide as 20 to 30 metres and could stretch over several kilometres," Dahiru said.

"We consider these as end results of prolonged land degradation resulted mainly from the loss of vegetation cover and leading in loss of livelihood because majority of population is in and around the area where these gullies exist. So restoring this land has been of prime most importance to us and the community and the World Bank came to the rescue," he added.

Conference of Heads of State and Government of the Pan-African Agency of the Great Green Wall. The grant will help fast track efforts to restore degrading land, save biological diversity as well as create green jobs and build resilience of the Sahelian people.

In March, 2023, UNCCD said, "Two years on since the One Planet Summit, 80 percent of the US$19 billion pledged towards the Great Green Wall Accelerator has been programmed across the 11 African nations that are part of the initiative. However, continued political leadership and country ownership, targeted action at all levels, and strengthened institutional arrangements are required to realize the vision of this Africa-led movement." These findings come from the new analysis of the Great Green Wall Accelerator, commissioned by the UNCCD, which takes stock of the progress achieved since 2021 and identifies a series of recommendations for action.

If mistreated its topsoil, that takes centuries to build up, can be blown or washed away in a few seasons, exacerbating food insecurity, poverty, conflict, migration and political instability. Thus, says UNCCD, re-establishing land's productivity by ensuring land degradation neutrality (LDN) is key to promoting peace, achieving development and mitigating climate change impacts. It defines LDN as "a state whereby the amount and quality

of land resources necessary to support ecosystem functions and services and enhance food security remain stable or increase within specified temporal and spatial scales and ecosystems." The concept emerged from the UN Conference on Sustainable Development (Rio+20) in 2012. It was realised management of land degradation has co-benefits for climate change mitigation and adaptation and biodiversity conservation, in addition to enhancing food security and sustainable livelihoods. In 2015, LDN became a target for the Sustainable Development Goal 15, which is about sustaining life on land. That year at COP12 to UNCCD, Parties adopted LDN as a "strong vehicle for driving implementation of UNCCD" and called on countries to set voluntary targets to achieve "no net loss" by 2030 so that healthy and productive land is maintained. So far, 122 countries have committed to translating this global target into country-specific targets and actions.

UNCCD prescribes a range of sustainable land management measures so that LDN contributes to and benefits from the achievement of other multilateral agreements like the UN Framework Convention on Climate Change and the Convention on Biological Diversity But countries appear to be keen on restoration of land through plantations. With growing awareness of economic costs of land degradation—which represents a reduction of 10-17 per cent of global GDP a year—political leaders are adopting ambitious targets to restore degraded forests and agricultural land, said Chris Reij, Senior Fellow of the World Resources Institute Washington. The Bonn Challenge, launched in 2011, aims to bring 150 million ha of the world's deforested and degraded land into restoration by 2020. In 2014, at the UN Climate Summit, countries extended this target to 350 million ha by 2030 under the New York Declaration on Forests. These global commitments have spurred regional efforts. In 2014, Latin American and

Planting trees is not a bad practice in regions that receive reliable rainfall. Unfortunately trees only provide strength to the soil at places where rainfall is above 500 or 600 mm. And most of the world's desertifying land receive rainfall below this level

Caribbean countries launched Initiative 20x20 to bring 20 million ha into restoration by 2020. Over 20 countries have joined the African Forest Landscape Restoration Initiative (AFR100), which aims to bring 100 million ha of deforested and degraded landscapes under restoration by 2030. Such large-scale plantation projects are not only expensive but are often mired in controversies, particularly in dryland areas which are home to most of the world's poor.

Planting trees is not a bad practice in regions that receive reliable rainfall. Unfortunately trees only provide strength to the soil at places where rainfall is above 500 or 600 mm. And most of the world's desertifying land receive rainfall below this level. Besides, using technology to plant trees does not address the cause of either desertification or climate change. Since trees are part of the ambient carbon cycle, carbon remains stored in them only until they die. Savory's claims are not unfounded. Since 2007, countries in Africa have been trying to create a barrier of trees across the Sahel region of Africa to stop the Sahara desert from expanding. Some 80 per cent of the people in this region depend on rain-fed agriculture. Though the origin of the idea, dubbed Great Green Wall, goes back to the colonial times, it could never take off for the simple reason that plants could not survive in the absence of adequate water and care. Even in 2007, when the African Union (AU) approved the initiative, it faced a great deal of criticism. A clear vision emerged five years later and the aim of the initiative was changed to surround the Sahara with a wide belt of vegetation— trees and bushes greening and protecting an agricultural landscape. The new vision engages all the countries surrounding it, including Algeria and others in North Africa, not just the 11 original sub-Saharan countries of the Sahel. Now, the "green wall" is a mosaic of land use practices whose ambition is to restore some 100 million ha of degraded land, create 10 million jobs in rural areas. ■

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SEEKING SEEDS

Seed trade harmonisation policies face community resistance

AFRICA IS witnessing a continent-wide polarised battle between the two seed management systems: farmer seed systems, which is the dominant informal and indigenous system managed by small farmers, and the industrial seed sector, the formal trade dominated by a handful of multinational corporations along with local subsidiaries. The newly adopted seed laws by various countries cover the formal industrial seed sector. Some 20 countries have rolled out seed policies in the past five years to formalise or industrialise the seed sector. These countries are seeking to implement what is called "seed trade harmonisation" to facilitate easy movement of certified seed across the continent.

Since 2005, African countries have been negotiating ways to develop the seed sector. The African Seed and Biotechnology Programme—a continental seed programme steered by the African Union (AU)—came into effect in 2008. Its focus is to establish effective and efficient seed systems, and enhanced application of biotechnology and methodologies within the seed

sector. Within the continent, there have been several regional economic bloc-specific seed regulation regimes. The Common Market for Eastern and Southern Africa (COMESA), an economic bloc of 21 African nations, adopted COMESA Seed Harmonization Implementation Plan (COMSHIP) in 2014; the Economic Community of West African States (ECOWAS), a regional economic and political bloc of 15 nations, passed the ECOWAS Seed Regulations in 2008; and the Southern African Development Community (SADC), a security and political bloc of 16 nations, adopted the Harmonized Seed Regulatory System (HSRS) in 2013. All these regulations govern seed variety releases, seed certifications, and phytosanitary control. So, over these 15-odd years, there have been deliberate efforts to create an institutional mechanism to formalise this sector.

REGULATING THE SEED SECTOR

"A $30,000 fine, or 20 years of imprisonment." This is the punishment for trading uncertified or fake seeds in Malawi, as per the country's Seed Act approved in April 2022. Government data shows that close to 60 per cent of the seeds traded in Malawi's market are uncertified. The new law provides for instruments to regulate the production, processing, certification, sale, import and export of seeds. In a country where agriculture accounts for 80 per cent of the employment opportunities as well as 80 per cent of the total exports, the legislation was much needed. At least one would think so.

Its passage was preceded by nearly a decade of debate, with the approval to the Act stalled many times. While the government deployed all reasons to justify the legislation, there was an uncomfortable question: What happens to Malawi's informal seed system, or farmer seed

Multinational seed companies are overshadowing the domestic seed companies due to their resource advantage. This, therefore, calls for the government to put in place mechanisms that will protect the local seed companies

system, which accounts for 80 per cent of the planted seeds, leaving only the 20 per cent of the formal seed system to be regulated by the current law? Farmer groups and civil society organisations saw the law as an entry of commercial seed companies to the market to ultimately take over the indigenous seed system. Speaking at the country's parliament on April 4, 2022 while Madalitso Kambauwa Wirima, deputy minister of agriculture, said the law had more advantages than disadvantages, Ulemu Chilapondwa, vice-chairperson of the Parliamentary Committee on Agriculture and Food Security, offered a word of caution: "Multinational seed companies are overshadowing the domestic seed companies due to their resource advantage. This, therefore, calls for the government to put in place mechanisms that will protect the local seed companies." John Lungu, chairperson of the Seed Traders Association of Malawi, also raised the same concern, "The new law may result in loss of income and livelihood of farmers."

The enactment of the new seed law in Malawi came four years after the launch of the country's seed policy in 2018. This policy has been driven by HSRS, to which Malawi is a signatory. HSRS establishes elevated standards for seed production and trade among the member nations, allowing for quick cross-border movement of improved, high-quality seeds. Under this, the country has to make necessary institutional changes in all three elements of the regional policy: seed variety release, seed certification and quality assurance, and quarantine and phytosanitary measures for seeds. With Malawi enacting the seed law, it became the second SADC nation after Zambia to fully domesticate HSRS. COMESA is also spearheading this process in its member countries through COMSHIP, which is steered under its Alliance for Commodity Trade in Eastern and Southern Africa (ACTESA) programme. John Mukuka, chief executive director of ACTESA, said, "Of the 90 million smallholder farmers, only 20 per cent have access to quality seed. The initiative is to ensure improved seeds to all...It does not prevent one from using indigenous seed. COMESA system embraces both the formal system which involves inspections

PHOTOGRAPH COURTESY: FOOD SOVEREIGNTY GHANA

to make sure that you produce quality seed and the informal seed system where people can use indigenous seed but for their own use."

"Without seed, we cannot grow anything. And if we do not own it, we do not own food as well"—this seems to be the new battle cry in Africa. Country after country is adopting laws to regulate the seed markets, ostensibly to help farmers access high-yielding varieties.

Once upon a time, the continent had distinct geographical tags for specific food diversity. Malawi was known for its potato; Zambia produced tasty and nutritious maize; West Africa had millet; and the northern Africa was full of rice, grown mostly along the banks of the Nile. But something happened along the way that is making these indigenous seeds and crops go extinct. Currently very few Africans can boast of growing, let alone enjoying, the continent's indigenous foods since most countries are now dominated by crops grown from seeds produced by a few companies.

WHY THE PROTESTS

Protests against these laws have also become more vocal. Farmers' groups across the continent see the laws as culmination of a nexus between the governments and multinational seed corporations to take over the multi-billion dollar trade. They also see it as an encroachment on their food sovereignty and fear they will soon lose rights over their seeds once they start purchasing them. Take the case of Zambia, one of the first countries to be a part of the harmonisation of seed initiative under SADC and COMESA. Under Zambia's seed laws, a farmer has to get a quality certification for trading in indigenous seeds. The country's farmer seed system, like elsewhere, is an informal but established network under which seed exchange takes place. In 2014, the country saw many farmers' groups and non-profits protest against the seed harmonisation initiatives. They saw a threat to the indigenous crops and knowledge on which

farmers still depend.

They were of the view that the seed harmonisation programme would prevent indigenous seed from flourishing. And it unfolded exactly that way. One has to visit the National Plant Resources Centre, housed at the Zambia Agriculture Research Institute (ZARI), to get a sense of the country's indigenous seed and plant diversity and the absence of demand for the varieties. The centre is a gene bank that collects, preserves and propagates indigenous seeds and plants from across the country to save them from extinction. According to Sumini Sampa, assistant senior agricultural research officer of the centre, the gene bank currently has over 6,000 indigenous seed and plant varieties, stored in special fridges that operate at -20°C while different plants are grown around the centre. "All these seeds and plants are given free to anyone who would like to grow them," Sampa says. However, the centre, on average, receives only about four requests a month, the officer informs.

Chikwangala, a small farmer of Mpemba village in Chongwe, a farming district about 50 km east of Zambia's capital Lusaka, recalled with nostalgia the "good old days" when farmers could store seeds like maize after harvest in preparation for the next planting season. He said the hybrid seeds "imposed" on farmers were not only expensive but also harmful to the environment. "Farming has become very difficult and unprofitable as we have to buy seeds at very high cost. These seeds have also destroyed our soils," Chikwangala said. Barbara Hachipuka Banda, chief executive officer of non-profit Natural Agriculture Development Program Zambia that promotes native crop varieties, said, "The seed harmonisation initiative has not taken into consideration the great diversity in our agricultural practices. These laws are a kind of one-size-fits-all model. Every country has a distinct circumstance and landscape.

Protests against seed laws have also become more vocal. Farmers' groups across the continent see the laws as culmination of a nexus between the governments and multinational seed corporations to take over the multi-billion dollar trade

By making the continent one unit, you only help the multinational companies to trade well," said Banda. Mukuka said, "It is not COMESA's mandate to stop those interested in dealing with indigenous seed. Our job is that for those that want to export they can use the harmonised system through SCCI [Seed Control and Certification Institute, Zambia's seed authority] or other seed companies in countries like Kenya or Zimbabwe." According to him, it would not affect indigenous knowledge, which would always be there at the gene bank at ZARI.

In November, 2021, various farmers' organisations in Ghana appealed the Supreme Court against the country's Plant Variety Protection Act (Act 1050), adopted in 2020. The groups, which included the Peasant Farmers Association of Ghana, Food Sovereignty Ghana (FSG) and the Centre for Indigenous Knowledge and Organisational Development, said the law was designed to strengthen multinational seed companies and would ultimately put Ghanaian seed companies at disadvantage. Ghana's parliament had discussed this law some 10 years ago and shelved it in 2015 following opposition by civil societies. In a suit filed at the country's Supreme Court on November 11, 2021, FSG challenged the constitutionality of the Plant Variety Protection Act. The appeal in the highest court said that the new law threatened indigenous knowledge and practices of saving, using, multiplying stocking, exchanging or selling seeds and other propagating material. According to the petitioners, Ghana's informal seed system accounted for 85 per cent of the total seed market. So, by extension, the new law would also impact the livelihood of a large number of farmers.

Governments justify the rush to formalise the seed sector citing acute food scarcity in the continent. Africa is grossly food-insecure and a net importer of food. According to UN, the continent will have the world's highest number of people living in hunger—433 million—by

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2030. It spent $35 billion on importing food in 2020 and the amount is estimated to increase to $100 billion by 2030 as the gap between demand and local production widens.

How the agriculture sector performs has ramifications for the economy. The sector accounts for 32 per cent of Africa's GDP and employs more than 60 per cent of the continent's labour force, largely in the poorest countries. Nearly three-fourths of Sub-Saharan Africa's (SSA's) population is small and subsistence farmers, but it accounts for over 75 per cent of the agricultural output.

THE DILLEMA

According to "The Seed Sector in Africa: Status Report and Ten-year Action Plan (2020-2030)", a report published by the African Union Commission (AUC) in 2021 to guide the continent's agricultural policy, "At the farm level, yields must increase if surpluses available for trade are to be realized. Current yields of staple cereal crops in Africa are low and near stagnant at around 1 ton/ha for maize, as compared to 4 tons/ha in other developing regions." As per the AUC assessment, increasing more areas under agriculture is not sustainable. So, it suggested, "Key to increasing productivity is adoption of high-yielding varieties, fertilizers, and other inputs. Of all the inputs, high-quality seed is perhaps the most important, as it determines the upper limit of what farmers can achieve. Improving access to new high-yielding and climate-smart hybrid varieties requires increasing seed production and expanding distribution through increased competition in the seed system." An analysis of agriculture policies of 40 African countries showed that access to improved high-yielding varieties of seeds and bringing in the private sector have been clearly articulated as the strategy for agrarian boost.

This set the confrontation line between the two seed systems. Africa's seed sector is predominantly informal. Millions of small-scale farmers in SSA still supply 80 to 90 per cent of all the seeds planted in Africa. In the informal seed system, farmers obtain, develop, produce,

maintain and distribute seeds from one growing season to the next. The seeds are retained from previous harvests or acquired through farmers' social networks. This system also holds the rich diversity of seed, including varieties that are relevant to farmers and adapted to local weather conditions. It is a very dynamic system having the proven capacity to reach to the most remote farming communities. This system does not come under the quality regulation systems of governments. On the other hand, only 20 per cent of farmers in SSA have adopted improved crop varieties, the lowest in the world. This formal sector is regulated by national seed committees and quality standards controlled by national seed certification agencies. The new policies aim to increase this significantly. The formal private seed sector has been witnessing a boom, after deregulation of the seed industry back in early 1990s. IHS Markit, a subsidiary of S&P Global, in its "Commercial Seeds Market in Africa 2021" report said that the African seed market has seen a huge growth since 2014, reaching nearly US $1.9 billion in 2019. "Our forecast is that the commercial seed market in Africa is expected to resume its robust growth following a down year in 2020, reaching $2.95 billion in 2025," it states. "Quality seeds are a prerequisite to successful agriculture and constitute a major pathway for the success of regional food security goals, with the potential to increase overall productivity by nearly 40%. Seed companies are well positioned to develop and provide access to quality seeds in Africa," the report adds. Though still nascent, the commercial seed market is cornering significant shares in major crops like maize, which accounts for 42 per cent of the African commercial seed market.

These two seed systems are governed by different sets of global treaties and agreements. For the farmer seed systems, rights of farmers have been articulated in the International Treaty on Plant Genetic Resources for Food and Agriculture; the United Nations Declaration

An analysis of agriculture policies of 40 African countries showed that access to improved high-yielding varieties of seeds and bringing in the private sector have been clearly articulated as the strategy for agrarian boost

on the Rights of Peasants and Other People Working in Rural Areas; and the United Nations Declaration on the Rights of Indigenous Peoples. These instruments protect farmers' rights to freely save, reuse and exchange seeds. The industrial seed sector, dominated by multinational corporations, operates under legal regime of the International Union for the Protection of New Varieties of Plants (UPOV).

In recent times, all the major pan-Africa progress in the agriculture sector revolves around formalising the seed sector. Often, such policy decisions have been taken without any consultation or public scrutiny. On February 16, 2022 the African Union's policy organs adopted the continental guidelines for "the harmonisation of seed and regulatory frameworks and the continental guidelines for the use of biotechnology in food and agriculture in Africa" in a not-so-transparent way. This endorsement was leaked to the media much later.

Civil society groups have been opposing these guidelines for years. The guidelines are part of the African Continental Free Trade Area (AFCFTA), a free trade deal rolled out in 2018 after 54 of the 55 countries signed the African Continental Free Trade Agreement. In addition, the draft document on biotechnology guidelines has promoted modern biotechnology through biased and distorted narratives, even problematising the precautionary approach as a barrier to wider diffusion of genetically modified products on the continent.

Earlier, on September 23, 2021, African non-profits and activist groups working on seed sovereignty and peasants' rights opposed the African Union's presentation of the "common position" during the United Nations Food Systems Summit (UNFSS). The groups said: "As social movements in Africa we reject both the UNFSS and the AU's position, which allegedly represents all of us Africans, as further entrenchment of the corporate capture of our food systems." Over 200 organisations signed this statement. These groups ran a campaign against UNFSS last July when they issued the "Common African Statement" to reclaim Africa's food

PHOTOGRAPH COURTESY: UNIVERSITY OF ILLINOIS

sovereignty and transform the industrial food system. "The documents, including a background paper prepared for summit dialogues and a draft policy brief for the summit, bring into focus plans for the massive industrialization of Africa's food systems," said Mariam Mayet, executive director of the African Centre for Biodiversity (ACB). ACB also released a statement on March 4, 2021, that said the "dialogues are deaf and blind to the converging systemic crises we face today, and the drastic urgent re-think it demands".

The real push for the seed sector's switch to the industrial level started with the formation of the Alliance for a Green Revolution in Africa (AGRA) in 2006. At an event in 2004, the then UN Secretary-General Kofi Anan had given a call for "a uniquely African Green Revolution" to boost agricultural production and eradicate poverty. As a follow up to this, The Rockefeller Foundation and the Bill & Melinda Gates Foundation established AGRA, with its headquarters in Nairobi, Kenya. The first major initiative of AGRA was to launch the Program for Africa's Seed Systems (PASS) in 2007 with a capital of $150 million over five years. The core of this initiative is to make high-quality seeds to farmers. For this, PASS focuses on: "educating a new generation of African crop breeders; breeding and releasing new crop varieties; helping local seed entrepreneurs establish companies; and building agro-dealer networks." But to achieve all these, as a strategy, PASS puts all its attention to "a continual search process to identify interested groups and individuals to establish and manage local seed companies." Soon, the Howard G Buffett Foundation, the US Agency for International Development and the Dutch government committed funds to pass, making the total investment to $285 million over a decade. PASS now has operations in 17 countries. It primarily supports private sector intervention in seed production, not on the farmer seed system.

For most of the groups that oppose the introduction of the new seed system, AGRA is the

fountainhead of it. They allege that AGRA has an overt intent to centralise seed production in just a few multinational companies. AGRA first set up the African Seed Investment Fund (ASIF) that invests capital in seed companies for delivering quality-certified seed to smallholder farmers. This fund came handy for many start-up seed companies since commercial banks usually do not fund such "high risk" ventures. Lending credence to the allegation of this fund privatising or corporatising the seed sector, most of the seed multinationals like Monsanto, DuPont Pioneer, Syngenta, SeedCo and Vilmorin are big players in seed sector in countries where ASIF is actively disbursing. These are also the countries that have aggressively brought in policy and legal changes to ensure that the profits and interests of companies investing are protected through enforcement of intellectual property rights.

A SUB-PLOT

Of late, AGRA has come under critical public scrutiny. First, it started with a clear target and deadline: to double yields and incomes for 30 million small-scale farming households while halving food insecurity by 2020. In February 2022, an independent evaluation by US-based consultancy Mathematica said that the AGRA "did not meet its headline goal of increased incomes and food security for 9 million smallholders". No country was on track to reach the goal of doubling productivity, with only Ethiopia and Malawi showing staple crop yield growth of 50 per cent by 2020. Three countries—Burkina Faso, Kenya, and Nigeria—have shown a decline in productivity. The Alliance for Food Sovereignty in Africa (AFSA) in a letter dated September 7, 2021, urged all donors to stop funding this false solution and shift their support to agroecology—a healthy, sustainable, resilient and culturally appropriate food system for

Michael Fakhri, the UN Special Rapporteur on the Right to Food, said, "Africa is facing pressure from industry to align seed legislation with UPOV, thereby enacting laws that allow seeds to be patented"

Africa. An evaluation published in the journal Agricultural Economics in November 2013 said that AGRA grants for improvised seeds had led to huge government expenditure on inputs. High yielding hybrid seeds need more inputs like fertilisers and also irrigation facilities. This evaluation, covering 2010-11, said that while AGRA disbursed $40-50 million a year, the total government expenditure on inputs reached to $1 billion a year, or more than 20 times of AGRA's funding. Such input subsidy programmes (ISPS) are "one of the most contentiously debated development issues in sub-Saharan Africa," said a paper published in the journal Food Policy in 2018. "After ISPS were phased out during the 1980s and 1990s, the landscape has changed profoundly since the early 2000s. By 2010, at least 10 African governments initiated a new wave of subsidy programs that were designed to overcome past performance challenges," it stated. Of these, programmes in three countries—Malawi, Tanzania and Ghana—were designed and catalysed by AGRA.

Malawi's Affordable Inputs Program (AIP)—a $199.2 million programme, which began in 2020 and is supported by AGRA, allows subsistence farmers to purchase farm inputs at a subsidised cost with the government paying over 70 per cent of the share. The World Bank, too, has criticised AIP. Another 2020 study by US' Tufts University evaluating the impacts of AGRA found that yields had not reported that high an increase. "Over the 12-year period in which AGRA operated, from 2004-6 to 2016-18, maize production in the 13 countries increased 87 per cent, but that production gain was due more to a 45 per cent increase in area harvested than it was to yield increases, which improved only 29 per cent," said the study. An assessment in July 2020 by the Biodiversity and Biosafety Association of Kenya said that "AGRA's most supported and subsidized crop, had declined by 4 percent since AGRA started. So have yields for many other staple crops. So rural poverty remains high, and the number of severely undernourished Kenyans increased 4 per cent, even before the pandemic."

On March 14, 2022 the ongoing reforms in the seed sector in Africa found prominent mentions in the 49th Regular Session of the United Nations Human Rights Council. Michael Fakhri, the UN Special Rapporteur on the Right to Food, said, "Africa is facing pressure from industry to align seed legislation with UPOV, thereby enacting laws that allow seeds to be patented." He hinted that the various legislations being adopted in Africa supported the corporates, taking away the farmers' rights over seeds, and proposed that "All member states enact Farmers'

Rights within their legislation and prioritise national and international support of FSS, in order to reconcile the legal contradictions between UPOV and Farmers' Rights." Fakhri also called on UNHRC to be vigilant of agrichemical giants that are using food as a weapon to destroy communities, land and biodiversity for profit. "When we talk about seed systems, we talk about the right to life itself. Whoever controls seeds, controls life. This is why human rights require us to put all seeds into the hands of all the people."

Groups critical of these seed laws also cite a recent UN resolution to protect the farmers' rights over seed. On December 17, 2017, the UN General Assembly approved the Declaration on the Rights of Peasants and other People Working in Rural Areas. This declaration extends human rights protection to farmers whose "seed sovereignty" is threatened. It was approved, with 121 countries voting in favour; eight against and a sizable 52 abstaining. Developing and poor countries mostly voted in favour while the developed countries largely abstained. The US, UK, Australia, New Zealand, Hungary, Israel and Sweden voted against the declaration indicating the polarised debate over seeds and ownership.

Ideally, this declaration should have triggered country-level efforts to protect farmers' rights, like in Malawi the rights of small farmers over their farm-saved seeds. Timothy Wise, senior advisor at the Institute for Agriculture and Trade Policy, US, in his 2019 book Eating Tomorrow: Agribusiness, Family Farmers, and the Battle for the Future of Food, indicts governments for throwing away solutions of organised agriculture, with corporate-controlled technology and seeds, and of misleading farmers on solutions to farm crisis. He has junked the solutions of consolidating small farms and sees the developments as a power play between formidable businesses and the world's small farmers. For Africa, this is another phase of its long fight over resources. ■

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4 AIR POLLUTION & MOBILITY

HIGHPOINTS

Air pollution kills **1.1 million** people annually in Africa

5 African countries are amongst the **top 10** countries globally with highest $PM_{2.5}$ exposure

Across Africa **14%** of all deaths in children under 5 were linked to air pollution

In some African countries used vehicles account for **80-90%** of total imported fleet which adds to air pollution load

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FOUL ORDER

African countries feature as the worst polluted in the world

IN FEBRUARY 2023, Kenya government decided to levy traffic congestion charge. Motorists have to pay this charge as part of the government's plan to reduce carbon emissions. Manufacturers with production plants that emit carbon significantly are also targeted. Such units will be slapped with a new tax for every tonne of carbon emitted. The move is part of government efforts to reduce air pollution and traffic jams amid rising global concerns about climate change, according to a policy document from the country's finance ministry.

Under the plan, the government seeks to introduce a "traffic jam fee" on automobiles driven in zones marked as heavy traffic areas like Nairobi's Central Business District and other major cities and towns like Mombasa, Kisumu, Nakuru and Eldoret. "The government is exploring and developing a congestion charging scheme in major cities in a bid to protect the environment and as a source of revenue for greening the energy sector, among others," read the document titled "The National Green Fiscal Incentives Policy Framework". In 2021, the World Health

Organization (WHO) estimated 19,000 people die each year in Kenya due to air pollution. Some 70 per cent of pollution levels are recorded in the capital city, Nairobi, noted United Nations Environment Programme (UNEP). Besides exacerbating the climate crisis, 9 out of 10 people in Kenya's major cities and key towns are exposed to air pollution beyond the global health standards set by WHO. This trend threatens the global economy. It is slowly but surely reducing life expectancy through chronic diseases such as asthma and impacting the developmental potential of unborn babies.

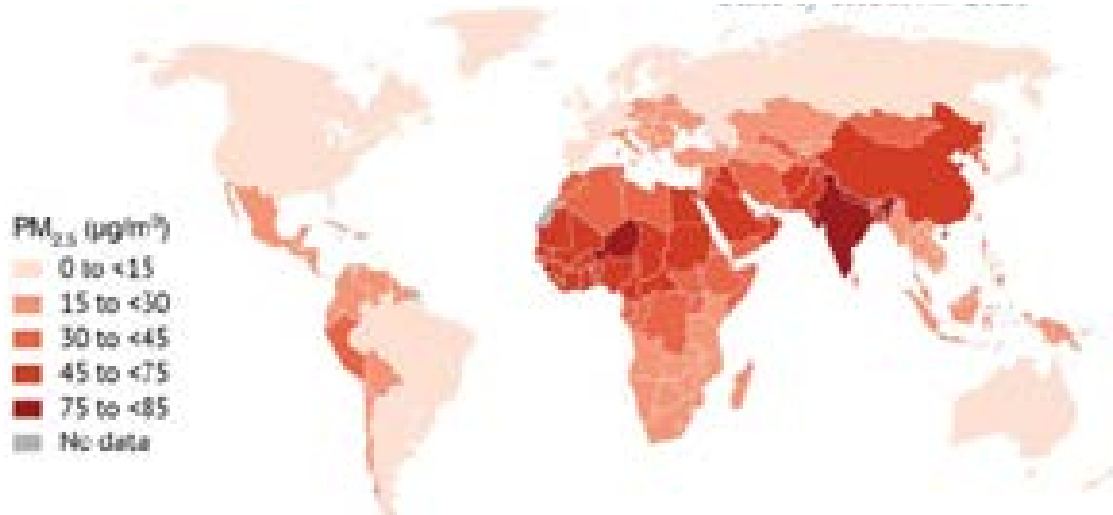
Kenya's minister for energy committed to a carbon reduction of 32 per cent by 2030 at the 27th Conference of Parties (COP27) to the United Nations Framework Convention on Climate Change held at Sharm-el-Sheikh in November 2022, promising a raft of measures to encourage clean energy transition. The country is following in the footsteps of South Africa, developed countries and major cities across the globe that have introduced or are planning to unveil the traffic congestion charge.

New York City, which has the most congested traffic jams in the US, will become the first major global city to introduce the traffic jam charge after London, which introduced it in 2003. New York plans to introduce a congestion charge of up to $23 per day, while London charges a fee of £15 per day. The move is coming amid environmental complaints that Kenya has been importing too many 'old' cars, which are now a major contributor to air pollution in major cities. Official data and statistics show the country's registered vehicles more than doubled in the last five years to 4.35 million in 2021. The Kenyan government believes the carbon tax, which has been gaining traction worldwide, is a perfect catalyst for hastening the switch to clean energy. This will also promote the "polluter-pays-principle," where polluters are made responsible for bearing the costs of managing or preventing resultant environmental damage. "We plan to explore the viability and design of a carbon tax because this will both cost-efficiently reduce greenhouse gas emissions, health complications and provide a revenue stream to help the government meet its broader financial objectives," the document added.

The ministry believes correct carbon pricing will send the right signal to markets and private investors and force them to go green in all their endeavours. The initiative is at its final planning stages and what now remains is to design the carbon tax in the national budget and make decisions on the rates, who will pay and how to allocate the revenues raised in future. Across the world, more than 40 governments have implemented some form of carbon tax. In Africa, only South Africa has a similar programme. The country charges R46 for every tonne of carbon emitted. Ethiopia, like Kenya, is planning a similar programme to fight against air pollution.

Population weighted annual average $PM_{2.5}$ concentrations

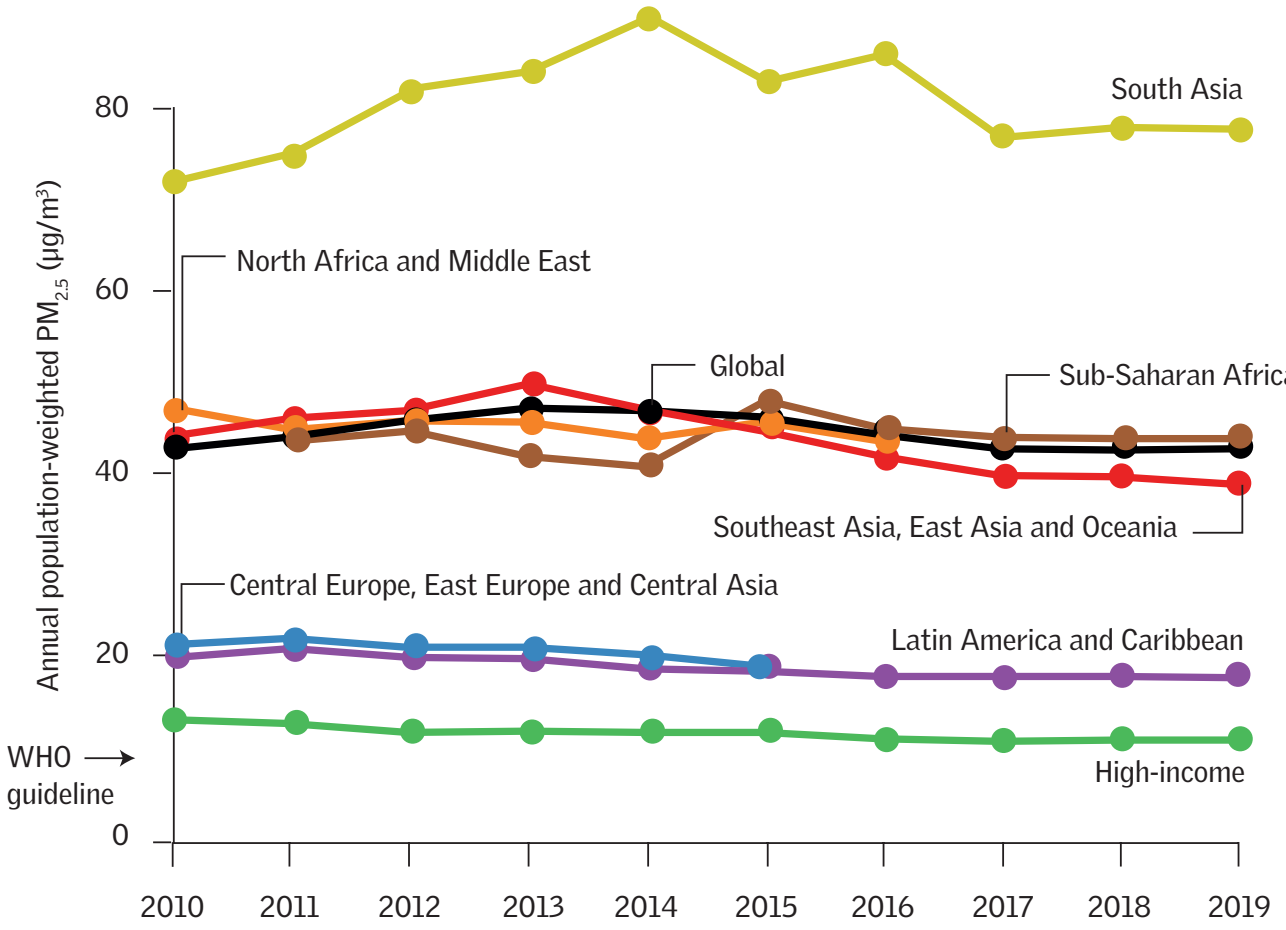
Sub-Saharan Africa and North Africa have highest annual average particulate pollution



Source: SoGA 2020 Report, p.6

$PM_{2.5}$ population-weighted annual average concentrations in Sub-Saharan Africa and North Africa

They are above the global average and for above the WHO guidelines

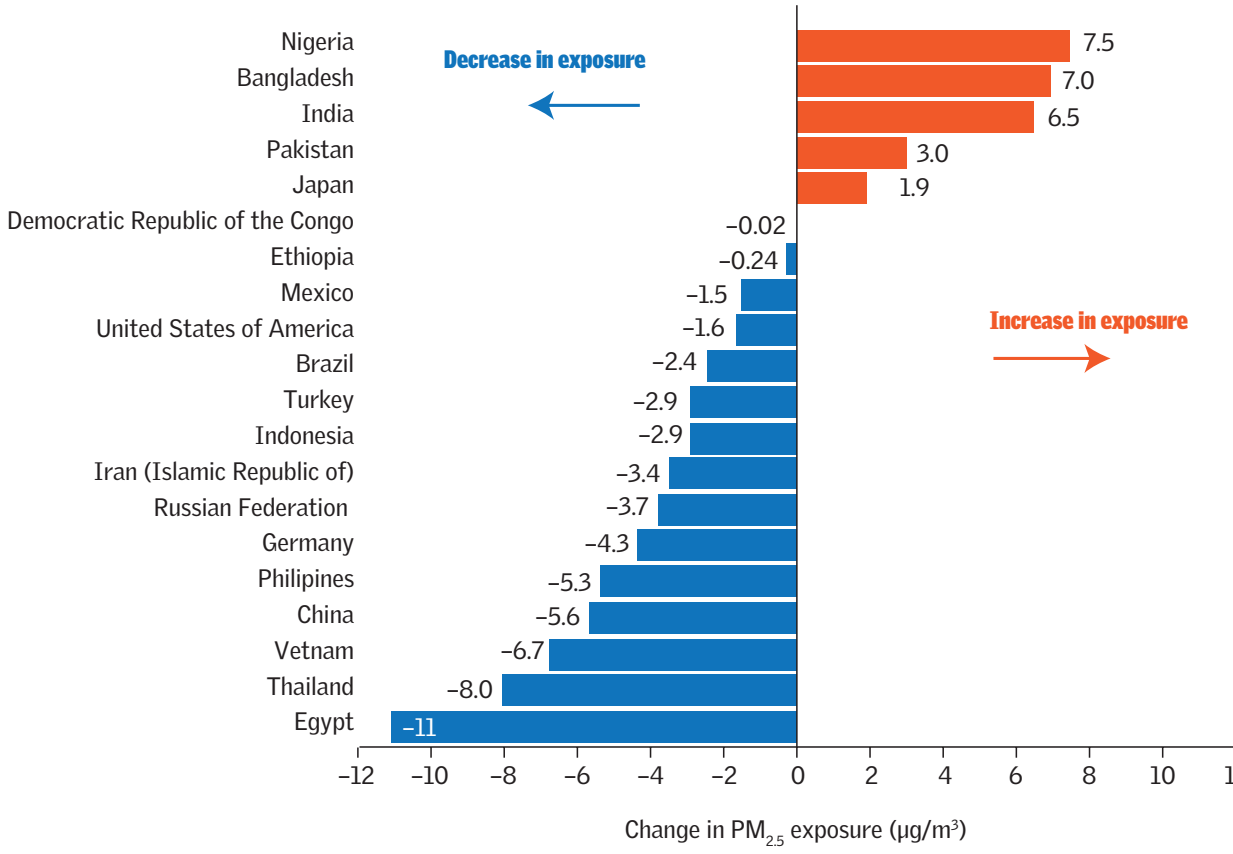


Source: SoGA 2020 Report, p.7

Air pollution – in general, and vehicular in particular – is emerging as a major public health challenge in Africa. Air quality monitoring is extremely limited in Africa and that makes air quality trend analysis challenging. Limited data allows only a fragmented picture of the status of air quality in most cities. The most recent analysis of air quality and public health risk is available from the State of Global Air (SOGA) 2020. This consolidated data set and analysis provides insight into the emerging trend in Africa. Key findings from the SOGA report:

High PM2.5 concentrations: Africa is in the grip of high particulate pollution with tinier fraction PM2.5 emerging as a serious concern. The annual average trend in population-weighted PM2.5 concentrations brings out this challenge. Higher daily exceedances could pose a bigger challenge, especially in cities and areas around major pollution sources. Sub-Saharan Africa and North Africa show highest population-weighted annual average PM2.5 concentrations. They are above the global average and far above the WHO guidelines. Globally, some populous countries have reported decline in annual average PM2.5 exposures. These also include countries of Africa. While Egypt has reported a substantial decline of 10.6 µg/m3 from 78.5 to 67.9 µg/m3, Democratic Republic of the Congo and Ethiopia also reported marginal declines of 0.02 µg/m3 and 0.24 µg/m3 respectively. However, Nigeria reported a 7.5 µg/m3 PM2.5 increase from 62.9 to 70.4 µg/m3.

Substantial $PM_{2.5}$ decline in Egypt and increase in Nigeria amongst 20 populous countries



Source: SoGA 2020 Report, p.7

PM2.5 exposure in Africa: It is important to note that five African countries— Niger, Nigeria, Egypt, Mauritania and Cameroon—are amongst the top ten countries globally with highest PM2.5 exposure (population-weighted PM2.5 annual averages). The PM2.5 annual averages in these five countries range from 64.5–80.1 μg/m3. While Mauritius has the lowest concentration, Niger has reported the highest. The top ten polluted countries in the African region—Niger, Nigeria, Egypt, Mauritania, Cameroon, Mali, Senegal, Chad, Gambia and Cote d'Ivoire—had PM2.5 concentrations in the range of 55.6–80.1 μg/m3.

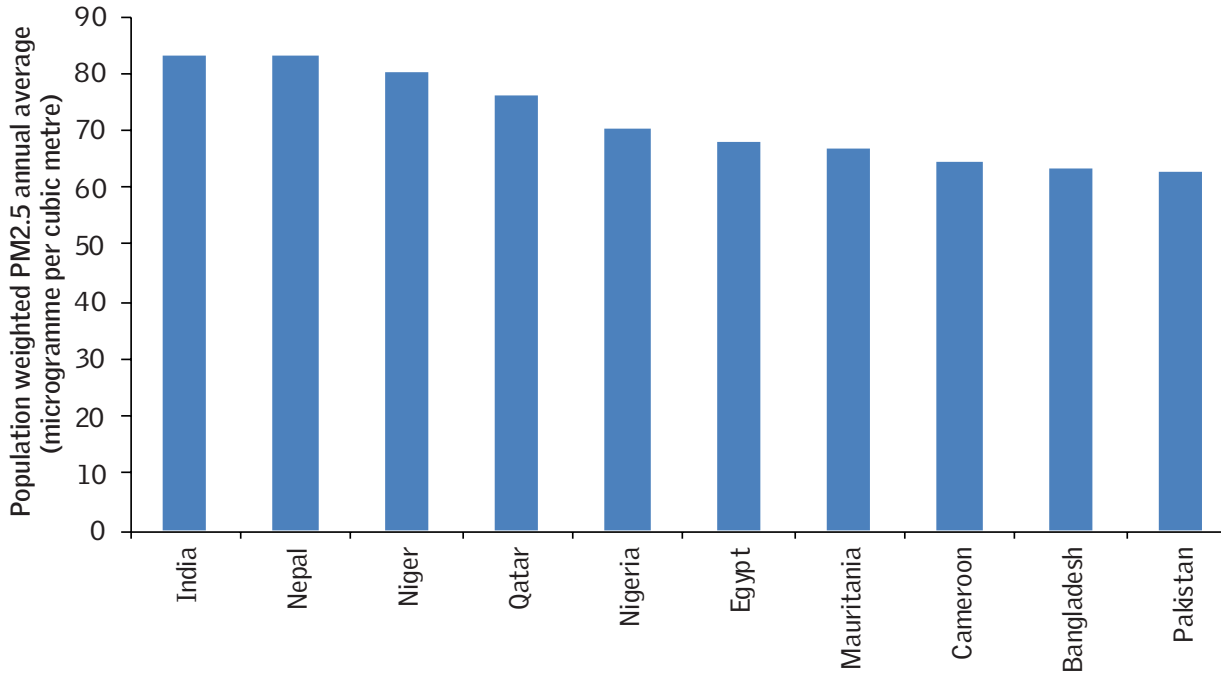
Ozone concentration: Even before Africa could address particulate pollution, it has started experiencing a slow rise in ozone pollution, a deadly toxic gas. However, the top 10 countries with the highest average ozone exposures are in Asia and Middle East. Although, North Africa is in the danger zone as well.

During 2010 and 2019, increases in ozone concentration were reported in three of the 20 most populous countries in Africa—Ethiopia, Nigeria, and the Democratic Republic of the Congo. Ethiopia showed a steep increase of 27 per cent from 24.9 ppb in 2010 to 44.3 ppb in 2019. However, Egypt is amongst the 8 countries showing 1.7 ppb ozone levels reduction.

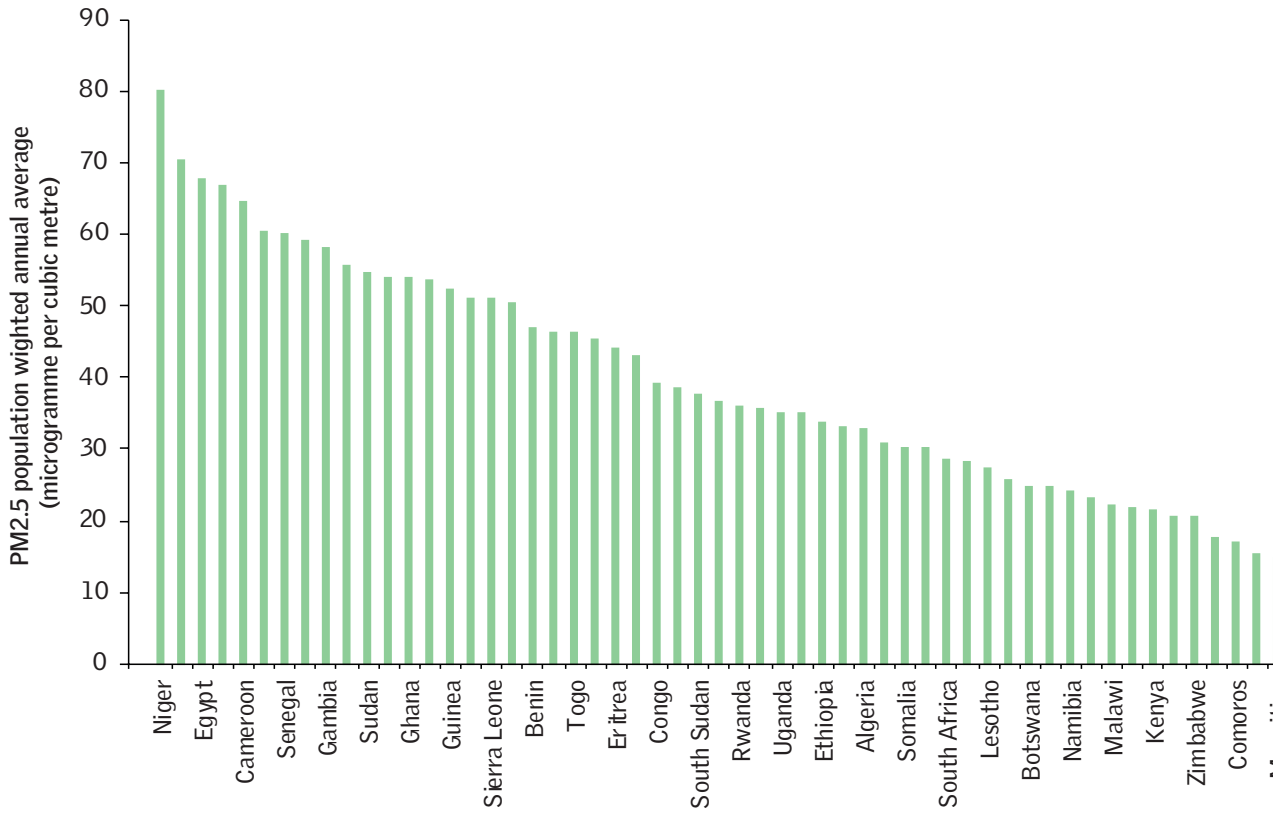
Ozone exposure in Africa: Ozone concentrations range from 19.4 to 54.3 ppb in Mauritius and Algeria respectively. The top ten countries with highest ozone exposure are Algeria, Libya, Central African Republic, Tunisia, Nigeria, Egypt, Benin, Togo, Morocco and Cameroon.

Household air pollution (HAP): While ambient air quality outdoor has already turned toxic, household pollution due to burning of solid fuels for cooking and lighting has continued to

Top 10 countries with highest populated-weighted PM2.5 annual averages

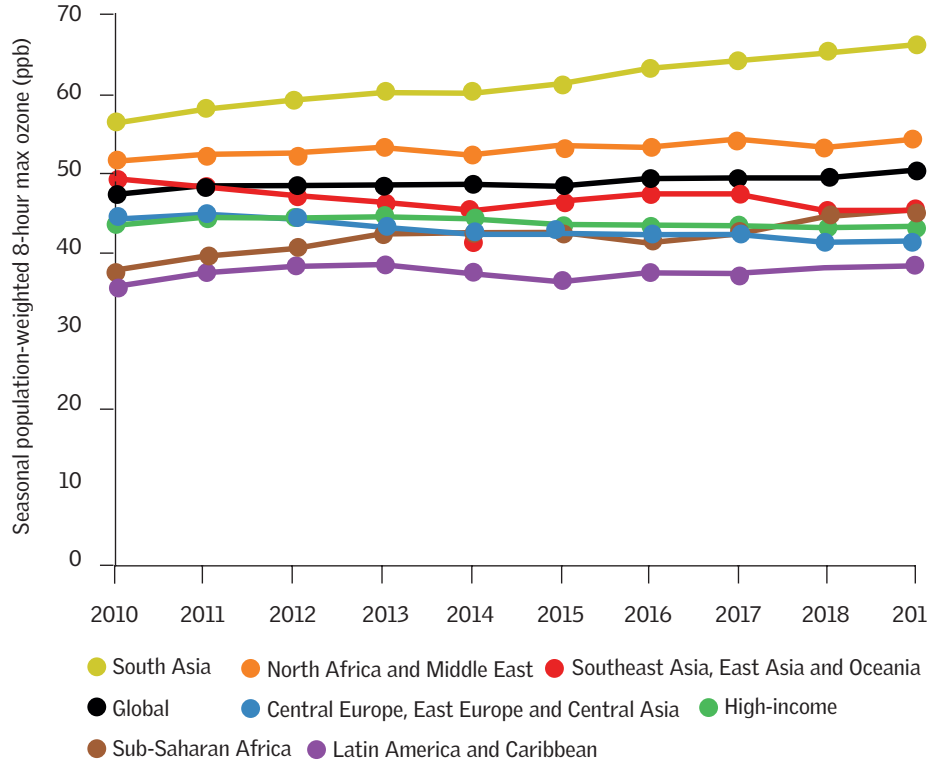


Population weighted PM2.5 annual average in the Africa region



Source: CSE based on SoGA 2020 report

Region-wise ozone concentration



Source: SoGA 2020 Report, p 10.

Widespread HAP exposure in Sub-Saharan Africa

Source: SoGA 2020 Report, p.12.

remain a cause of very high exposure and ill health in Africa. Use of firewood, biomass, kerosene, coal, charcoal, etc. to cook food and for heating and other purposes has increased indoor or household air pollution. Access to clean fuel needs to be explored and expedited to lower the household air pollution burden. Sub-Saharan Africa and parts of Asia show widespread household air pollution exposure.

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The SOGA 2020 report points out the slow progress that has been made in Sub-Saharan Africa with regard to HAP. However, with adoption of cleaner fuels globally, HAP exposures and health impacts are declining. Since 2010, in South Asia, Southeast Asia, East Asia, and Oceania Super Regions, use of solid fuels has reduced slowly and steadily. But that still leaves 49 per cent of the world's population—about 3.8 billion people—exposed to HAP from the burning of solid fuels. Most of them live in just 17 countries—which have over 50 million people and more than 10 per cent of the population relying on solid fuels for cooking. Six of these 17 countries are in Africa. These are Nigeria, Ethiopia, Democratic Republic of the Congo, Tanzania, Kenya and South Africa.

HAP exposure in Africa: The SOGA 2020 report notes, "Several countries in Africa with fast-growing population actually experienced net increase in the numbers of people exposed to household air pollution, despite reductions in the percentages of their populations using solid fuels for cooking. Nigeria, for example, reduced the percentage of its population using solid fuels from 82 per cent to 77 per cent, but population growth meant that 29 million people have remained exposed. Increase in the numbers of people exposed occurred in countries such as Ethiopia and the Democratic Republic of the Congo where 96 per cent and 93 per cent of the population, respectively, continue to rely on solid fuels for cooking."

However, South Africa has reported a decline. The top ten African countries with the highest proportion of households cooking with solid fuels are Central African Republic, South Sudan, Rwanda, Burundi, Niger, Mali, Madagascar, Tanzania, Uganda, and Guinea-Bissau. More than 97 per cent of the population in these countries is estimated to be using solid fuels for cooking. ■

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COOKING DISASTER

Air pollution kills over a million annually in Africa

AIR POLLUTION is the second leading risk factor for death across Africa, according to "The State of Air Quality and Health Impacts in Africa" report released in 2022. Nearly the entire continent faces severe health impacts due to it, with several countries experiencing some of the highest levels of air pollution in the world. In 2019, air pollution contributed to 1.1 million deaths in the continent and two-thirds of it was linked to household pollution. The report analysed major air pollution sources and related health impacts in the continent of over 1.2 billion population. Africa is home to five of the top 10 most heavily polluted countries worldwide in terms of outdoor fine particulate matter (PM2.5), highlighted the report published by the United States-based research organisation Health Effects Institute (HEI). The report stated, "Outdoor $PM_{2.5}$ is the most consistent

predictor of deaths from cardiovascular, respiratory and other diseases in studies of long-term exposure to air pollution."

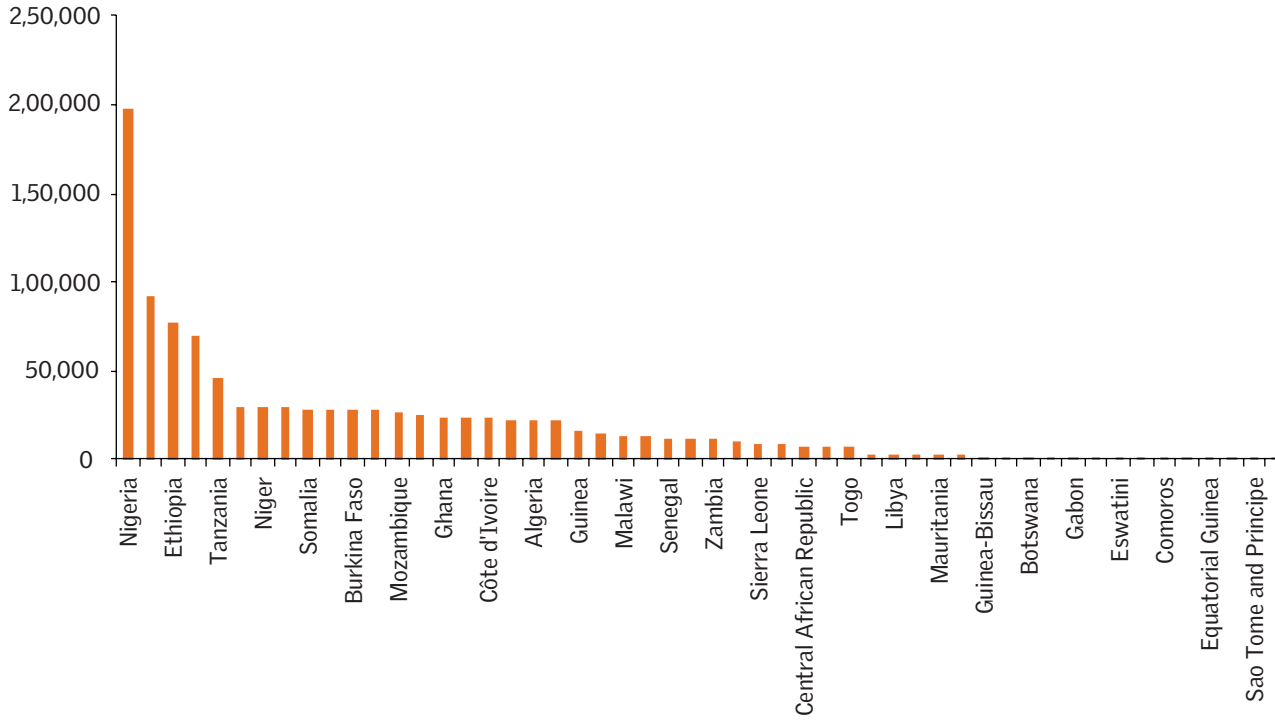
There is huge variability in air pollution related deaths in Africa. It ranges from 36 deaths, the lowest in Seychelles, to 0.197 million deaths in Nigeria, the highest. The top 10 countries include Nigeria, Egypt, Ethiopia, Democratic Republic of the Congo, Tanzania, South Africa, Niger, Morocco, Somalia and Kenya. Asian and African countries report the highest PM2.5 age-standardized death rates and Disability -Adjusted Life Year (DALYs). These include Egypt (157 deaths/100,000 population), India (96/100,000), China (81/100,000), Iran (63/100,000) and Nigeria (59/100,000). Total mortality is also high in many of the same countries where age-standardized death rates are high. In North Africa and the Middle East, the 10 countries with the highest numbers of PM2.5-attributable deaths include Egypt, which had 91,000 such deaths. In Sub-Saharan Africa, the top 10 countries with the highest burden are Nigeria (68,500 deaths), South Africa, Ghana, Democratic Republic of the Congo, Cameroon, Ethiopia, Côte d'Ivoire, Tanzania, Angola and Kenya.

In 2019, long-term exposures to ozone contributed to an estimated 365,000 deaths from COPD worldwide, accounting for 11.1 per cent of all COPD deaths globally. This premature loss of life equates to 6.21 million DALYs from COPD across the world. It is important to note that African countries are not amongst the top 10 with highest ozone pollution deaths. Changes in ozone-attributable deaths among the world's 20 most populous countries showed that 15 of these countries experienced increases in ozone pollution burden. The largest proportional increases were observed in Brazil (191 per cent), Ethiopia (171 per cent), Democratic Republic of the Congo (97 per cent), and Indonesia (89 per cent). Congo and Nigeria are in the top 20 global list.

In 2019, air pollution contributed to 476,000 deaths globally among infants in their first month of life (75 per cent related to low birth weight and preterm birth). Nearly 20 per cent of

Air pollution deaths in Africa

African countries report one of the highest $PM_{2.5}$ age-standardised death rates and DALY in the world



Source: CSE, based on SOGA 2020 report

new-born deaths were attributed to air pollution. In Africa, Democratic Republic of the Congo reported 52 per cent infant deaths, Ethiopia 23 per cent and Uganda 21 per cent. Two-thirds of all infant deaths are attributable to HAP. Sub-Saharan Africa bears the maximum burden.

According to "The State of Air Quality and Health Impacts in Africa", access to clean energy across Africa is not equitably distributed, leading to larger disease burdens in certain areas, the report highlighted. "Across east, west, central and southern Africa, an estimated 75 per cent of the population relies on burning solid fuels such as coal, wood and charcoal for cooking. This exposes residents to high concentrations of harmful pollutants at home daily," it noted.

Newborns and children under five years old in these regions are at an exceptionally high risk from household air pollution (HAP) linked to the use of solid fuels for cooking. About 236,000 newborns died within the first month of life from air pollution exposure, with 80 per cent of those coming from HAP. In 2019, 14 per cent of all deaths in children under five across Africa were linked to air pollution. The impact on newborns and infants also has long-term consequences for overall health, including issues with lung development and increased susceptibility to communicable diseases such as lower respiratory infections in young children, the report stated. "This report gives evidence of the substantial threat air pollution poses to the health and even life, of babies and children under the age of five years. This vulnerable group needs special attention," said Caradee Wright, chief specialist scientist with the South African Medical Research Council.

In an analysis of air pollution in fast growing cities in Africa over 14 years (2005-2018), Karn Vohra, Research Fellow, UCL and Eloise Marais, Associate Professor in Physical Geography, UCL found that the major source of air pollution in the continent has shifted from

In 2019, 14 per cent of all deaths in children under five across Africa were linked to air pollution. The impact on newborns and infants also has long-term consequences for overall health, including issues with lung development and increased susceptibility to communicable diseases such as lower respiratory infections in young children

rural geography to the urban one. They report from their findings on the *theconversations.com*, "For centuries, air pollution in Africa has been dominated by open burning of biomass. This is a common practice by farmers in the dry season to clear land and to prepare for the next sowing season. The smoke produced is full of pollutants, bad for people and the environment. This is now changing, in cities at least. In our analysis we identified that urban pollution sources have surpassed rural biomass burning as the main cause for worsening air pollution in cities. Satellite observations are too coarse (~10 km) to pinpoint the exact sources, but we can speculate that these include road traffic, burning of waste, and household use of fuels like charcoal and wood."

They reported: "The shift from rural to urban sources, combined with rapid population growth, is leading to more people living in closer proximity to air pollution and worsening population health." According to their findings on premature deaths due to sustained exposure to small particles, in the 21 cities under study in Africa, premature death had "steadily increased" and "risen from 84,000 in 2005 to 110,000 in 2018. This is on average about 2,000 avoidable deaths each year.

Earlier, in 2016, the OECD Development Centre published a working paper titled "The Cost of Air Pollution in Africa" which was claimed as the "first attempt at calculating the cost of air pollution in Africa." According to this paper's estimate, "The total of annual deaths from ambient particulate matter pollution across the African continent increased by 36% from 1990 to 2013, from a then relatively low base of ≈ 180 000 in 1990 to ≈ 250 000 in 2013. Over this period, deaths from household air pollution also continued to increase, by 18%, from an already

high base of ≈ 400 000 in 1990 to well over 450 000 in 2013. For Africa as a whole, as at 2013, the estimated economic cost of premature deaths from ambient particulate matter pollution was ≈ US$ 215 billion. The estimated economic cost of premature deaths from household air pollution was ≈ US$ 232 billion." The paper also attributed the rise in pollution and mortality to the unbridled urbanisation and rise in vehicles. "In the period from 1990 to the present, and at each succeeding five-year interval in between, the death toll from air pollution in Africa has risen in tandem with the uninterrupted growth in the size of the urban population of Africa over this period," said the OECD working paper.

LACK OF REGULATORY POLICIES

United nations Environment Programme (UNEP) has reviewed the legislations on air quality in 194 countries across the world in 2021 to assess if such instruments (national air quality act or environmental act including national ambient air quality standards) exist and have been promulgated and how these have been designed, what their level of ambition is and if they cover indoor air quality and newly emerging pollutants. This brings out sharp regional differences and the fact that most countries in Africa have not adopted legislative instruments containing ambient air quality standards. Only countries in Africa that have adopted such instruments are Algeria, Benin, Burkina Faso, Côte d'Ivoire, Egypt, Eswatini, Gambia, Ghana, Kenya, Mauritius, Morocco, Mozambique, Nigeria, Rwanda, Senegal, South Africa, and United Republic of Tanzania. Ambient air quality standards are a regulatory measure to set the target for pollution reduction and achieve clean air. These standards are needed to provide adequate margin of safety to protect public health, vegetation and property, establish priorities for abatement and control, provide uniform benchmarks for assessing air quality at national level and impact of control measures over time, and indicate the need and extent of monitoring programmes. The standards should be health-based and uniform across the entire population and not land use based (for example weaker standards for industrial areas than for urban areas/ residential areas). Industrial areas are also densely populated and as urbanization progresses, boundaries between residential and industrial areas become porous, exposing people to high levels of air pollution.

However, in Africa, there is a trend towards regional cooperation on air quality that has allowed some embedding of legislative instruments. These include Eastern Africa Regional Framework Agreement on Air Pollution (Nairobi Agreement), Central and Western African Regional Framework Agreement on Air Pollution (Abidjan Agreement) and Southern African Development Community Regional Policy Framework on Air Pollution (Lusaka Agreement). These agreements call for regional cooperation on the harmonization of AQS, monitoring procedures and data management. 6 This action will require a lot more traction to strengthen air quality management. ■

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ON A NEW ROADMAP

African countries will have to adopt improved fuel quality and emission standards to curb dieselisation

WHILE AFRICAN cities are extremely vulnerable to air pollution, especially to emissions from ageing and outdated vehicle technologies, the spotlight on health impact of vehicular pollution in Africa is particularly important as this region is most vulnerable to import of old and used vehicles. Vehicles are among the most rapidly growing sources of pollution across Africa and pose a very complex challenge. They are responsible for very high exposure as vehicular emissions take place in the breathing zone of people. People living or working in close proximity to heavily polluted roadways have very high levels of exposure. Vehicles emit tiny and toxic particles and deadly carcinogens. Studies show that traffic related air pollution is associated with increased risk of pre-term births, smaller brain size, low-birth weights36 among infants and increased risk of heart disease. In fact, a 2017

UNICEF report mentions that air pollutants inhaled during pregnancy can cross the placenta and affect the developing brain of a foetus, with potentially lifelong effects. Studies by the US-based non-profit Health Effects Institute show that in densely populated developing Asian cities, as much as 50 per cent of the population lives or works near roadsides. The maximum effect of vehicular pollution is up to 500 metres from a roadside. There can therefore be tangible health benefits from reduction in vehicular emissions. There is very little assessment of the health impact of vehicular pollution in cities of Africa.

Motorisation in Africa: Motorization in Africa is in its early stages of growth and the baseline stock is still much lower than that in rapidly growing developing countries. According to Deloitte's 2016 Africa Automotive Insights report, there were 42.5 million vehicles in use in Africa in 2014. This increased to 45 million as per International Organization of Motor Vehicle Manufacturers (OICA) 2015 data. South Africa had the highest share with 21.4 per cent, followed by Egypt with 12.8 per cent, Algeria with 12.4 per cent and Nigeria with 8.4 per cent.

A 2014 World Bank estimate shows that the vehicle ownership rate in Africa was still much lower than the world average and the average in high-income countries. In 2012, the only countries exceeding 50 cars per 1000 people were South Africa, Botswana, Mauritius and Namibia. According to OICA, vehicle ownership is expected to increase by 31 per cent. Increasing vehicle ownership has been observed in a few countries, including Libya, Mauritius, South Africa and Botswana. Key urban centres are witnessing rapid increase. In Kenya, where nearly 30 per cent of all vehicles in the country are in its capital city Nairobi alone, it is estimated that the car fleet will double in just six years. In Lagos, Nigeria, it is estimated that if the ownership rates grow

As high-income countries are now more focused on phasing out diesel cars from city centres and are even planning a complete ban on diesel cars in future, there are additional concerns that a huge fleet of discarded diesel cars and SUVs from these countries will get dumped in Africa

from 0.05 to 0.06 per capita between 2010–25, there will be an 80 per cent increase in vehicle numbers. In Ethiopia's capital Addis Ababa, even if the base numbers were small the fleet increased by 6.6 per cent in 2015 as compared to 2014. Without its own well-established vehicle-manufacturing base, Africa has become hugely dependent on vehicle imports. South Africa has some manufacturing base while Nigeria and Ethiopia are setting up their assembly capacity.

Dieselisation in Africa: Within the context of used-vehicle imports, it is important to understand the state of dieselization in Africa. There are special concerns around the toxicity of diesel emissions. The International Agency for Research on Cancer (IARC) of the WHO has reclassified diesel exhaust as a Group 1 carcinogen. Diesel exhaust is now in the same class of deadly carcinogens such as asbestos, arsenic and tobacco for their strong link with lung cancer. Diesel vehicles also emit several times higher particulate matter and nitrogen oxides than petrol vehicles. Moreover, new science has now implicated black carbon, the dark fraction of particulate matter, for enhancing climate impacts as well. Most of the diesel particulate core is the dark matter that absorbs light and heat and warms up the climate and fouls up our lungs. High black-carbon emissions from the explosive increase in diesel vehicle numbers, use of high- sulphur diesel, outdated vehicle technology and expansion in road-based freight traffic have added to the local health as well as global climate risks. Black carbon is also co-emitted with a range of other toxic and warming gases. This link between local and global impact of diesel particulate now changes the geo-politics around the diesel emissions mitigation as the policies and action on diesel transport vary widely across vehicle-producing and vehicle-importing nations in developed and developing countries.

As high-income countries are now more focused on phasing out diesel cars from city centres and are even planning a complete ban on diesel cars in future, there are additional concerns that a huge fleet of discarded diesel cars and SUVs from these countries will get dumped in Africa. Diesel consumption in the region is largely driven by the high share of commercial, freight and public transport that is not easily substitutable. The share of cars is still lower, but the share of diesel cars is increasing in the region due to price difference in favour of diesel. The comparative share of diesel is very high in countries with a huge difference in prices. In several countries, including Angola and Madagascar, the share of diesel in total fuel consumption is around 70–80 per cent. Countries with similar prices for diesel and petrol have lower consumption of diesel. For instance, in Botswana, Namibia, Lesotho, etc., where the prices for petrol and diesel are similar, the share of diesel consumption is around 50–55 per cent. Nigeria is the best-practice country in terms of fuel pricing; petrol is kept effectively cheaper than diesel. This has helped eliminate dieselisation of cars and kept the share of diesel consumption fairly low. Share of diesel consumption in total fuel consumption is only 16 per cent.

Data from studies carried out by Demiss Alemu of the Addis Ababa Institute of Technology and the Federal Transport Authority in 2012 show that dieselisation is pushing the light-duty vehicles market towards bigger engine sizes which consume more diesel and generate more emissions. Ethiopia, like other African countries, is dieselizing without clean diesel. This has serious implications for their air quality and public health. African countries will have to adopt improved fuel quality and emissions standards to curb dieselisation. Transition towards clean fuel and vehicles: Leaded petrol was a major challenge for Africa. In 2002, a partnership for clean fuels and vehicles (PCFV), formed during Johannesburg

NIGERIA'S DEFINITIVE PUSH FOR CLEAN AIR

It is important to link fiscal solutions with stringent emissions standards

NIGERIA HAS effectively curbed dieselisation with fuel pricing policy. Higher price of diesel fuels has helped lower use of diesel cars in Nigeria. This is a critical step as the country imports mostly used, old vehicles. Since these old vehicles are based on old diesel technology and use poor quality fuel, it would have significantly escalated public health risk. But commercial vehicles are still on diesel. Diesel use in buses and trucks is also high and this segment attracts more new vehicles. Nigeria needs clean diesel and emissions standards for vehicles.

It is important to address diesel emissions as poor-quality diesel harms public health and climate. The International Agency for Research on Cancer of the WHO has reclassified diesel exhaust in Group 1 of carcinogens for definite links to cancer, putting it in the same bracket as tobacco. The European emissions standards that Africa and Asia follow allow diesel cars to emit three times more nitrogen oxides and several times more particulate matter compared to petrol cars. Nigeria therefore will have to quickly move to clean fuel and stringent emission standards to address diesel emissions from all sources. Nigeria has adopted Euro III emission standards.

The country moved towards adopting low-sulphur fuel and took out the notification for low-sulphur diesel and petrol. Nigeria adopted low-sulphur diesel at 50 ppm and petrol at 150 ppm in April 2017. However, the implementation was delayed. The country should adopt Euro IV emission standards. Nigeria has adopted clean vehicles and fuels regulations like other countries in the ECOWAS region. However, according to the media reports, sulphur in petrol and diesel remained 20 and 30 times higher than the standards. Fuel import is increasing in the country. According to Nigeria Bureau of Statistics, petrol import increased from 17.3 billion litres in 2017 to 20.14 billion litres in 2018 and 20.89 billion litres in 2019. Petroleum import cost was reported to increase three times from N289.46 billion in first quarter of 2019 to N837.67 billion by second quarter. Imported fuels are blended (dewatering, re-gassing and desulphurisation) as per the standards set by the Standards Organisation of Nigeria (SON) for cost optimisation. Fuels contain high sulphur content of 1000 ppm.48 It is important to note that lack of local refining capacity in Nigeria hampers production of low-sulphur fuels. Despite having 2.5 million low-sulphur content and high API gravity daily barrels of oil crude drilled from the Niger Delta by Shell, Chevron, Exxon and other energy giants, Nigeria has to import refined high-sulphur cheaper fuels from Europe as the state-owned refineries are non-functional.

There is however hope from new local refineries which are being set up and are expected to boost low-sulphur fuels production. The government in November 2020 commissioned the first phase of a 5,000 bpd modular refinery in Ibigwe, Imo State which is expected to produce 271 million litres of kerosene, diesel, naphtha and HFO annually. Others include Dangote-owned 650,000 bpd refinery in Lagos expected to be completed this year and a 200,000 bpd refinery owned by BUA to be set up in Akwa Ibom.

Nigeria needs to implement Euro IV emissions standards for all new vehicles and Euro IV fuels for all new and on-road vehicles and set up local refineries or upgrade and produce low-sulphur fuels. It is important to link fiscal solutions with stringent emissions standards. Fiscal strategy for clean fuel fund (direct tax incentive for import of clean fuel; differentiated retail prices for clean and dirty fuel and revenue from higher tax to go to clean fuel fund; and even a small tax on each litre of fuel sold can help to offset costs) and additional and differentiated tax on all cars can help bring more revenue for clean fuel fund. It is more cost effective to design and implement the complete system in one step.

World Summit on Sustainable Development, identified three priorities—elimination of lead in petrol, reduction of sulphur in diesel, and clean vehicles and technology. When PCFV was formed in 2002, only Sudan in Sub-Saharan Africa was using unleaded petrol. Later all of Africa, except some parts of Algeria, was using unleaded petrol. At present entire Africa is lead free. Supply of low-sulphur diesel is also a priority. Countries had very high sulphur levels in diesel—up to 10,000 ppm. East African countries are gradually moving to low sulphur diesel. Morocco, Tunisia and Mauritius have met the 50 ppm target set by the PCFV. Five more countries—Kenya, Uganda, Rwanda, Burundi and Tanzania in east Africa—moved to 50 ppm from January 2015.

Low-sulphur diesel transition in Africa: African countries need quick transition to low-sulphur fuels and improved vehicle emission standards. Developed countries have adopted 10 ppm sulphur fuels. But, in Africa, while some countries have implemented 50 ppm sulphur fuels, many others are still struggling to do so. The average sulphur levels, particularly in diesel fuel, are very high and reach up to 10,000 ppm. PCFV is working towards lowering sulphur levels in fuels by improving refinery technology and fuel import standards in Africa. According to UNEP, low-sulphur fuels are critical to lowering direct emissions of PM from on-road traffic. Morocco is the most advanced African country in terms of low-sulphur fuel adoption. It implemented 50 ppm sulphur diesel in 2012 and became the first African country to adopt 15 ppm in 2018. Mauritius has also adopted 50 ppm sulphur fuels. The next phase of transition to low -sulphur diesel in the Africa region began in 2015, five East African countries—Burundi, Kenya, Rwanda, Tanzania and Uganda—adopted and implemented 50 ppm diesel sulphur fuel. Since then, there has been gradual progress with Ghana, Malawi, Mozambique and Zimbabwe implementing 50 ppm diesel sulphur fuel in 2017 and Benin, Eswatini, Lesotho and Namibia doing the same in 2019.

Nigeria moved towards adopting low-sulphur fuel and issued a notification for low-sulphur diesel (50 ppm) and petrol (150 ppm) in April 2017. However, implementation was delayed. But Nigeria has a unique strategy for curbing dieselization. In Nigeria diesel is priced higher than petrol. This has been effective in stopping dieselization of cars. In West Africa, nearly all the countries use diesel with sulphur in the range of 1,000–10,000 ppm. Ethiopia is drafting a low-sulphur fuel quality roadmap. In southern Africa, Botswana, South Africa, and Zambia have fuel quality with diesel sulphur levels in the range of 50–500 ppm.44 Other countries such as Lesotho, Malawi, Mozambique, Namibia, Eswatini, and Zimbabwe have moved to 50 ppm sulphur fuels. Among these countries, Botswana and South Africa are aiming for 10 ppm sulphur fuels. But the timeline is not clear. Though a few West African countries have already moved to low-sulphur fuel, the remaining have been directed to adopt low-sulphur fuel by the Economic Community of West African States (ECOWAS). A meeting of ECOWAS was held in February 2020 to push for unified regional improved fuel and vehicle emission standards to address climate goals. It was decided that a shared regional standard for low-sulphur petrol and diesel, based on Euro IV emission standards, would commence in January 2021. In case of imports outside ECOWAS, similar standards for regional refinery production would commence by 2025.45 Other African regions will need to deliberate and fasten adoption of low sulphur fuels.

Vehicle emissions standard: As fuel quality is languishing in most of the continent, progress on emission standards is slow. As of now, Algeria and Egypt (only for public buses) have Euro III emission standards. South Africa and Nigeria are at Euro II standards. South Africa planned to implement 10 ppm fuel by 2017. Nigeria is yet to implement Euro III standards. Egypt, Kenya, Morocco and South Africa have Euro II standards and Tanzania has Euro I standards only for buses. West African countries as directed by the ECOWAS have to adopt shared regional standard, which are the same as Euro IV standards. Zambia is in the process of developing vehicle emission standards. The country plans to adopt Euro III and then gradually move to Euro IV. The draft standards are to be approved by the Zambia Bureau of Standards. Ethiopia is drafting emissions standards along with low-sulphur fuel quality roadmap.

There is not much information about heavy-duty vehicle emission standards in Africa except that Egypt and Tanzania have Euro III standards for public sector buses and Euro I for other buses. ■

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IMPORTED POLLUTION

African countries are becoming scrap yards for old vehicles from advanced economies

IMPORTING OLD and polluting vehicles, some of which are unfit for the road, is how the low- and middle-income countries are embracing automobiles. The ill-effects of this thriving international used car trade are overshadowed by the glitz of the new vehicles across the world that is constantly adding to the already inflated global fleet of 2 billion. The market for used cars exists because developed countries want their industry to thrive and ensure market for used cars to promote uptake of new cars. And developing countries want access to affordable cars.

The problem of the continuous flow of discarded, old, used and cheap vehicles from high-income to low-income countries of Africa and other parts of the world remains neglected in the

national and global strategies for air pollution control and climate mitigation. This is leading to an enormous pile-up of clunkers in importing markets that have very little wherewithal to address air pollution, climate and other environmental impacts. Used vehicle import is rampant and a flourishing trade in Africa. African countries are becoming scrap yards for old vehicles from advanced economies. While advanced economies have the capacity to deal with the accompanying problems of vehicles changing several hands within their domestic markets, poorer economies do not. Low- and middle-income countries that do not have their own vehicle manufacturing base and strong environmental safeguards are most vulnerable to the unregulated and uncontrolled import of used vehicles. But as the pressure is increasing to meet clean air standards as well as the Nationally Determined Contribution (INDC) commitments to reduce pollution and greenhouse gas emissions, developing countries are beginning to frame regulations to reduce vehicular emissions. However, constraints of poorer economies, low level of affordability of consumers, lure of cheap vehicles, lack of clean automotive fuels and weak emissions regulations have created conditions and incentives for the trade of used vehicles and uncontrolled dumping. Imports to Africa: To understand the overall trade flows and direction of trade, it may be useful to analyse data on the value of international trade reported by the International Trade Centre statistics of the World Trade Organization. This indicates the value of the trade, not the quantum. It also does not distinguish between old and new vehicles. The aggregated value of international trade in vehicles for 2017 shows that vehicles came to Africa from over 17 countries. If total vehicle import is considered, Germany, China and Japan are the biggest exporters to Africa.

The share of used vehicles is 80–90 per cent of the total imported fleet. In Kenya, the share of commercial vehicles in new sales is the highest at 86 per cent

POLLUTING FLEET

The scale of dumping from the rich countries to the poor is overwhelming. Back in 2014, it was estimated that globally about 40 million vehicles a year approach their end-of-life, which is 4 per cent of the total global automobile ownership. A lot of these get traded to low- and middle-income countries. This number is expected to explode as the global automobile fleet is slated to double by 2050 on the back of growing economy and aspirations for four-wheelers, estimates the International Energy Agency. A 2014 World Bank estimate shows that the vehicle ownership rate in Africa, though much lower than the world average, is rapidly increasing across cities. In Kenya's capital city Nairobi, car fleet has doubled in 2012-2018. While Addis Ababa saw a 6.6 per cent increase in its car fleet in 2015 alone, Lagos is expected to see an 80 per cent increase in vehicle numbers from the current level in the near future. Sadly, this meteoric increase in car fleets in most African and South Asian cities is fuelled by old imported vehicles.

Direction of trade changes depending on the vehicle segments as well. The maximum cars come from Germany, Japan, India, Korea and the US. While most of the cars come from the high-income countries, the share of China and India increases in import of commercial vehicles and two-wheelers. Most motorised two-wheelers are from China (62 per cent) and India (26 per cent). Japan, South Africa and China dominate import of goods vehicles in the region. In the public-transport segment, the highest share is that of Japan at 33 per cent, followed by China at 25 per cent and India at 14 per cent. Public transport vehicles are those that can accommodate over 10 people. Smaller ones are popular largely as para-transit vehicles in the informal sector that meet considerable travel demand.

That vehicle import is hugely dominated by used vehicles is evident from data from the Deloitte Africa Automotive Insights Report, 2016 for the major countries of Ethiopia, Kenya and Nigeria. The share of used vehicles is 80–90 per cent of the total imported fleet. In Kenya, the share of commercial vehicles in new sales is the highest at 86 per cent. But in Ethiopia and

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Nigeria, the share of passenger vehicles in new sales is as much as 84 per cent and 71 per cent respectively. In low- and middle-income vehicle-importing countries of Africa and South Asia, motorisation is riding high on used-vehicle imports. Incentives for old and used vehicles are strong for various reasons. Studies have shown that on average a vehicle's price depreciates faster in a high-income country than in a low-income one. Used vehicles from a high-income country can be sold in low-income countries for higher price, indefinitely extending the lifetime of the imported fleet. Also, it is said that repairs in low-income countries tend to be cheaper because of the lower cost of labour there, holding down maintenance costs overall. Low income countries also get a wider choice of brands at cheaper prices. Thus, limited number of brands in domestic markets, price differentials and differing depreciation rates incite demand and trade in used vehicles. They also push up average age of vehicles in importing countries. High-income exporting countries with high motorisation rates, vehicle stocks and high rate of vehicle replacement have become consistent and large suppliers of old vehicles. But this trade needs regulation to ensure that very old, gross polluters and damaged and unsafe vehicles do not penetrate these markets. It is argued that with proper regulation, it is possible to source international trade quality vehicles that are better than what is locally produced. But importing countries are often not in a position to take advantage of advanced vehicles from exporting countries as they do not have requisite fuels.

On the other hand, exporting countries that have stronger regulations for vehicle inspection, extended manufacturer responsibility, scrappage and end of-life of vehicles are not vigilant and do not have strong enough regulations for filtering export of used vehicles. It is important to review the regulatory landscape in both exporting and importing countries as this trade has huge implications for local pollution, health risk and energy security. Low environmental safeguards enhancing vulnerability: There is a considerable time lag in enforcement of improved emission standards for vehicles and fuel quality across Africa. These standards are not yet uniformly harmonized across the continent—this is blocking emission standards-based

vehicle production and import in the region. On-road emissions monitoring is also weak. UNEP has tracked the evolution in fuel quality and emission standards—it shows wide variance in the current standards across Africa. The constraint of poor fuel quality does not allow immediate harmonization of vehicle emission standards for both vehicle import and local production at the level of Euro IV emissions standards. However, there has been considerable progress in bringing 50 ppm sulphur fuels in South and East Africa that opens up the opportunity to introduce Euro IV emissions standards. Without the requisite fuel quality, it is not possible to link vehicle import with emission standards. Also, countries cannot take advantage of the newer fleet from the advanced markets as the poor-quality fuel will not allow operation of advanced emission-control systems.

This is leading to massive downgrading and stripping of vehicle technology in the region. Key approaches to regulate vehicle import: Several regulations have evolved in Africa and South Asia that include fixing of age to ensure newer fleet is imported, fiscal measures to make import of vehicles more expensive and discourage very old vehicles, and emission-based taxation to import cleaner and more fuel-efficient vehicles. UNEP has done extensive classification of countries by type of measures they have adopted in Africa.

Imposing age restriction on imports: Fixing the age of vehicles for import and combining it with tax measures is the most common strategy. In Africa, while four countries, including Egypt, Morocco, South Africa and Sudan, have banned used vehicle imports, another 25 countries have imposed age restrictions on vehicles. Age restrictions are 3–15 years. Algeria, Angola, Chad, Mauritius and Seychelles have capped the age at three years. Gabon, Libya, Mozambique, Niger and Tunisia have an age cap of five years and less. Lesotho, Kenya, Mauritania, Namibia and Senegal have capped the age at eight years. Benin and the Democratic Republic of the Congo have capped it at ten years, and Liberia, Benin, Nigeria and Swaziland have capped age at 15 years. Age-based taxation on imports: A large group of countries have linked higher taxes with age of vehicles. The objective of such incremental measures is to discourage import of very old vehicles and promote use and purchase of newer vehicles. This is also combined with vehicle inspection and pre-import inspection programmes. These initiatives in different countries have thrown up different lessons and results. Country-wise approach to regulate vehicle import: While broad approaches and strategies are common, specific country experiences have thrown up a wide gamut of lessons. These lessons are important as the countries are on their way to further refine their strategies to chart the future roadmap. ■

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A UNIQUE OPPORTUNITY

Africa needs to leapfrog to zero emission electric vehicles to decarbonise and eliminate toxic exposures from vehicles

AFRICA IN the early stages of growth, is battling growing air pollution, energy security concerns and gradual increase in carbon emissions. Sub-Saharan Africa and North Africa have the highest population-weighted annual average PM2.5 concentrations, as per the State of Global Air 2020 (SoGA). The rising number of vehicles is aggravating these concerns and increasing toxic exposure risk. Even though the level of motorisation and vehicle ownership level in Africa is still low, it is rising rapidly and is largely based on very old, used and imported polluting vehicles. While some countries have made the transition to 50 ppm sulphur fuels, the rest are still using high-sulphur fuels, which can be as high as 500–5,000 ppm.

This is obstructing the use of cleaner vehicles and introduction of tighter emissions standards of Euro IV across the region. Even though several countries have started to take action to fix the age of vehicles and impose higher taxes on older vehicles to control the influx of old, cheap and polluting vehicles, these vehicles still dominate the fleet. While more enabling strategies are needed to support the acceleration and harmonisation of the roadmap for clean fuel and clean internal combustion engines (ICE) in the countries of Africa, there will still be a time lag to harmonise with the global best emissions standards. But there is an opportunity for Africa to sidestep the ICE curve and leapfrog to zero emissions electric vehicles to decarbonise and eliminate toxic exposures from vehicles. In fact, this is a learning that is already emerging from the rest of the developing countries in Asia, including vehicle-producing countries like India, which are now shaping strategies to accelerate the transition to zero emissions.

There is considerable common ground among the developing countries, including Africa, which are now taking steps to build this programme. There are several common approaches that are also unique to developing countries. Most countries in Africa and Asia, with lower level of personal vehicle ownership, are prioritising the mass modes of transport to decarbonise urban commuting, electrifying small paratransit that meet the maximum travel demand, focusing on two-wheeled vehicles that are most polluting and dominate the vehicle fleet, targeting the commercial fleet operations for delivery and the aggregator fleet to maximise impacts. Countries are also adopting industrial policy to build local vehicle manufacturing base to cater to the regional markets, retail value chain within the economy, create new and green jobs with related economic spin offs.

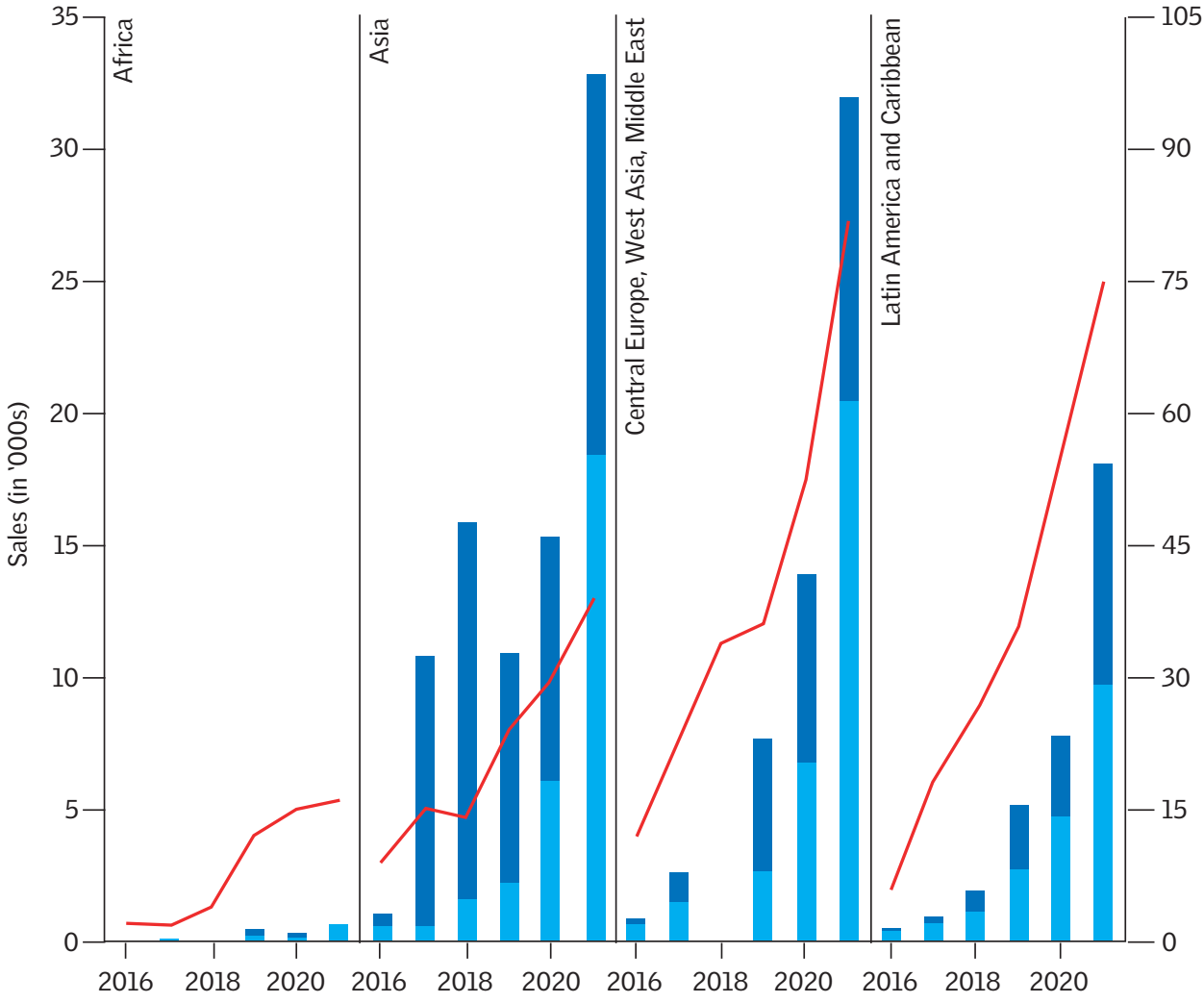
There is considerable excitement in the Africa region as countries are developing capacities and roadmap to make the zero emissions transition. There are also concerns around affordability, high upfront costs, inadequate access to low cost finance, and bankability of electric vehicles

Simplicity of the technology has enabled start-up based industry to emerge, mobilise resources to respond quickly to the market especially in the small vehicle segments that dominate these markets. This opportunity has also created enormous demand to shape enabling policies, regulations, technology roadmap and policy accelerators to build scale. They are finding their distinct ways to design demand and purchase incentives for consumers and fleet operators to build markets, incentivise industry to produce, designing charging infrastructure, evolving battery chemistries, and developing funding strategies to meet the cost of transition. A learning curve is gradually evolving that needs to be tapped to inform each other and enable each other. There is considerable excitement in the Africa region as countries are developing capacities and roadmap to make the zero emissions transition. There are also concerns around affordability, high upfront costs, inadequate access to low cost finance, and bankability of electric vehicles. There is also a lot of uncertainty around the product its resale values etc. But countries are evolving strategies and that is an opportunity for cross learning among the regions.

STATE OF VEHICLE ELECTRIFICATION

Electrification of vehicles is in its nascent stages and in very early stages of growth in Africa. But already quite a few countries have got their foothold in the electrification trajectory. Though the scale, scope and the stage of development varies widely across the countries some of those who are firmly on the EV landscape include South Africa, Nigeria, Morocco, Kenya, Zimbabwe, Ghana, Mauritius, Mozambique, Ethiopia, Uganda, Egypt, Tunisia, Cote d'Ivoire, Zambia, Ghana, Mauritius, Mozambique, Tanzania, Tunisia, Cote d'Ivoire, among others. They have either started developing policies or regulatory instruments or are implementing pilot

Electric car models available in selected emerging markets by segment (left), sales and models available by region 2016–21 (right)



Light blue: BEV; Dark blue: PHEV; Number of available models (right axis)
Source: IEA 2020: Global EV Outlook 2022 Securing supplies for an electric future

programmes or are manufacturing and setting up charging infrastructure. Understandably, the market uptake of electric vehicles (EVs) is still very small. The market shares of EVs in the total vehicle market are less than 0.1 per cent. Even though the overall EV stock is small it is necessary to understand the delineated trends across vehicle segments.

As noted in other countries of Asia including India, the EV promotion strategies in most countries of Africa have also prioritised high-usage, high-occupancy vehicles like taxis, buses, microbuses, paratransit like matatos, tuktuks etc, and ride-share fleet to maximise emissions and carbon reduction benefits. The smaller vehicles like two and three wheelers with small format batteries have got the priority attention. Most pilots or local assembly has begun with this segment which is also more cost effective compared to bigger vehicles. These are also numerous therefore their early transition to zero emissions technology can provide considerable benefits. In several countries two-wheelers dominate the fleet. In Uganda two wheelers make up for 46 per cent of the vehicle fleet. In Kigali, Rwanda, motorcycles are more than half of all vehicles on the road. In Kenya, motorcycles are set to more than triple to five million this decade compared with 2018. Motorcycles and utility vehicles of all types are also the fastest-growing

segment of the African automotive market. The United Nations Environment Programme (UNEP) expects the sales of both electric and traditional two- and three-wheelers in Africa to increase substantially by 2050. However, EV two wheeler markets are likely to see a different consumer base. This will be dominated by bulk purchase by businesses, including EV start-ups that buy the vehicles and then lease or rent them to drivers. The individual ownership for personal usage may be comparatively lower. Even though fuel and maintenance costs of electric vehicles are as much as 40 per cent lower on a per-mile basis than the ICE equivalent,2 purchase of e-motorcycles by individual consumers is dampened by the upfront capital costs. Lower incomes and difficulty in accessing credit are discouraging factors so far.

The UN Environment programme is currently active in nine African countries to introduce electric two and three wheelers. These include Ethiopia, Togo, Kenya, Rwanda, Uganda, Burundi, Madagascar, Sierra Leone, and Tanzania. Some of the first line efforts have been supported by UNEP including the pilot electric bikes project in Nairobi's Karura Forest in 2021. Forty-nine motorcycles donated by Shenzhen Shenling Car Company Limited (TAILG) were part of the pilot project based on a study implemented by the Energy and Petroleum Regulatory Authority, the University of Nairobi and Sustainable Transport Africa. This is being done along with the ministries, and national and sub-national authorities. As part of this project, 99 electric motorcycles were provided to four partners—Karura Forest, Kenya Power and Lighting company, Power Hive and Kisumu County. The initiative in Kenya is supported by UNEP with funding from the International Climate Initiative of the German Ministry for the Environment. This is expected to assess the barriers to the technological shift towards electric bikes, and

E-mobility start-ups and businesses are emerging in many African countries to produce E-two-three wheelers. Zimbabwe has companies that offer leasing for electric three wheeler and scooters; electric vans for delivery service

feasibility and affordability. This is also getting replicated in Uganda, Ethiopia, among others.

E-mobility start-ups and businesses are emerging in many African countries to produce E-two-three wheelers. Zimbabwe has companies that offer leasing for electric three wheeler and scooters; electric vans for delivery service. Dealership offers beneficial loan and insurance options for imported used EVs. Uganda has companies that are leasing electric motorcycles and renting batteries. Ghana has solar-powered two-three wheelers taxis for leasing. South Africa has app-based electric three wheelers taxis that are cheaper than ICE taxi service. In Morocco, private companies are distributing electric two-three wheelers with cheaper insurance policies for EVs than for their ICE counterparts. Kenya-based ARC Ride has launched electric two- and three-wheelers for UberEats deliveries in Nairobi. In Kigali, Rwandan start-up Ampersand is introducing a fleet of electric motorcycle taxis and plans to expand to other East African countries.

A study by UK Aid and World Bank Group and others in 2022 shows three wheelers for commercial application are more affordable and need less charging infrastructure. For example, in Mali and Burkina Faso, the total cost of ownership electric three wheelers for freight is 40 percent lower than that of their ICE counterparts. Nigeria, Uganda among others are developing assembly capacity and manufacturing of new electric motorcycles. South Africa has a start-up company that manufactures and operates electric three-wheeler taxis. Ghana is assembling electric two and three wheelers. Yet another strategy that is becoming popular is retrofitting. Uganda is retrofitting existing ICE motorcycles, and assembling electric motorcycles and battery packs. Rwanda is also retrofitting ICE motorcycles to electric.

Interest in the car segment is also growing that can be put to personal use as well as commercial use like taxis. The International Energy Agency that tracks electrification of the global car fleet reports positive trends in this segment in 2021. Although electric car sales are very low across Africa, they have increased by 90 per cent from a very low base, of which battery operated EVs are 85 per cent. But due to the small market size currently only limited models

are available throughout Africa. In South Africa, three-quarters of the available options for electric cars are from high-end brands.5 Increase in this segment can make more vehicles available in commercial and rideshare fleets (see Graph 1: Electric car models available in selected emerging markets by segment, sales and models available by region 2016–21). Nigeria has taken the lead to assemble solar powered electric cars. The National Automotive Design and Development Council (NADDC) have started this pilot programme. There are reports that about 200 units have been sold. As of 2021, South Africa has stock of about 860 battery operated cars and 880 plug-in hybrids, as per the IEA global data explorer, 2022. Other data sets have also reported small stocks in Kenya and Morocco. The UNEP, together with the Global Fuel Economy Initiative are working on the baseline setting and policy development for the introduction and shift to electric vehicles in Ghana, Mauritius, Mozambique, Tunisia, Cote d'Ivoire, and Zambia among others.

There is also more strategic deployment of EVs. Electric cars have been introduced for tourism in National parks in Arusha and the Northern tourist circuit. It will take a while to achieve price parity in this segment. According to a 2022 study of UK Aid and World Bank Group etc electric passenger cars are 20 to 50 percent more expensive than ICE counterparts depending on the market and model. The initial application will be more in the commercial and delivery fleet and such bulk purchase for fleet operations can also help to reduce costs and promote more product diversification. ■

PHOTOGRAPH COURTESY: WORLD ECONOMIC FORUM

ELECTRIFYING

African countries are adopting policies to encourage electric vehicles. Fiscal incentives are needed the most to make this transition

COUNTRIES ACROSS Africa have started to work towards target driven electric vehicle (EV) policy though it is still nascent and ad hoc. But several countries have included zero emissions transition in their respective nationally determined commitment (NDC) submitted to the United Nations Framework Convention on Climate Change (UNFCCC). This is also influencing local policy making. A few countries have begun to set policy and aspirational targets for electrification. For example Cape Verde has set 100 per cent electrification targets for new sales for passenger cars by 2035 and urban buses by 2040. Interim electrification milestones are being set for various fleet segments including passenger cars, urban buses, government vehicles, and countrywide charging infrastructure. Similarly, Morocco has set an EV production target of 1 million units by 2025. Kenya has gained market momentum and the Kenyan Ministry of Energy has set a target of 5 per cent

of all newly registered vehicles to be electric by 2025. Tanzania is developing national electric vehicle policy to support EV market development through targeted EV implementation frameworks and capacity building. This includes the development and adoption of national electric vehicles policy, regulations, and support for market transformation in cities of Dar es Salaam, Mwanza and Dodoma for fast growth. Key targets are commuter buses, three wheelers and two wheelers.

Rwanda is integrating e-mobility in their targets for reducing greenhouse gas emissions as part of their national climate action plans to meet the requirements of NDCs. Rwanda's NDC targets involve mobilizing US $900 million for electric vehicles and charging infrastructures. EVs are expected to contribute to a reduction of 9 per cent of GHG emissions in their energy sector in 2030. It has set a target for progressive adoption of electric buses, cars and motorcycles starting in 2020, replacing conventional vehicle sales and diminishing transport fuel imports. Rwanda has announced tax exemptions for EV sales. This measure depends on external financial support from donors. Earlier, e-mobility was mentioned in the Third National Communication UNFCCC had even mentioned adoption of electric cars to substitute 150,000 conventional cars by 2050. Rwanda is also revising its National Transport Policy. Its 2019 e-mobility feasibility study that had identified the possibility of reducing greenhouse gas (GHG) emissions by 17 per cent in 2030 compared to a business-as-usual scenario, aims to achieve 30 per cent electrification of motorcycles, 8 per cent of cars, 20 per cent of buses and 25 per cent of taxi, mini and microbuses in 2030.

Zimbabwe too is working on an electric mobility policy framework and roadmap that is

Several countries have started to create fiscal incentive programmes to increase supply of EVs. Priority in Africa is to reduce the cost of the EVs and make the vehicles available in the market by providing incentives to the industry and vehicle importers

expected to be functional by year-end. By 2020, Kenya is reported to have adopted 21 technical standards related to vehicles, batteries and safety requirements. Several other countries are evolving their EV policies and regulations. It is also notable that several of these policies are taking a more holistic view of the solutions for the ICE vehicles as well as the role of the EVs. For instance, Uganda's Electrical Vehicle (EV) policy was drafted and implemented against the backdrop of a study conducted by the Makerere University, Kampala in 2015 that showed high CO_2 emissions from vehicles. It took note of energy security concerns and high oil prices. Also the role of EVs despite their high costs. Kampala City Capito Authority, Uganda Revenue Authority and Ministry of Works & Transport carried out an analysis of inventory of vehicles, average age of vehicles, and fuel efficiency of vehicles. They also considered the impact of fossil fuel vehicles. This showed that the average fuel efficiency was about12.4 kmpl; 15 years or older vehicles were responsible for high concentration of GHG emissions; and ICE vehicles were responsible for high emissions. It therefore recommended policy shift to EVs, blanket ban on import of second-hand vehicles (≥ 15 years), and increasing tax rates on diesel engine vehicles. The implementation started in 2018 after the approval from the Technical Committee and Programme Working Group.

As experience in the global South has demonstrated that the devil is in the design of the policy, regulations, and mandate and fiscal enablers. For the new technology to compete with the mainstream ICE vehicles a combination of target, mandate and incentives supported by a roadmap for charging infrastructure are needed. This will also require funding and financing strategies along with resource mobilization. Therefore, considerable efforts are needed to understand each aspect of the policy design for effective enablers.

PHOTOGRAPH COURTESY: AUTOFUTURES.TV

DESIGNING INCENTIVES

Several countries have started to create fiscal incentive programmes to increase supply of EVs. Priority in Africa is to reduce the cost of the EVs and make the vehicles available in the market by providing incentives to the industry and vehicle importers. This is different from several other demand incentive programmes that provide direct fiscal incentives to the consumers to purchase electric vehicles. But to encourage ownership and usage of EVs, the cost of electricity is being reduced to lower the operational costs. Several countries are now designing and implementing incentive programmes. These include Rwanda, Kenya, Egypt, Morocco, Zambia, Mauritius, Cape Verde, Seychelles, and Uganda among others who have started to adopt incentives including subsidies and tax rebates.

Strategies vary across countries. In April 2022, Rwanda unveiled a wide set of tax breaks to push the adoption of e-vehicles. In order to reduce the ownership and maintenance cost of electric vehicles, a range of tax exemptions have been provided, which include import and excise duty exemption and zero rated VAT on electric vehicles, spare parts, batteries and charging station equipment; exemption from import and excise duties, and exemption of 5 per cent withholding tax on spare parts, batteries and other equipment. It is also providing rent-free land for charging stations. It provides preferential cent excise duty depending on the engine size. EVs are exempted. Ruwana has also reduced electricity tariffs for EV. The Kenya government has halved the import duty for fully electric vehicles from 20 per cent to 10 per cent in 2019. The state-owned firms – Kenya Power, an electricity distributor, and KenGen, a power generator – have started phasing out fossil fuel-powered vehicles in their own fleets. Tunisia is providing tax breaks and other incentives to increase electric vehicles. The country's Finance Act 2023, which came into effect on 1 January, has reduced customs duties on electric vehicle charging equipment to 10 per cent and the value-added tax (VAT) to 7 per cent. This is projected to lead to deployment of 50,000 electric cars by 2025 and provide attendant benefits of reduction in oil consumption of 5.9 million barrels, or a reduction in imports of fossil fuels of US$660 million over the period 2020–30.

In Egypt steps are being taken to streamline vehicle licensing processes for EVs; a formal registration procedure dedicated to EVs has been initiated in 2019. In 2013, a decree was issued by the Shura Council (consultative council) of Egypt to provide electric cars with a 100

per cent exemption from custom duties and this remains in the recent presidential decree for import tariffs. But such explicit exemptions for other types of electric vehicles, like electric two-wheelers are not yet available. The Ministry of Trade and Industry has exempted used electric cars from the restrictions on used vehicle import. Used electric cars can be imported on the condition that they are no more than three years old. In 2021, Egypt has also granted used passenger cars with electric or dual motors a 10 per cent discount on the free on board (FOB; the value at the point of export) value. Well-designed incentive programme can help to overcome the challenge of upfront costs.

According to reports upfront prices remain out of the range of average Africans. For example in Nigeria, the average cost of a new electric vehicle is about $55,600 (N23M) which higher than the average annual salary of average Nigerians in Lagos.

STEP UP

However, as noted already, at this moment the incentive programme is oriented towards reducing the cost of the EVs by reducing tax burden. The region is yet to move to providing direct fiscal demand incentives to the consumers that countries like India have adopted for two wheelers and commercial vehicles. The strategy to reduce supply cost is a good step forward as Africa needs to increase the availability of cost effective EVs models in the market. A vehicle when imported in Rwanda has to pay 25 per cent import duty, 18 per cent value-added tax (VAT) and 5–15 per.

This is also needed to encourage local manufacturing and assembly. Moreover, in the import-driven countries such as Africa leveraging that policy to promote EV importation is

Fiscal incentive is also needed to encourage local manufacturing and assembly. Moreover, in the import-driven countries such as Africa leveraging that policy to promote EV importation is an important approach to combat dumping of old and polluting ICE vehicles

an important approach to also combat dumping of old and polluting ICE vehicles. Once the market begins to gain more maturity, a more target driven supply mandate can be adopted to encourage industry to produce and diversify their product base more affordably and reduce price pressures. That can also be supported by more demand incentives to build consumer demand. Moreover, as several countries are now scaling up their public transport and non-motorised transport parking policy and low emissions zone approaches, even non-fiscal incentives can be designed to connect targeted zones with electric buses, electric paratransit or e-wheelers or cars. This will create a direct disincentive for fossil energy powered vehicles and scale up the EV market.

The electrification strategy has opened up opportunities in the developing South to create its own manufacturing base, even in countries that so far were only vehicle importing countries, to have local economic spin off, retain value chain, create employment and also make the cost of transition more affordable. This was not earlier possible with ICE vehicles in Africa. But EVs have created this opportunity. While vehicle producing countries in Asia including India and China are already on that track, the vehicle importing countries of Africa are also taking that route. The relative simplicity of the technology of electric motors, battery packs and related assembly especially in small vehicle segments have created this opportunity. This has become a start-ups led growth and not dependent entirely on traditional original equipment manufacturers (OEMS). Several African countries are developing their EV policy as industrial development policy. South Africa, Uganda, Nigeria, Ethiopia, Morocco, Rwanda, Ghana, Tunisia, Sudan, Zambia, Zimbabwe, Togo, Namibia, Botswana, Cape Verde are moving in that direction and setting up assembly facilities.

Nigeria is promoting local assembly of cars, vans and small vehicles like three-wheelers and two-wheelers. National Automotive Design and Development Council (NADDC) and Stallion Group had launched the first-ever electric car assembled in Nigeria. Less than 200 units have been sold so far.9 Hyundai Kona is manufacturing e-cars and has recorded 120 units sale in two years. The Nigerian government has signed a memorandum of understanding (MOU) with Israeli and Japanese companies to start manufacturing electric vehicles (EVs) in Nigeria.11 South Africa has adopted more detailed target and approach to become a EV production hub. It wants to retain and build export market and also maintain the share of auto industry at 4.9 per cent to the country's GDP by accelerating local manufacturing. Their 2021 draft Auto Green Paper on the Advancement of New Energy Vehicles in South Africa: Road to Production of Electric Vehicles (The Roadmap), for public consultation, has asked for tax reforms to support industrial policy and to stimulate domestic demand for vehicles by reducing the ad valorem duty and providing benefits to the employees of automotive companies. A standard rate per kWH is being suggested to reduce the price of an EV. It is considering lowering taxes on EVs while taxing luxury vehicles higher.

The thrust is on localisation of production. As per the South Africa policy document, there is an agreement to consider electric vehicle battery manufacturing. Temporary support in addition to the South Africa Automotive Master Plan 2035 can reduce the gap for local businesses. The EV industrialisation policy is considering lower or zero-rated duty for selected EV components, EV credits for offsetting manufacturing OEM's customs account. Production incentive and production rebate certificates are expected to promote local content. It is also proposing to strengthen value chain investment and transitioning from raw material exporter

There are close to 50 start-ups companies in Kenya in the electric two- and three-wheeler space and about 18 e-mobility companies, with more being established faster than before. In Kenya, 64 per cent of market players in e-mobility have invested in local assembly

to product exporter. There is emphasis on skilling and employment.

In Uganda, locally manufactured electric buses from Kiira Motors have started operations in Kampala. In Nigeria, Jet Motor Company has partnered with GIG Logistics to provide EVs for both transport and logistics services in the Nigerian market.15 Interest in R&D and capacity building and innovative business model is growing in Nigeria, Ethiopia, Tanzania, South Africa, Kenya, among others. Egypt's first domestically built electric vehicle is expected in 2023. The government is incentivising customers to buy electric vehicles. McKinsey has estimated that as of the end of 2021, there were more than 20 start-ups in the ecosystem, which together have raised over US $25 million for funding in that year. There are close to 50 start-ups companies in Kenya in the electric two- and three-wheeler space and about 18 e-mobility companies, with more being established faster than before. In Kenya, 64 per cent of market players in e-mobility have invested in local assembly.

The nascent but growing market is attracting foreign manufacturing partners in the region to establish EV production base in the region as is evident in Egypt and Morocco and other countries. German automaker Opel, Chinese automaker Dongfeng is among this group. Companies are targeting mobile phone-based ride-sharing services that are increasingly becoming the leading mode of mobility in Nigeria and other Sub-Saharan Africa auto markets. Free license and authorization will be provided for commercial electric vehicles. The governments are also de-risking the business by guaranteeing a market, where preference will be given to electric vehicles for government-hired fleet. Rwanda is adopting this strategy. ■

5 ENERGY

HIGHPOINTS

Every year some **130 million** Africans have to be provided clean cooking fuels to meet the universal access target in 2030

In Africa, some **0.7 million** people died in 2019 due to lack of clean cooking fuels

Africa, with nearly **18%** of the world's population, represents less than 6% of global energy consumption

In Africa, more than **60%** of the continent's population is facing acute energy poverty

Africa has a renewable energy potential of **9,000 GW** with about 60 per cent of it concentrated in the Sub-Saharan region

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NEED A BOOSTER

Africa's energy demand will significantly increase. How will the continent ensure this?

AFRICA IS on low energy, literally. Every second person in the sub-Saharan Africa doesn't have access to electricity while globally it is near universal. Some 130 million Africans have to be provided clean cooking fuels every year to meet the universal access to clean cooking fuels target in 2030. Some 0.7 million people died in 2019 due to lack of clean cooking fuels. If the continent doesn't get to make this shift, some 1.1 billion will be without clean fuels in 2030– a significant increase from the 932 million currently. And, without energy life doesn't move; livelihood shrinks; economic progress stunts; and access to healthcare to education inevitably become impossible.

Madagascar is a living example of what entails a country without energy availability and

access. It is one of the world's most energy-starved countries. Less than a quarter of its population has access to electricity, even though just for a few hours a day; and only 1.5 per cent has access to clean cooking facilities.

In Ambohimanatrika village of the Moramanga district, it is an everyday struggle for the women residents to scout for fuelwood. Women and children limp into the village with bundles of tiny dry twigs. That is the only fuel for cooking. The residents inform the collection that day is good enough for a couple of days. They have to trek deeper into the neighbouring forest again to collect fuelwood. Women spend four to five hours a day to collect cooking fuels. Many seem happy that the village has a forest nearby. But the dependence is so high that it is being denuded fast. In coming few years, residents fear, the forest will be cleared of trees and twigs. What would happen after that? "We already have a firewood scarcity. We move up to 5 kilometres inside currently to access trees. The forest might not be there in future but locals have no option other than firewood," said a village resident as his wife and children come back from the forest with headloads of twigs.

Madagascar faces the same dilemma and threat as its many villages. According to the country's New Energy Policy, firewood accounts for 92 per cent of total household energy demand. Electricity penetration is so low that recharging mobile phones has emerged as a big scale local business. While in rural areas firewood is used raw, the country's towns and cities use massive amount of charcoal. On an average, a person consumes 100 kgs of charcoal a year. A poor household spends about one-third of its earning on fuel for cooking. Besides, most of the services and small scale industries also use charcoal as a fuel. Collecting fuelwood or its substitution in the wild is a permanent work throughout the year for most of the households in the nation with a low rate of employment and low access to energy.

During 2000-2020 in Asia 1.2 billion people got access to electricity; in 2020 the continent could give access to 97 per cent of its total population. During the same period, in Africa the population gaining access to electricity increased by 24 million

Lack of access to clean cooking fuel is a double whammy. Over-dependence on biomass has led to fast deforestation with forests covering just 10 per cent of the island nation. Various studies warn that by 2100 there would be no forest at all. Unclean fuels are grave health hazards. According to World Bank's Country Environmental Analysis 2022, air pollution – largely indoor – is the third largest risk factor for death and disability in Madagascar, causing nearly 17,000 deaths and 850,000 days lost to illness annually while the economic cost of land degradation since 2000 is estimated at over $6.7 billion, amounting to 1.78 per cent of annual GDP.

ENERGY POVERTY

Africa is the most energy-starved continent. The United Nations Conference on Trade and Development (UNCTD) says that globally 733 million people lacked access to electricity out of which 600 million were in sub-Saharan Africa. According to a World Bank estimate, only 18 per cent of the population in sub-Saharan Africa had access to clean fuels and technologies for cooking in 2020. To make sense of this, in Middle East and North Africa nearly 96 per cent of population had access to clean fuel and technology, and globally this figure is 70 per cent. In 17 countries in sub-Saharan Africa – including Madagascar – less than 5 per cent of population had access to clean fuels.

Across regions of the world access to electricity is increasingly progressively. During 2000-2020 in Asia 1.2 billion people got access to electricity; in 2020 the continent could give access to 97 per cent of its total population. During the same period, in Africa the population gaining access to electricity increased by 24 million. Sub-Saharan region is the worst in terms of access to energy within the continent. For instance, the per capita annual electricity consumption in

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sub-Saharan region is 200 kilowatt hours (kWh) in comparison to 1,442 kWh in North Africa region. Accessing clean fuel and getting light from the grid are two national development goals for all African countries. Unbearably slow progress in these means a life going nowhere.

Alem Mengiste, a resident of Addis Ababa, the capital city of Ethiopia, narrated how her life remained the same without clean fuel access. Eight years ago, she made a decision to move from a small town Woldia to the capital city. Of all the hopes she had, a better living condition was the foremost. Not much has changed in her life style: "I used to use firewood to cook my food while I was in Woldia and now also use the same in Addis Ababa." Alem hoped electric power in the capital city would be the only source for light, a condition she desperately wished for. But Kerosene lamps light her home.

Notwithstanding her transition from a small town to the country's capital city, clean energy access is a national constrain. Every second Ethiopian doesn't have access to electricity, according to Sultan Woli, the country's state minister for water and energy. According to the 2022 Energy Outlook of Ethiopia, biomass fuels fulfil close to 86 per cent of the country's current energy demand. This is the state of affairs when in the next seven years the country has a promise to keep: universal access to affordable, reliable and modern energy services under the UN Sustainable Development Goals (SDG 7). Messay Emana Getu, researcher and team leader for bio-safety and climate change team of the Ethiopia Biotechnology Institute, says, "Two factors make Ethiopia an energy poor country: lack of access to renewable energy and inefficiencies of the existing energy service provisions." In urban areas and even in the capital Addis Ababa, the energy infrastructure is inefficient and wasteful due to the old national grid systems, he says. Messay says, "Due to the disparity between rural and urban areas in access to energy/lighting system students have different performances in their education. For urban area students can study any time, day or night, while students in rural areas don't have that luxury." Alem is an example that not all in the urban areas has the "luxury" of accessing electricity.

Besides health and economic impacts of not having access to clean and adequate energy,

countries in the continent have become net emitter of greenhouse gases (GHGs) just because of their over dependence on biomass fuels. Benin is a stark example.

Over 97 per cent of Benin households use firewood for cooking. More than 5 million tons of wood energy is used per year for cooking meals in Benin. And households account for 83 per cent of energy consumption in the country, according to AFREC data for the year 2020. This makes firewood as the main energy source. In Benin, the rural electrification rate is 10 per cent with just under 400 electrified localities. In electrified villages and even in the city, electricity is expensive and not at all easy to obtain in terms of logistics.

To meet this demand, forests are being cleared. About 100,000 hectares of forest are destroyed annually for reasons including bush fires, agriculture, timber, service or fire, and for the manufacture of charcoal. This means the country is sequestering less carbon as forest cover is decreasing. Burning biomass also increases its carbon/GHGs emissions. Since 1997, the country has become a net source of GHG emissions with emissions exceeding absorption due to the combined effects of deforestation, forest degradation and the increase in GHG emissions, especially in the energy and agriculture sectors. According to a study by the Ministry of the Living Environment and Sustainable Development, in 2015, total net emissions were estimated at 7,792.37 Gg CO_2 eq, 47.4 per cent of which came from the energy sector. But Benin, following the objectives of the Paris Climate Agreement, has undertaken to reduce overall cumulative GHGs emissions (excluding the forestry sector) by approximately 49.49 Mt E-CO_2, i.e. a reduction of 16.17 per cent over the period 2021 to 2030. In the energy sector, Benin intends to reduce cumulative greenhouse gas emissions by 23.35 Mt E CO_2 over the period from 2021 to 2030. But for this to happen it has to bring in changes in its household energy consumption character.

Scarcity of biomass, or wood, is hitting communities hard leading to change in food consumption behaviour. In a research finding published in *Scientific African* in July 2020, researchers from the Kenyatta University, Taita Taveta University and the Ministry of Agriculture, Livestock and Fisheries found that due to shortage of fuelwood families were changing their food items that need less time to cook. And many families also resorted to cooking more composite meals. The scarcity is not just due to deforestation but also government's increasing restrictions to forests to stop degradation. This poses a significant challenge as the alternate sources like LPG and kerosene are expensive.

Alice Yatich, a resident of the remote rural outpost Kipkelion Kericho County, said, "We travel long, sometimes up to six kilometres, to collect firewood. The recent extension of the ban on logging has worsened the situation, with authorities blocking us from accessing forests." Her firewood collection was no more adequate as per her daily requirement. Forced to buy from market, she couldn't afford them. "Yes, several studies indicate charcoal production is a key driver of deforestation. But due to lack of cheaper alternatives, we still rely on charcoal for cooking. Five litres jerry can, used for lighting and cooking in less than two weeks, now goes for Ksh800 (US$6) and we can hardly afford," she said.

On the other hand, the scarcity of firewood due to deforestation and restrictions has increased the demands for kerosene which is the next affordable fuel for cooking and lighting. This has resulted in rise of its price in turn forcing people back to fuelwood and charcoal. Emilly Chebet, a resident of Kipkelion, said, "The price of kerosene for lighting and cooking has skyrocketed, forcing most households to alternate between firewood and charcoal."

Kenya National Bureau of Statistics (KNBS) recently revealed that the country's yearly kerosene consumption has been declining for various reasons, including rising costs. According to Sylvester Makaka, an energy expert and advisor at the Kenya Association of Manufacturers (KAM), rural Kenya's underdevelopment was largely due to the unavailability of affordable and reliable energy. He said besides hampering job creation through industrialization and manufacturing, energy poverty contributes to limited access to education and unhealthy living conditions. "Energy poverty is to blame for a lot, including underdevelopment. Children cannot study at night and early in the morning. Insufficient energy or lack of access at all hinders agricultural development, thus keeping the rural population trapped in a vicious circle of poverty," he said.

The energy crisis currently brewing reminds one of the one in the 1970s, also called as "the

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fuelwood crisis" or "the other energy crisis." That period African countries took up massive agricultural expansion for self-sufficiency in food production. The expansion came at the cost of forests, which also was the big source of fuelwood. It precipitated the crisis of fuelwood scarcity. While currently the crisis is not that severe, but the poorest bear its brunt the most. But the International Energy Agency (IEA)'s "Africa Energy Outlook 2022" has put out a warning that the energy crisis is no less a threat. As the Russia-Ukraine war has increased prices of food and energy, the IEA says, "The overlapping crises are affecting many parts of Africa's energy systems, including reversing positive trends in improving access to modern energy, with 4% more people living without electricity in 2021 than in 2019. They are also deepening financial difficulties of utilities, increasing risks of blackouts and rationing. These problems are contributing to a sharp increase in extreme poverty in sub-Saharan Africa, with the number of people affected by food crises quadrupling in some areas."

THE FUTURE

Africa is home to one of the world's fastest growing and youngest populations: every third person born today is an African. Three of the top-10 economies with the fastest rate of economic growth are in Africa, with the continent's overall economy growing on average by 3 per cent during 2010 and 2019. However, economic growth in Africa has not consistently translated into improved living standards for most of its population. Despite progress, nearly 40 per cent of people in sub-Saharan Africa still live in extreme poverty. Furthermore, inequality has worsened over time. In 2019, according to the World Inequality Database of 2022, the wealthiest 10 per cent of Africans possessed 70 per cent of the continent's wealth. Both within-country and between-country disparities across Africa have increased since then, reaching levels like those seen in the early 2010s. These inequalities are likely to be further exacerbated by current price spikes, aggravated by climate-related droughts and extreme weather events. These factors contribute to a rise in migration, both within the continent and to other parts of the world.

A similar narrative emerges when examining the development of Africa's energy system. The

availability of clean, secure, and affordable modern energy services has not kept pace with the continent's expanding energy needs, though progress has been made.

In 2000, clean cooking access was lacking for four in 10 people in Central Asia, Southern Asia, and Eastern Asia, South-eastern Asia, while two in 10 were in Sub-Saharan Africa. However, by 2021, Sub-Saharan Africa saw a significant increase, with four in 10 people lacking access. If current trends continue, it is projected that nearly six in 10 individuals without access will be in Sub-Saharan Africa by 2030.Startlingly, a staggering 64 per cent of Africans primarily rely on gathered wood, agricultural, and animal waste as their primary sources of cooking fuel.

Africa, with nearly 18 per cent of the world's population, only represents less than 6 per cent of global energy consumption. Among the African countries, South Africa, known for its industrialisation, accounts for approximately 16 per cent of the continent's energy usage. Despite the rapid growth in overall energy demand in Africa, which averaged 2.4 per cent per year from 2010 to 2019, the use of electricity has been relatively slow, increasing by only 2.3 per cent during the same period. This growth rate falls significantly behind the average observed in other developing regions. SGD's recent report highlights that various development indicators for Africa is way below the targets envisaged by the SDG framework. The region suffers from severe shortfall in meeting basic requirements related on access to electricity and cooking.

To make sense of the energy poverty in Africa, *Down To Earth-Centre for Science and Environment* analysed the electricity consumption in the continent for 2021. The analysis reveals that more than 60 per cent of the continent's population is facing acute energy poverty. Considering benchmark annual per capita electricity consumption 360 kWh (according to the recommendation of the World Bank's Regulatory Indicators for Sustainable Energy, about 38

In 2000, clean cooking access was lacking for four in 10 people in Central Asia, Southern Asia, and Eastern Asia, South-eastern Asia, while two in 10 were in Sub-Saharan Africa. However, by 2021, Sub-Saharan Africa saw a significant increase, with four in 10 people lacking access

countries globally fail to provide basic electricity access to the population with average per capita electricity consumption at 118 kWh varying between a broad range of 17 kWh and 333 kWh. Appallingly, 30 countries out of these are from SSA region with an average per capita electricity consumption of 110 kWh. This, in a hypothetically worst scenario, a family has to make a hard choice between using a fan for an hour a day for 300 hot days or a CFL for 5 hours a day throughout the year. It portrays a very dismal picture of energy access in Africa as more than half of the total population of Africa is affected with maximum energy deprivation.

These SSA countries collectively account for 62 per cent of the total population of the Africa region which signifies the enormity of energy poverty in the continent. Even the average per capita electricity consumption for entire Africa is not very encouraging as it is just 602 kWh. South Africa leads the chart with 3,758 kWh followed by nine other countries with a better than average electricity access scenario. However, six other countries are managing to extend basic energy supplies marginally better than the recommended threshold but still below the average for Africa. Needless to mention, there is no point of comparison against the world average which stands at 3600 kWh except for the case with South Africa. This further implies that the entire Africa region is facing poverty issues affecting almost entire population of the continent barring South Africa, 17 per cent of the world's population.

Thus, Africa represents a unique situation: it has the world's lowest per capita use of modern energy and at the same time one of the lowest energy consumption of energy. But as the population rises and economic growth picks up, energy consumption will increase significantly. But to ensure access to energy at affordable cost, governments have to increase the subsidies. Given the high level of debt among African countries and the post-pandemic economic slowdown, governments

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may not be able to spend on energy sector as required. The IEA says that the energy subsidy burden in 2022 has doubled due to the energy price rise. "(It is) an untenable outcome for many facing debt distress. Some countries, including Egypt, Ethiopia and Uganda, are being driven to halt or reduce subsidies, or to reinstate fuel taxes due to growing financial burdens." This will hit the poorest the most as there is high disparity in Africa on energy access and consumption. According to IEA, "The average household in a city consumes more than three-times more oil and electricity than the average rural household in Africa."

But in immediate future, the continent would face a high demand for electricity. Optimistic development scenarios predict the continent's energy demand to expand significantly by 70 per cent by 2030 due to its growing population and need for industrial growth. Most of the demand is supposed to be created from residential sector. The demand is expected to be met largely through new capacity additions mainly by Solar PV due to declining cost of the technology propelled by its accelerated uptake and economies of scale.

The "Africa Energy Outlook 2022" suggests, a heavy reliance on traditional biomass (~7 EJ out of total supply of ~20 EJ) as the primary energy sources in SSA with comparable share from fossil fuel (3 EJ) and RE (3.5 EJ). So far RE is limited to only 12 percent in the energy mix despite of a very promising potential and growth opportunity. The forecast for energy supply scenario in 2030 indicates traditional biomass utilisation completely augmented with RE using modern bio energy solution. This, essentially means SSA region has significant RE potential with biomass being the primary RE source.

On comparison of three distinct geographical regions in Africa, traditional biomass is the major primary energy source for SSA whereas North and South Africa have negligible use for traditional biomass. For North Africa, natural gas is the major primary fuel supported by oil and very little coal. On the other hand, South Africa has been relying majorly upon coal for its primary energy requirements and has been forecasted to continue using coal as the primary resource by the end of this decade. ■

PHOTO COURTESY: GE GAS POWER

GAS RUSH

Developed countries want to exploit the huge energy resource of Africa. Is this another manifestation of colonial exploitation?

THE WORLD'S immediate priorities have shifted since the Russia- Ukraine war. Recommitments to fossil fuels have surfaced globally, particularly from countries in Europe, to reduce dependence on Russian gas. Africa has emerged as the biggest source for it. Africa has 9 per cent of the world's natural gas reserves, as per Climate Action Tracker, a research initiative by Germany-based non-profits Climate Analytics and New Climate Institute. According to the estimates in "BP Statistical Review of World Energy 2022" by UK-based energy company British Petroleum or BP, gas production in Africa has increased from 200.6 billion cubic metres in 2011 to 257.5 billion cubic metres in 2021. Within the continent, 18 countries produce gas; Algeria, Nigeria and Egypt together account for 87 per cent of total production. In 2021, Africa used 164.4 billion cubic metres of the gas produced for its own needs, according to the BP review. Yet, 80 per cent of rural Africa lives without electricity, said the

International Energy Agency (IEA)'s "Africa Energy Outlook, 2022" report. Driving this dash for gas is the European Union (EU), which wants to reduce its reliance on Russia following the Russia-Ukraine war. In 2021, the EU imported 90 per cent of its gas consumed, of which Russia contributed some 45 per cent. A fifth of the EU's gas imports came from Africa, of which Algeria contributed 12.6 per cent.

Rasmus Grand Berthelsen, director of the Nordic regions at Denmark-based political consultancy firm Rasmussen Global, said, "It is obvious by now that the EU is heavily dependent on Russia for fuel and has been facing a crisis, especially with the coming of winter. That is why we are seeing Europe extending the life of coal plants, firing up nuclear plants and opting for all dirty energy including liquefied natural gas (LNG) to meet its needs." Alongside, Europe has also started to increase its gas dependence on Africa. In May 2022, the EU announced intent to expand LNG imports from Africa by 50 billion cubic metres, along with pipeline gas from other regions, as a step towards its goal to reduce the reliance on Russian energy by two-thirds by the end of 2022. Mathew Baldwin, EU's deputy director for energy, during his visit to Nigeria in July 2022 said at media briefings that the bloc seeks to build a new partnership with countries like Nigeria to obtain more gas and LNG.

Since March 2022, energy players such as BP and Italy's Eni SpA had announced deals with at least four African countries—Algeria, Angola, Egypt and the Democratic Republic of Congo—to develop new gas production and export ventures or to expand existing ones. Kolawole Banwo, a development expert and public affairs analyst from Abuja, said, "Having the EU show interest is an opportunity to expand our market, generate more exports and earn more foreign exchange."

Not all African leaders are against fossil fuels, particularly gas, as a transition fuel. For example, Senegalese President Macky Sall said there was no need to rush the transition because the potential benefits of producing and exporting fossil fuels for Africa still outweighed the harm. "We are all in favour of both a just and fair green transition, instead of decisions that harm our development process," said Sall, even as he backed the 'transition fuel' agenda. By February 2023, seven African countries with no history of fossil gas exploitation have now opened their doors to gas projects, a new briefing report showed. Some 84 per cent of new reserves in the pre-production stage are coming up in Mozambique, Senegal, Tanzania, Mauritania, South Africa, Ethiopia, and Morocco, stated the Global Energy Monitor briefing released in February 2023. Their reserves were pegged at 5,137.5 billion cubic meters (bcm). Potential emissions are expected to reach about 11.9 billion tonnes of carbon dioxide.

In May 2022, the EU announced intent to expand LNG imports from Africa by 50 billion cubic metres, along with pipeline gas from other regions, as a step towards its goal to reduce the reliance on Russian energy by two-thirds by the end of 2022

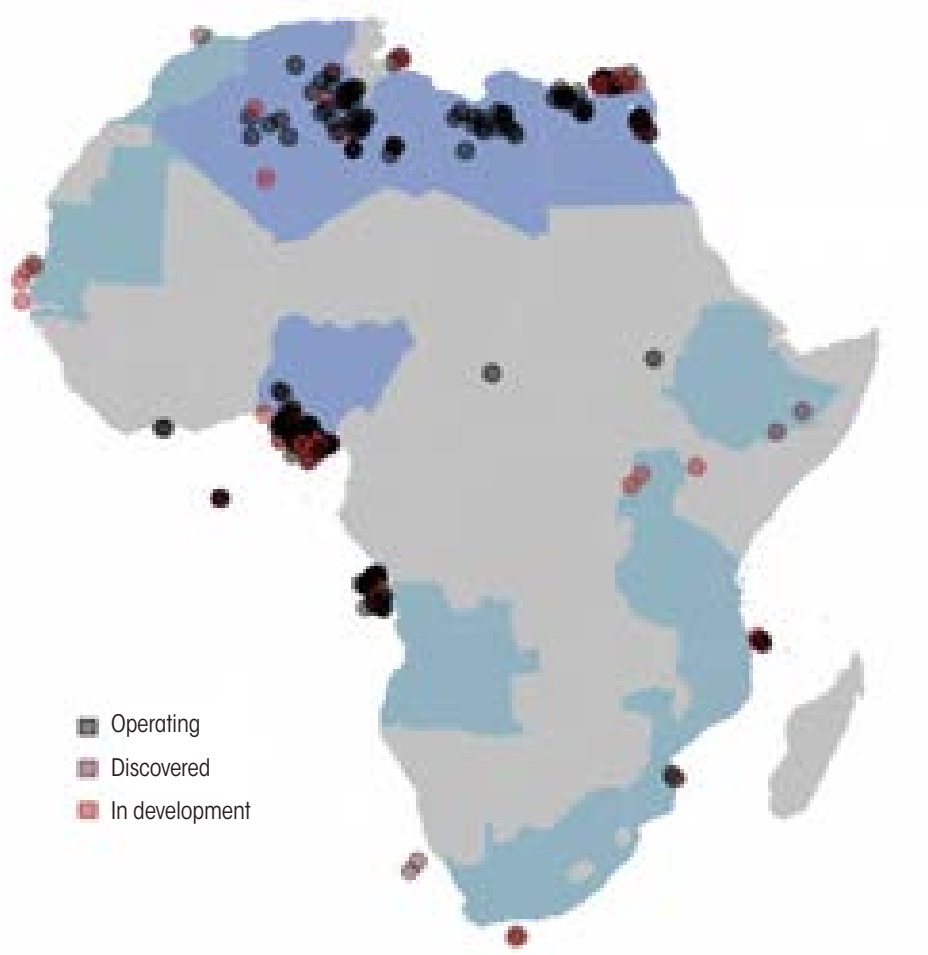
A PUSHBACK

Notwithstanding Africa's economic and development interests, the EU's intention to tap into the latter's fossil fuel reserves has evoked concerns. It can be seen as "another manifestation of colonial exploitation," said Nnimmo Bassey, director of health of Mother Earth Foundation, an environmental think tank and advocacy organisation. "Europe ought to transit to cleaner energy, but insists on using dirty fuels and burdening Africa," Bassey said. Amos Wemanya, senior advisor for renewable energy and just transition at Power Shift Africa, a Nairobi, Kenya-based think tank, explained, "The EU's demand for African oil and gas is short-lived. Eventually everyone is moving to renewable. By developing new oil and gas projects in Africa temporarily, the EU will leave Africa with stranded assets, and new added loans to repay. The new infrastructure such as gas pipelines will not even be beneficial to the domestic population."

Climate activists and experts from Africa protested the attempts by wealthy countries to consider fossil fuel, particularly Africa's natural gas, as an alternative energy source at the expense

GASEOUS STATE

By February 2023, seven African countries with no history of fossil gas exploitation had opened their doors to gas projects



Note: "The Old Guard" (Algeria, Nigeria, Libiya and Egypt) shown in blue and "Upcoming Natural Gas Hubs" (Ethiopia, Mauritania, Mozambique, Senegal, South Africa and Tanzania) are shown in turquoise.

Source: GEM Global Oil and Gas Extraction Tracker

of the ongoing green transition. The reaction was after it emerged that the wealthy nations, especially Europe, were using other underhand tactics besides pushing the "transition fuel" agenda. For instance, they had deployed a battalion of over 600 lobbyists at the 27th Conference of Parties (COP 27) to the United Nations Framework Convention on Climate Change held in November 2022 in Sharm El Sheikh, Egypt to promote gas as a substitute low-carbon fuel for high-content fossil fuels like coal and oil.

The African activists and experts released a report in COP 27, "Fossil Fuelled Fallacy: How the Dash for Gas in Africa Will Fail to Deliver on Development," explaining why the move would further worsen the climate crisis in Africa. "This report confirms that the pro-gas rhetoric is in no way intended to help African to develop. It is once again a trap to turn Africa into a gas station. We don't need more fossil fuels," said Mohamed Adow, a director at Power Shift Africa, a non-profit. Africa needs a decentralised but democratic energy system based on the continent's renewable energy sources, he added. Adow said it was the only way of greening African economies inclusively and fairly. He described it as the real solution to end the continent's energy apartheid.

It was almost certain the suggestion of a "transition fuel" would not be entertained when the continent is experiencing climate carnage of epic proportions and already transitioning to green

energy sources. The energy crisis and desperation for alternative fossil fuel faced by European countries resulted from Russia. Russia, a former top supplier, has been restricting exports as retaliation against sanctions slapped on them over the Ukraine invasion.

So relentless are the "anti-gas as transition fuel" activists that they had a special campaign christened "Don't Gas Africa." The movement was led by African civil society and its sole purpose was to ensure Africa is not locked into mega-fossil gas production, according to their website. "Europe, multinational fossil fuel entities and their financial backers are willing to subject Africans to needless pollution, environmental degradation and severe vagaries of climate change as they profit," said Dean Bhekumuzi Bhebhe, a lead activist at "Don't Gas Africa." He insisted that Europe and other developed countries were up to no good and called upon African leaders to remain firm and reject the "transition fuel" agenda from Europe's negotiators.

Fossil fuels remain hazardous investments and the desire to expand fossil fuel industries should be condemned by all those concerned about climate change in Africa, according to a new report by the "Don't Gas Africa" activists and experts. The continent needs a green transition even though "fossil fuels are still with us for some time," said Eng Raila Odinga, Kenya's former Prime Minister. Many African leaders, including African Programme Director at Oil Change International, Thuli Makama, said history shows fossil fuel extraction in Africa hardly benefits locals. Others argued that the Ukraine war would not last long and Africans might be left with 'white elephant' infrastructure for fossil fuels as the world switches to renewables.

This "dash for gas" threatens the global scientific consensus to halt constructing new fossil fuel infrastructure. Further, these fields have witnessed opposition due to the potential impacts on local ecosystems and communities.

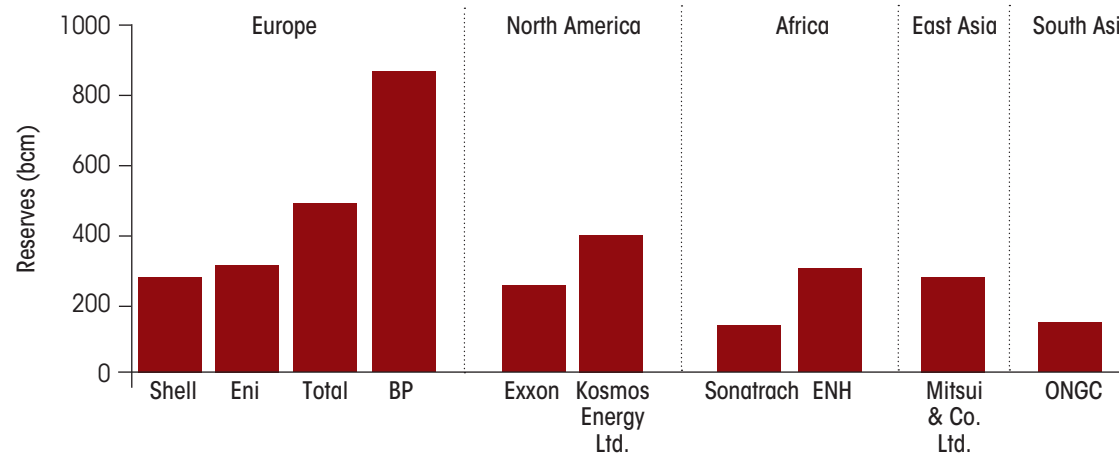
Much of the gas from the new projects is being constructed to cater to the international market and not domestic consumption. In Mozambique, only 30 per cent of the population has access to electricity. The access in Tanzania, Mauritania, and Ethiopia is 40 per cent, 47 per cent and 51 per cent, respectively. Over 97 per cent of the new liquefied natural gas infrastructure planned for Africa is being built for export

GEARING UP FOR THE EXPORT MARKET

The Global Energy Monitor's (GEM) database "Global Oil and Gas Extraction Tracker (GOGET)" include data on 421 extraction projects, of which 79 fields are in the pre-production stage. According to this database, pre-production reserves in Africa total 2,307.4 bcm in Mozambique, 778.7 bcm in Senegal, 574.6 bcm in Mauritania, 512.5 bcm in Tanzania, 192.7 bcm in Algeria, 192.6 bcm in Egypt, 155 bcm in Nigeria, 143.6 in Angola, 102.2 bcm in Libya, 96.3 bcm in South Africa, 42.5 bcm in Ethiopia and 39.4 bcm in Morocco. Previously, only Algeria, Nigeria, Libya and Egypt were gas reserves and production hubs. These four countries accounted for 78 per cent of African gas reserves in 2021, according to the United States Energy Information Administration. They will continue to dominate gas production in the near term. But, according to the briefing, Mozambique and other new entrants in the African gas market are estimated to contribute more than 50 per cent of gas production in Africa by 2038.

Also, much of the gas from the new projects is being constructed to cater to the international market and not domestic consumption. In Mozambique, only 30 per cent of the population has access to electricity. The access in Tanzania, Mauritania, and Ethiopia is 40 per cent, 47 per cent and 51 per cent, respectively. Over 97 per cent of the new liquefied natural gas infrastructure planned for Africa is being built for export, mainly to Europe and Asia. The major players include Shell, Eni, Total and BP from Europe; Exxon, Kosmos Energy Limited from North America; Sonatrach and Empresa Nacional de Hidrocarbonetos in Africa; Mitsui & Co Ltd in East Asia;

TOP COMPANIES BY RESERVES OF NEW GAS FIELDS IN AFRICA



Source: GEM Global Oil and Gas Extraction Tracker

and Oil and Natural Gas Corporation in South Asia.

Further, there are questions about the future of these gas infrastructure projects. EU aims to cut its gas demand by 35 per cent by 2030 compared to 2019. If the European Commission's new proposal REPower EU is fully implemented, it could result in a 52 per cent drop in gas demand by 2030, compared to 2019.

"Europe's current interest in African gas is clearly fuelled by a short to a medium-term supply crisis, while significant volumes of gas from in-development African projects will only come online much later this decade, potentially stranding that gas without a buyer," the briefing warned. Moreover, these new nations' assets cannot be repurposed for domestic use without "extraordinarily expensive infrastructure development", Global Energy Monitor noted.

INDEBTED?

As the discussions around just energy transition and fossil fuel phase out ramped up globally, alongside the Summit for a New Global Financing Pact in June 2023 in Paris, yet another name got added to the list of countries that have signed a Just Energy Transition Partnership (JET-P) deal. Senegal had become the fourth country after South Africa, Indonesia and Vietnam to sign the JET-P deal, with the International Partners Group comprising France, Germany, the European Union, the United Kingdom and Canada. The deal was announced June 22, 2023 and will mobilise Euro 2.5 billion for Senegal in new and additional financing over an initial period of 3-5 years. The European Commission's official website said the finance would come from international partners and multilateral development banks and a draft investment plan will be prepared within 12 months.

The partnership will offer significant opportunities for investment from the private sector, sovereign wealth funds and philanthropic foundations, according to the official website of the President of France. No mention of grants or concessional loans being a part of the finance was found in the official statements. The official website of the President of France also mentioned that the partnership will help accelerate the deployment of renewable energy and increase the share of renewable energy to 40 per cent in terms of installed capacity of Senegal's electricity mix by 2030. It will also help with the publication of a vision for a long-term greenhouse gas emission development strategy for Senegal by COP28, due to be finalised in 2024. Senegal's new nationally determined contributions, which were to be published at COP30, will reflect the climate ambitions undertaken in this deal.

The current share of renewable energy in Senegal is around 31 per cent of the installed capacity. A 2015 Senegal government planning document had set a target of 20 per cent renewable energy in the electricity mix by 2020 and 23 per cent in 2030.

The same year, a new target for 30 per cent of photovoltaic and wind in the electricity

generation mix was set for 2025. The 20 per cent target for renewable energy production in the electricity mix was achieved by 2021. Under this deal the installed capacity target stands at 40 per cent for 2030, but there isn't any electricity generation target set under the deal as of now. As of 2020-21, the total installed capacity for power generation in Senegal was around 1.2 to 1.5 gigawatts, generating 5.6 terrawatt-hours of electricity. The country currently relies heavily on imported fossil fuels to meet its energy demands.

Heavy Fuel Oil (HFO) was responsible for generation of around 85 per cent of the electricity for the country back in 2010, although this share has come down substantially due to a large shift towards gas and some coal as well as the recently growing solar and wind. But still, HFO continues to hold the largest share of fuel in the electricity mix of the country. Senegal adopted a gas-to-power strategy in 2018, following discoveries of oil and gas reserves between 2014 and 2017. "We will allow Senegal to develop its gas projects because gas is a transitional energy. What we want to do is get the big emerging countries out of coal as a priority," said French President Emmanuel Macron during the Paris Finance Summit.

It is rather rare to hear the Global North advocating for emerging economies to use natural gas as a bridge fuel — usually the expectation is to directly switch from coal / oil to renewable. But the question is: What is different in this case? As it turns out, it is about fulfilling Europe's own need for natural gas through export. In 2022, a Germany-Senegal gas plan came up, under which the German government was supporting the Senegalese government in export of gas and LNG resources to Europe and in ensuring that the extracted gas can be used by domestic power plants as well, according to Deutsche Welle, a German news broadcaster. Infrastructure to export the gas, including a floating terminal for LNG, is already being built in Senegal. The first flows of

Mohamed Adow, director of Power Shift Africa, tweeted in response to President Macron's statement: President Macron says he would "allow" Senegal to develop its gas because he views gas as a transitional fuel. This is outrageous coming from a former colonial power & shows how Macron is using his economic strength to dictate energy policies in Africa for the benefit of Europe

fossil gas from the Greater Tortue Ahmeyim field are expected in December 2023. It is one of the single-largest gas projects in Senegal.

The African civil society has been raising voices against obtrusion by the Global North in Africa's natural resources and energy policies. Mohamed Adow, director of Power Shift Africa, tweeted in response to President Macron's statement: President Macron says he would "allow" Senegal to develop its gas because he views gas as a transitional fuel. This is outrageous coming from a former colonial power & shows how Macron is using his economic strength to dictate energy policies in Africa for the benefit of Europe.

South African President Cyril Ramaphosa expressed his views on their JET-P deal at the Paris Finance Summit, saying "The financing of $8.5 billion offered to South Africa has been far below their estimated need of $98 billion and we must have a greater emphasis on grants and concessional loans." Moreover, a recent report titled Beyond Climate Finance by Delhi-based think tank Centre for Science and Environment (CSE) found that Senegal was one of the developing countries whose annual debt burden exceeded the cost of achieving its climate goal or NDC.

"A high debt burden coupled with high cost of capital makes renewable energy unaffordable in many developing countries," said Avantika Goswami, Programme Manager, Climate Change at CSE and a co-author of the report. "For this reason, there have been calls from many developing country leaders for more concessional and grant-based funding to be channeled for climate

mitigation and adaptation, and this is crucial for energy transition".

Senegal annually emits around 13.6 million tonnes of CO_2, excluding land use change, which is hardly .03 per cent of the global CO_2 emissions (37.12 billion tonnes) as of 2021. Clearly the need for action is much more globally (including Global North) and especially support for renewable energy growth is required in the Global South, where the cost of capital for renewable energy is still very high. Nivit Yadav, Programme Manager, Industry Unit, Centre for Science and Environment, said, "The past JET-P deals have largely been focusing on coal phase out and have had targets on capping coal based power in a country, whereas in this deal, for now what seems like a positive point is that its major focus is on enabling the growth of RE rather than acting as a stick on the fossil economy." ■

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A NEW CLEAN FUTURE

Renewable energy is the answer to Africa's future growth

RENEWABLE ENERGY is considered to play a pivotal role in the next 10 years in eradicating energy poverty significantly, especially in the Sub-Saharan Africa (SSA) region, in turn contributing to reduction in economic poverty as well. As per the International Energy Agency (IEA) forecast, oil continues to be the major primary source of energy in Africa with an equal share of RE which predominantly is envisaged to be developed and deployed in SSA. This signifies SSA has huge RE potential and opportunity for its deployment in the region.

Africa has a renewable energy potential of up to 9,000 GW (excluding hydro-power) with about 60 per cent of it concentrated in the SSA region. This includes primarily solar, wind resources and other minor sources like geothermal, tidal, bio- energy, pumped hydro and offshore wind. Africa's vast solar potential of about 8,000 GW promises the opportunity for green energy transition in the continent. The estimated potential is based on considering only 1 per cent of land

utilisation for solar and wind power generation.

Although Africa is the hub of renewable resources, realisation of the estimated renewable energy potential is almost insignificant at just 0.26 per cent. The SSA region also echoes the same trend. The current renewable energy installed capacity in Africa and the SSA region forms 9 per cent and 12 per cent of the total installed capacity respectively. However, solar PV emerges as the most preferred renewable energy technology option followed by on-shore wind together accounting for about 84 per cent of the total installed renewable energy capacity. Wind and solar both present huge opportunities to reduce and eventually eliminate energy poverty in Africa as the current realisation level is just about 0.15 per cent of solar and 1.7 per cent for on-shore wind.

With regards to energy for cooking, biomass is the commonly used energy source in Africa. Renewable electricity generation through modern application of biomass is limited to only 3 per cent. Utilisation of abundantly available biomass such as agri-residue, forest residues etc. can pave the way for producing cleaner bio fuels such as ethanol, bio-butanol, CBG, CNG which in turn can be used for electricity generation and for driving clean mobility and clean cooking.

It makes even more sense for Africa to transition to green energy. The political willingness is evident from the NDCs submitted by all African countries with Energy transition being one major and coherent focus areas across all countries. Other sectors such as waste are another major focus area by most countries but not all.

It is also interesting to note that about 60 per cent of US$1.2 billion of international financial support sought by Africa countries to meet NDC goals is mapped with mitigation activities, predominantly for the development of renewable energy in the continent by 2030. The SSA region, with 40 per cent share of this for implementing NDCs, seeks to develop mitigation

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measures, mainly focusing on renewable energy development in the region.

It is obvious that the continent requires urgent attention and action plan to address the inherent challenges in furthering energy access for various services and activities required to achieve SDG goals. The road ahead is fraught with several bottlenecks and impediments in the form of limited access to technology options, lack of affordable finance, and very limited flow of international investments, heavy reliance upon fossil-based energy sources for economic activities, high cost of power to the consumers' and uncertainty marred with lack of clarity in policy directions among others. Nonetheless, some of the countries in Africa have demonstrated positive and forthcoming intention to experiment and commercialise some of the RE technologies through innovative business models for energy services delivery.

To harness the vast potential of renewable energy, Africa has a much longer way to travel within a relatively shorter span of time. It must move very quickly in order to meet SDG goals and NDC targets. In order to save time and resources in learning through own experiences, countries in Africa need to learn from other countries and try and follow their footsteps for developing and implementing policies and solutions customized to their own needs. It would be prudent for them to understand the endeavours and efforts of some of the emerging economies in advancing energy transition through RE as a mainstream energy source aiding to overall economic growth.

For example, India, China, and Brazil have over the years been able to augment part of growing energy needs through ever evolving robust policy mechanisms and a well-developed renewable energy ecosystem. It must be remembered that these countries have not only raised power parity significantly with a respectable access to electricity to its people but also have been able to demonstrate sustained renewable energy based economy growth. Quite understandably, a lot of experiments, trials and failures have contributed for more than 30 years to achieve the state of renewable energy in these countries. And now, these countries are leading in all the

AFRICA'S NEW TOOL TO IMPROVE ENERGY ACCESS, EMPOWER LIVELIHOODS

Powering through mini-grids would be the most economical way to provide electricity to nearly 265 million people in 21 countries by 2030

AFRICA MINI-GRIDS Program (AMP) is a specialised support initiative that was started to provide electricity at economies of scale, promote increased commercial investment with new growth opportunities and novel business models to some of the poorest African countries. It was launched by the Rural Electrification Agency on September 29, 2022. The four-year project is funded by the Global Environment Facility, with support from the United Nations Development Programme (UNDP) in Nigeria.

This programme covers 21 African nations. The main aim of AMP is to focus on different low-price models, improve investments and develop financial credibility of mini-grids. It will work with countries to put policies and regulations in place to strengthen private investment, promoting a favourable environment for the mass deployment of renewable mini-grids.

The International Energy Agency's Africa Energy Outlook 2022 forecasts the levelised cost of electricity for solar generation to be $0.049 / kWh by 2030, which would be more economical than wind or gas. This includes an incremental installed capacity of 225 MW per year using solar mini-grid from 2021 to 2030

Mini-grids are decentralised electricity-generating systems that are not in sync with the country's national grid. Solar-based renewable mini-grids offer good prospects to improve the energy access situation in the 21 countries by providing services such as electricity to households, electrification of health and education centres and empowering local businesses to accelerate economic opportunities.

Powering through mini-grids would be the most economical way to provide electricity to nearly 265 million people in 21 countries by 2030, according to projections by UNDP. New funding of around $65 billion would be required to meet the mini-grid objective in the countries from the private sector. This opportunity would include the development of 110,000 mini-grids, powering more than 200,000 education and health centers as well as empowering more than 900,000 livelihoods.

FRAMEWORK FOR THE PROGRAMME DISSEMINATION

AMP will follow a country-based approach, thereby increasing South-South / Triangular collaboration prospects. The critical areas of work for AMP are:

- A regional project organised as a Knowledge Management platform to aid and assist in the National projects of the program. The mini-grids market of Africa is also covered under the regional projects. The main tasks covered under the projects are i) knowledge kits for the public and private sectors; ii) customised technical support to countries; iii) unique regional learning networks; and iv) assisting in digitalising the mini-grid sector
- 21 national projects, with each of the projects having a common arrangement and comprised of the following five aspects: i) policy and regulatory; ii) business model innovation and the private sector; iii) innovative finance mechanisms for scaling up mini-grids; iv) digitalisation and knowledge management; and v) monitoring and evaluation

ENERGY ACCESS FOR SUSTAINABLE DEVELOPMENT FOR ALL

Access to energy is one of the most critical enablers for the socioeconomic development of a country. Yet, more than 568 million (half the population) people in sub-Saharan Africa are deprived of electricity. AMP envisages working towards energy access among the countries in the region to provide benefits such as improving the quality of agribusiness, health and education sectors as well as other livelihood generation activities. This will ultimately help provide socio-economic benefits to the communities living in the region.

Through its plan to support mini-grid deployment in Africa, AMP has recognised the following areas of operation: i) national-level discussions for recognising the best means of establishing mini-grids in the region; ii) efficient utilisation of energy; and iii) digitising mini-grids.

Through the Nigeria and Eswatini projects launch, AMP is already in the implementation phase and these projects will continue till 2027. The 21 countries comprise 396 million people with no electricity access. The population comprises a diverse African population from Anglophone, Francophone and Lusophone countries; the small island developing states and crisis-affected countries.

aspects of renewable energy including generation, installation, manufacturing and commercialisation of technologies. Yet, there is a lot to be done. Africa cannot afford to enjoy the privilege of time of 30 odd years to reach the milestones these countries have achieved.

It can prove relatively easier, particularly for SSA to implement renewable energy from the stand point of potential realisation adequate for achieving threshold per capita electricity consumption level of 360 kWh a year. The SSA region requires additional realisation of just 6 per cent (301 GW) of the solar potential only in the region or 58 per cent (138 GW) of the on-shore wind potential. If it aspires to reach Africa level of 602 kWh, only 12 per cent (591 GW) of the solar potential needs to be converted to the opportunity or the wind potential need to be utilised to the fullest.

The SSA region has enough renewable energy resource to even reach per capita electricity access level of 1130 kWh annually, on par with the average of middle income countries, supplemented by 25 per cent (1,223 GW) of solar potential only or combination of various renewable energy technologies. However, this looks highly ambitious but achievable provided it is supported by a sustainable renewable energy ecosystem.

Africa has seen a very sluggish policy reforms to promote renewable energy in the region. IEA lists about 86 policies in force in Africa for promoting various renewable energy technologies such as wind, solar PV, and solar thermal, geothermal. These policies are introduced within past four decades earliest being the "Rural Electrification Policy" in Malawi. Latest additions are the new policies in 2023 focusing on Green Investment Program and on-shore wind energy in Morocco and Egypt, respectively. It has been observed that the countries have formulated various policies to promote energy access through mini-grids and small off-grid systems, net metering, FiT and DRE along with large scale wind and solar programs. Most of the African countries, however, have national renewable energy strategy as part of the overall national energy policy. In terms of count, SSA which comprises of 49 or 50 countries has merely 55 policies, just one policy for one country on an average, excluding South Africa, which has 7 policies. It confirms that SSA countries have weak regulatory environment for renewable energy growth as most of these policies are either very technology specific or in the form of umbrella plan. In the SSA region, there is a diverse range of geographical, developmental, socio-demographic, and institutional factors that shape the energy transition. Each country begins the transition from a unique starting point, which implies varying strengths and weaknesses. Therefore, national-level policy-making needs to be tailored to these specific conditions.

To harness the abundant potential of renewable energy, African countries can implement a wide array of deployment policies and measures to integrate renewable energy technologies into their energy systems and grids. This entails setting national or regional plans and targets for renewable and access to electricity.

For instance, consider Kenya. Kenya has great energy potential to ensure clean fuel and energy to everybody if renewable energy sources are fully exploited. There has been some significant improvement in this regard in the last two decades, according to analysis by the Ministry of Energy. Rollout of renewable sources has substantially boosted energy access, from a paltry 30 per cent electricity access in 2013 to over 70 percent in 2022. Through these efforts, Kenya is slowly but surely emerging as a superpower in renewable energy across Africa. The feat has been achieved through a comprehensive mix of incentives, friendly policies and the ability to leverage the abundance of geothermal energy sources in the country. There has been a rapid improvement in the exploration of wind, solar and geothermal energy generation in Kenya. The Eastern Africa nation is home to the largest wind farm in Africa, the 310 MW capacities Lake Turkana Wind Plant (LTWP). According to the Ministry of Energy, LTWP supplied the country's 30 per cent off-peak and 17 percent peak electricity demands in 2019.

To bolster renewable energy generation and penetration rate in rural areas, the Kenyan government has introduced several policies, which are slowly but surely impacting development. Kenya, for instance, recently introduced a feed-in tariff (FiT) on power generated from wind, biomass, geothermal and solar energy. The 2021 Finance Act reinstated VAT exemptions on renewable energy products. The country also launched Kenya Vision 2030, running from 2008 to 2030, with industrialisation through renewable clean energy as one of the key pillars.

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Considering geothermal abundance in Kenya, the country currently ranked eighth largest global geothermal energy producer, behind the USA, Indonesia, Turkey, and New Zealand. Besides geothermal, Kenya has made significant progress in exploiting solar and wind power. Apart from the current solar capacity of over 170MW, the country's estimated solar potential is around 15,000 MW, according to EPRA. Kenya Vision 2030 aims to produce 2036MW of wind power by 2030 from the current 460MW.

Similarly, Madagascar is moving fast in the renewable promoting. In 2023, the government has promised to set up solar parks with 2 megawatts of installed power in 42 districts. At a policy level, government is proposing to invest its annual petrol subsidy of US$11.25 million on renewable energy development.

Like Burkina Faso and Mali, Benin is particularly suited to photovoltaic solar energy. Each year, they receive up to 3,000 hours of intense natural light that can be used to provide much-needed energy to isolated communities. Benin has a national renewable energy policy. This gives a vision of the next 20 years. A special fund to help invest in this area has even been set up. The first 25 megawatt power plant was inaugurated in Pobè, 105 km east of Cotonou with the support of several technical and financial partners. Solar power plants that have been inactive for years have been rehabilitated. By 2026, the Beninese government will commission five other 100 megawatt solar power plants, as well as a 128 megawatt multifunction hydroelectric dam. It is also planned to build other additional solar photovoltaic power plants with a combined capacity of 50 megawatts to supply several rural localities. All in all, by 2030, the country is betting on 100 per cent electrification with a total installed capacity of around 1,180 megawatts from both solar energy and thermal power plants.

WHO WILL FINANCE THE TRANSITION?

Since finance is crucial to energy transition, most NDCs have "conditional" and "unconditional" targets—unconditional targets refer to climate actions that countries will achieve based on their own domestic resources and capabilities, whereas conditional targets are actions that can be achieved pursuant to specific conditions being met, such as international support in the form of finance, capacity building and technology. Countries can use the climate finance to reach their mitigation as well as adaptation goals. Adaptation is a critical area of climate finance in Africa, where 50 million people are at risk of falling below the poverty line from climate change related risks, 100 million face the risk of displacement, and 600 million people lack energy access. The Africa NDC hub estimates that between 2020 and 2030, the continent's adaptation needs will range from $259 billion to $407 billion—$26 billion to $41 billion a year. Mitigation needs for the same period are estimated to be $715 billion, or an average of $71.5 billion a year. Additionally, projected loss and damage costs for Africa for 2020-30 range from $289.2 billion to $440.5 billion in the less than 2°C warming and more than 4°C warming scenarios respectively, indicating an annual loss and damage need ranging from $28.9 billion to $44 billion.

But climate finance is not easy to come by. According to a report by Africa ndc Hub, African countries differ in their ability to attract private climate finance. The least developed and most vulnerable countries are likely to receive less financing than they actually need, as they might lack the institutional and political setup to attract private climate finance. Another issue that impedes the flow of climate finance is "cost of capital"—the cost incurred to access funds for projects. Cost of capital includes costs such as interest rates on loans, cost of debt, investors' expected rate of return and cost of equity. Since developing countries are

The least developed and most vulnerable countries are likely to receive less financing than they actually need, as they might lack the institutional and political setup to attract private climate finance. Another issue that impedes the flow of climate finance is "cost of capital"—the cost incurred to access funds for projects

considered to be a "high-risk environment" for investments, they face a much higher cost of capital than their developed counterparts. Although renewable energy costs have fallen significantly, a higher cost of capital makes investments in renewable unaffordable for many developing countries. According to a International Energy Agency's "World Energy Outlook 2022 Report", the "Weighted Average Cost of Capital" (WACC) refers to the cost to be paid for raising money for projects) of utility-scale solar PV projects for South Africa was in the range of 9.5-11 per cent, while for the US and countries in Europe, it was in the range of 3-5 per cent. A key concern is premature deindustrialisation of Africa. Kevin Gallagher, director of the Boston University Global Development Policy Center, US, said that although historical emitters from the Global North should act first on climate action, their green industrial policies are likely to birth a new dependency of Global South. The new technology and patents from this new carbon economy will likely make the Global South more dependent on the North and worsen the existing inequities.

Analysts fear that this investment in gas is likely to be for the short- to medium-term as the EU intends to reduce its gas demand by 35 per cent as compared to 2019 levels by 2030. If the European Commission's REPowerEU proposal is fully implemented, it could lead to a 52 per cent reduction in EU's gas demand by 2030. This could leave African countries with stranded fossil fuel and carbon intensive assets. Such challenges underlines the need for increased non-debt generating climate finance flows to Africa, so that countries are able to invest in the urgently required green transition. ■

6 HEALTH

HIGHPOINTS

Life expectancy in Africa has increased to **56 years** in 2019. Previously it was 46 years in 2000

In Africa **80%** of the people taking help from traditional health workers for treatment

Due to climate change, in eastern and southern Africa, an additional **75.9 million** people will be at risk from 10-12 months' exposure to malaria by 2080

In Africa **47** countries have already eliminated at least one neglected tropical disease

Sub-Saharan Africa saw the greatest number of deaths due to bacterial infections in 2019, with **230 deaths** per 100,000 people

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LIVING MORE, BUT...

Enduring life in a place that has the world's highest infant and child mortality rates does not ensure that the spell of the curse will be broken

IN AUGUST 2022, the World Health Organization (WHO) delivered the good news for the African continent: its healthy life expectancy, defined as "the number of years an individual is in a good state of health", was 56 years per person in 2019. Some two decades ago, in the year 2000, it was 46 years per person. This increase of 10 years was the highest in the world, according to WHO. "The sharp rise in healthy life expectancy during the past two decades is a testament to the region's drive for improved health and well-being of the population. At its core, it means that more people are living healthier, longer lives, with fewer threats of infectious diseases and with better access to care and disease prevention services," said Matshidiso Moeti,

WHO's Regional Director for Africa.

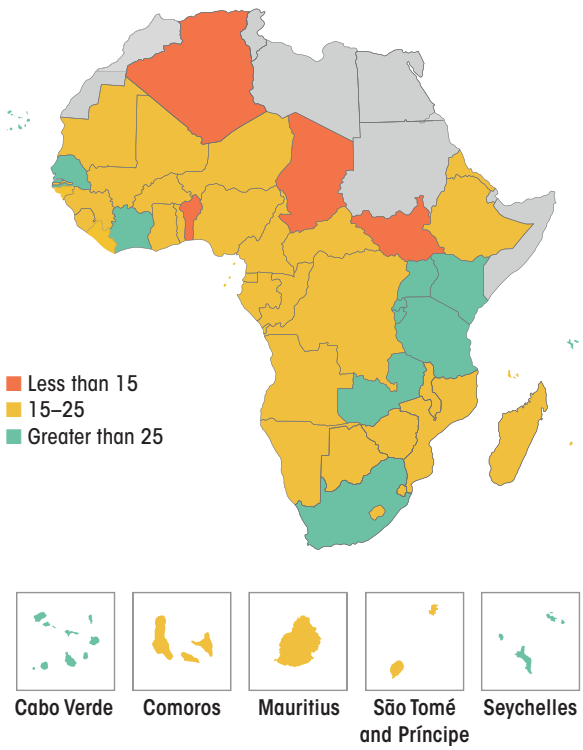
The steep increase in life expectancy coincided with a proportionate increase in the continent's universal health service coverage (UHC). Essential health service coverage nearly doubled from 24 per cent in 2000 to 46 per cent in 2019. This meant that countries in the continent achieved progress in reproductive, maternal, newborn and child health. Importantly, Africa significantly strengthened its fight against infectious diseases like HIV, tuberculosis and malaria.

For the continent UHC represents a target that has to be met by 2030, under Sustainable Development Goal (SDG) 3 on "Good Health and Well-being". This goal ensures "all people have access to the health care they need, when and where they need it, without facing financial hardships." WHO measures progress on UHC using two indicators: service coverage index (SCI) and financial risk protection. SCI, which comprises 14 tracer indicators on health service coverage, ranks countries in a scale of 0-100. "Over the past two decades, substantial progress has been made in the Region in the UHC SCI. In 2019, the latest year for which data is available, the SCI ranged from 28 to 75 (out of 100) across all Member States. Of these, seven had high service coverage (index of 60 and above), 29 had a service coverage index value of between 40 and 59, and 12 had low coverage (index between 20 and 39)," said the report "Tracking Universal Health Coverage in the WHO African Region, 2022", published in August 2022.

LEFT BEHIND

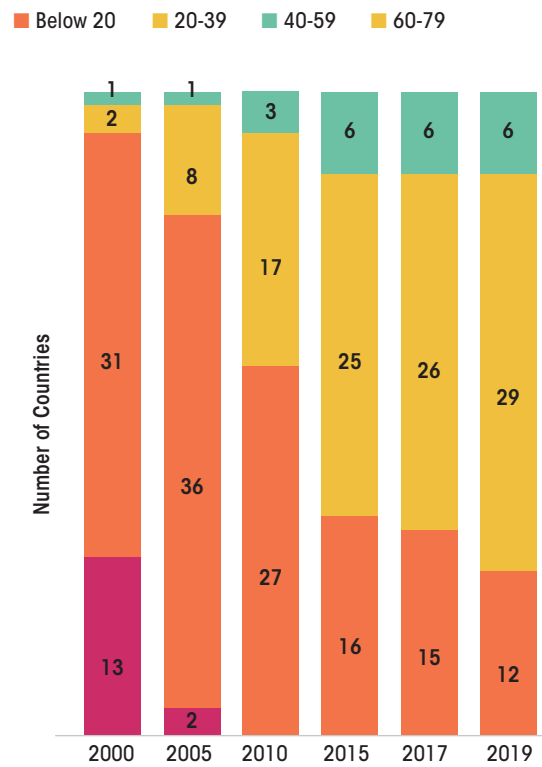
This progress is impressive, but it does not imply that the continent is coming at par with the rest of the world on critical health indicators. The healthy life expectancy of 56 years per person in 2019 is behind the global average of 64. Moreover, Africa is also left behind on the indicator of life expectancy at birth. In an analysis published in March 2023, Lars Kamer, research lead with online data platform Statista for Africa, said, "For those born in 2022, the average life expectancy

Change in UHC SCI (in index point), 2000–2019



Source: World Health Organization, 2021

Number of countries by UHC SCI group, 2000–2019



Source: World Health Organization, 2021

PROGRESS IN TACKLING MATERNAL/ NEWBORN DEATHS STAGNANT

Following India, countries with the highest number of absolute maternal and neonatal deaths and stillbirths in 2020 are Nigeria (540,000 deaths), Pakistan (474,000), Democratic Republic of Congo (241,000), Ethiopia (196,000)

DESPITE OVER 4.5 million women and babies dying every year during pregnancy, childbirth or the first weeks after birth, global progress on mitigating this has halted since 2015, revealed a new report by the United Nations (UN). Stagnating investments and little political intent, augmented by the COVID-19 pandemic, rising poverty and worsening humanitarian crises, have compounded an already precarious situation, the document released on May 9, 2023, noted. The report on improving maternal and newborn health and survival and reducing stillbirth placed India at the top, accounting for 17 per cent of global maternal deaths, stillbirths and neonatal births (788,000 total deaths). Pregnant women and newborns continue to die at unacceptably high rates worldwide, and the COVID-19 pandemic has created further setbacks to providing them with the healthcare they need, said Anshu Banerjee, director of Maternal, Newborn, Child and Adolescent Health and Ageing at the World Health Organization (WHO). "If we wish to see different results, we must do things differently. More and smarter investments in primary healthcare are needed now so that every woman and baby — no matter where they live — has the best chance of health and survival," she added.

Key findings of the report revealed how gains made between 2000 and 2010 were faster than they have been in the years since 2010. Maternal mortality ratio observed an annual reduction rate of 2.8 per cent between 2000 and 2009, which decreased to 1.3 per cent between 2010 and 2020. An improvement of reducing this indicator by 11.9 per cent is required in the next decade to meet global targets of an MMR equivalent to 70 deaths per 1,000 live births. Between 2000 and 2009, the stillbirth rate was reduced by 2.3 per cent and by 1.8 per cent between 2010 and 2021. A 5.2 per cent reduction is required between 2022 and 2030 to meet global targets of less than 12 stillbirths per 1,000 live births. Neonatal mortality rate (NMR) records a similar trend; a 3.2 per cent reduction between 2000 and 2009, 2.2 per cent reduction in 2010 and 2021. NMR needs to be reduced by another 7.2 per cent between 2022 and 2030 to meet the global target of ending newborn mortality.

While progress has not been up to mark, meeting these targets by the end of this decade can still save close to eight million lives — over one million women, 2.6 million stillbirths and 4.2 million newborns. Doing so "will only be possible with high coverage of life-saving interventions combined with quality and equity across the continuum of care, from preconception to the postnatal period," the report noted. Following India, countries with the highest number of absolute maternal and neonatal deaths and stillbirths in 2020 are Nigeria (540,000 deaths), Pakistan (474,000), Democratic Republic of Congo (241,000), Ethiopia (196,000), Bangladesh (121,000), China (108,000), Indonesia (103,000), Afghanistan (95,000) and Tanzania (94,000).

These maternal and infant health indicators can be improved significantly by ramping up essential health services. Three standard measures can be used to assess this availability; at least four antenatal care contacts (ANC4), having a skilled attendant at birth (SAB) and receiving postnatal care (PNC) within the first two days after birth. While coverage rates for ANC4 have improved to 68 per cent in 2022 from 61 per cent in 2010, the figure is projected to move up by only one percentage point by 2025. The same goes for SAB coverage rates, up from 75 per cent to 86 per cent in the same duration, and an expected improvement to 88 per cent by 2025.

For PNC, the coverage has recorded the highest improvement — up from 54 per cent to 66 per cent between 2010 and 2022. It is further projected to touch 69 per cent by 2025. The projections make it clear that ANC4 and PNC coverage will fail to meet global targets at the current pace. "Upward trends are promising, but rates of improvement to increase coverage must accelerate if 2025 targets are to be achieved. Further, even when pregnant women, new mothers and newborns have access to services, ensuring they benefit from respectful and quality care remains a critical gap," the report noted.

Bridging the emergency care lacuna for newborns and pregnant women is another hurdle without which achieving the targeted reduction in MMR, NMR and stillbirths will not be possible. Only 51 per cent of countries are expected to have care units for small and sick newborns planned in 80 per cent or more districts by 2025. A closer region-wise analysis reveals only 35 per cent of countries in sub-Saharan Africa are expected to achieve this goal. In contrast, 71 per cent of countries in Central and South Asia have planned for coverage in 80 per cent or more districts.

Access to quality emergency obstetric care (EmOC) is critical for reducing maternal mortality. But only about 36 per cent of facilities providing EmOC in sub-Saharan Africa are considered functioning versus 62 per cent in northern Africa and western Asia and more than 80 per cent of EmOC facilities in other regions. Improvement on this front can significantly help reduce maternal deaths, a leading cause of which are postpartum haemorrhage — defined as the loss of more than 500 ml of blood within 24 hours after birth. A set of interventions to manage postpartum haemorrhage can reduce heavy bleeding by 60 per cent, a new study has revealed.

The research, published in the *New England Journal of Medicine*, found "objectively measuring blood loss using a simple, low-cost collection device called a 'drape' and bundling together WHO-recommended treatments — rather than offering them sequentially — resulted in dramatic improvements in outcomes for women". A gender transformative approach can address maternal and newborn mortality. It is vital to stamp out the underlying factors which give rise to poor maternal health outcomes like socio-economic inequalities, discrimination, poverty and injustice, noted Julitta Onabanjo, director of the technical division at the United Nations Population Fund. Onabanjo argued in favour of including quality sexual and reproductive health services in universal health coverage and primary health care, particularly in vulnerable areas where mortality rates have either plateaued or even risen.

at birth across Africa was 61 years for males and 64 years for females. The average life expectancy globally was 70 years for males and 75 years for females in mid-2021." He elaborated: "With the exception of North Africa where life expectancy is around the worldwide average for men and women, life expectancy across all African regions paints a bleak picture. Comparison of life expectancy by continent shows the gap in average life expectancy between Africa and other continent regions. Africa trails Asia, the continent with the second lowest average life expectancy, by nearly 10 years for both males and females."

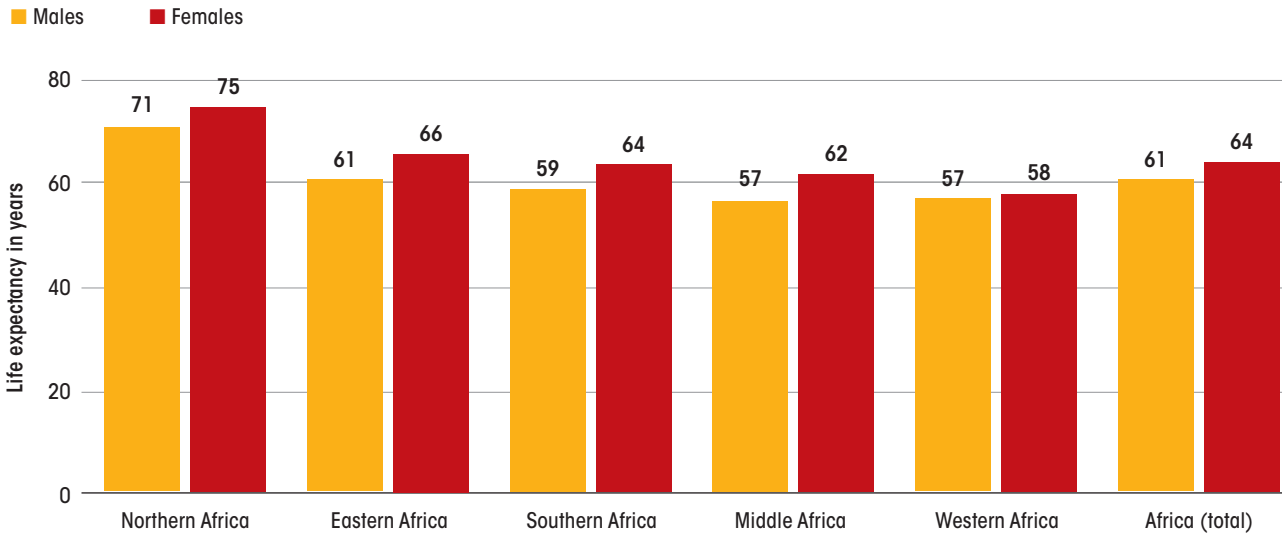
Call it the curse of geography. A person born in the African continent will live 18 years less than one born in America or Europe. Enduring life in a place that has the world's highest infant and child mortality rates does not ensure that the spell of the curse will be broken. Data from 2018 says the continent has a precarious demography—95 per cent of its population is less than 60 years old, but a 15-year-old sees a high probability of dying before the age of 60.

The continent has been living with recurring droughts and famines, and unending conflicts that have disrupted settled lives and crucial basic infrastructures. Their impacts on the overall health are now unfolding with scary manifestations. "Africa South of the Sahara" ranks the second highest in the In the Global Hunger Index (GHI) for 2022, after South Asia. The prevalence of undernourishment and rate of child mortality are higher in "Africa South of the Sahara" than in any other world region. In East Africa, Ethiopia, Kenya, and Somalia were experiencing one of the most severe droughts of the past 40 years, threatening the survival of millions. All 10 least-scoring countries in GHI were in Africa. According to German non-profit Welthungerhilfe, 278 million people in Africa suffered from chronic hunger in 2022. This corresponded to 20 per cent of the continent's population, or every fifth person in Africa. By comparison, globally 10 per cent of the population was affected by chronic hunger.

HUNGER AND DISEASE

Chronic hunger makes a person highly vulnerable to diseases. A person living in Africa is more prone to it than one living in any other continent. An increase in the burden of disease has resulted in the demand for government medical support. But women and children are deprived of it, even in times of medical emergencies. African countries are not known for using funds on this crucial human development aspect. Significant amounts are diverted to fighting weather extremities and in relief efforts. Only nine countries spend US $500 per capita per year on health while half of the continent's countries spend less than $140. Looking at 2019 data on domestic government health expenditure as a percentage of countries' overall health expenditure in the WHO African Region, most governments are funding less than half of the health budget. Only the governments of Algeria, Botswana, Cabo Verde, Gabon, Seychelles, South Africa and the Kingdom of Eswatini fund more than 50 per cent of the total health expenditure. This pushes the

Average life expectancy at birth in Africa for those born in 2022, by gender and region (in years)



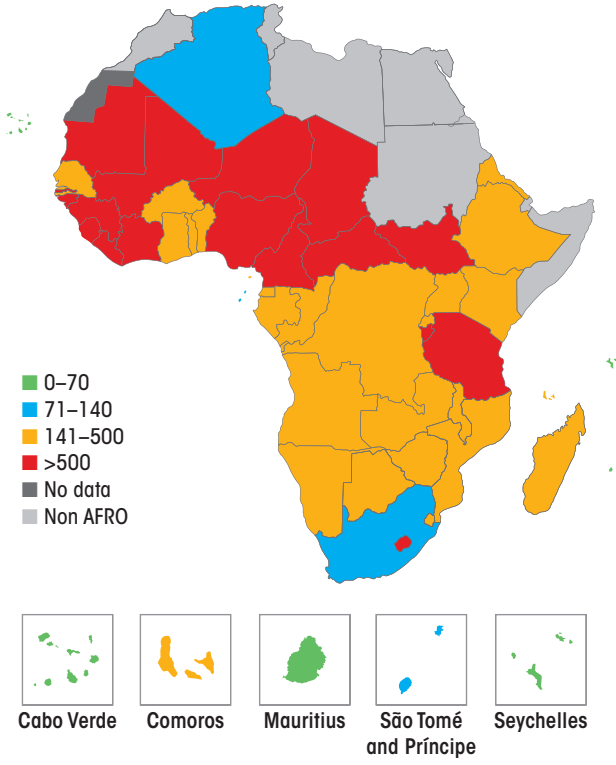
Source: Population Reference Bureau

continent into a downward spiral.

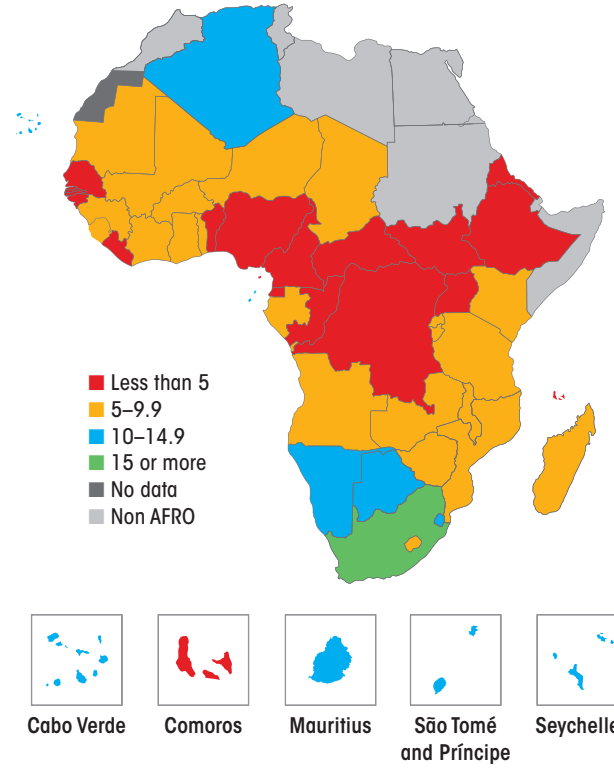
Africa had missed all the Millennium Development Goals. Now, it has the opportunity to meet SDGs that are high on health-related targets. But Africa's progress has been abysmal so far. The health indicators in African nations are so poor that meeting the world average seems unlikely. And if the burden of diseases that Africa is already known for was not enough, the continent is under the grip of the rich world's diseases as well—non-communicable diseases. This further impacts the continent's crumbling health infrastructure and stretches the already trickling health budgets. Soon, non-communicable diseases will emerge as the bigger killer in the continent than the most common condition causing deaths—HIV/AIDS. Climate change and environmental destruction could lead to the emergence of a variety of diseases for which the world is unprepared. A strong health system could well be the saviour in the times to come. But Africa is still struggling with the basics.

In December 2022, WHO released the "Atlas of African Health Statistics 2022" that measured the progress on nine health-related nine targets under SDGs. "A slowdown in the progress made during the past decade against maternal and infant mortality is projected in the African region," says the report. It has found that the target on reducing maternal mortality is the most difficult to achieve. In sub-Saharan Africa, 390 women will die in childbirth for every 100,000 live births by 2030. "This is more than five times above the 2030 SDG target of fewer than 70 maternal deaths per 100 000 live births, and much higher than the average of 13 deaths per 100 000 live births witnessed in Europe in 2017. It is more than the global average of 211. To reach the SDG target, Africa will need an 86% reduction from 2017 rates, the last time data was reported, an unrealistic feat at the current rate of decline," warns the WHO report. Similarly, the sub-Saharan region will not meet the 2030 deadline on infant mortality rate: "The region's infant mortality rate stands at 72 per 1000 live births. At the current 3.1% annual rate of decline, there will be an expected 54 deaths per 1000 live births by 2030, far above the reduction target of fewer than 25 per 1000." "Africa has scored some of the fastest reduction rates globally in key health objectives, but the momentum is waning. This means that for many African women, childbirth remains a persistent risk and millions of children do not live long enough to celebrate their fifth birthday," says Matshidiso Moeti, WHO Regional Director for Africa. "It is crucial that governments make a radical course-correction, surmount the challenges and speed up the pace towards the health

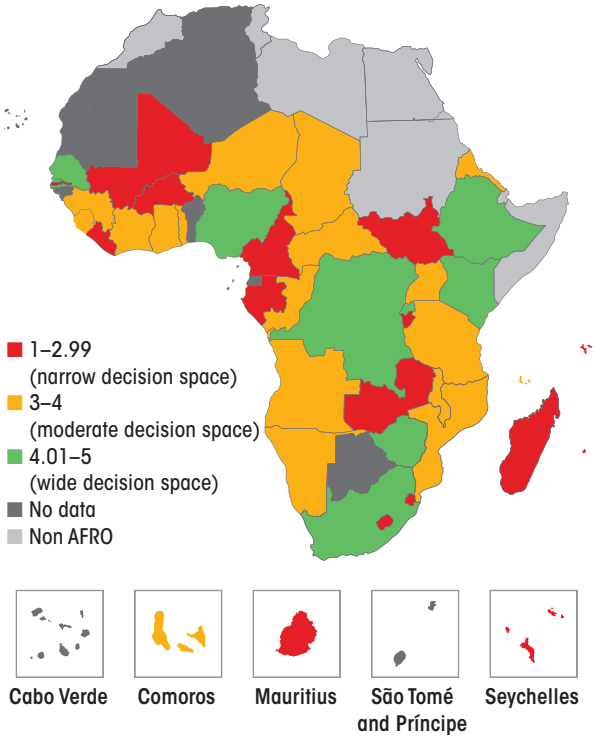
Maternal mortality ratio in the WHO African Region in 2017, UN MMEIG



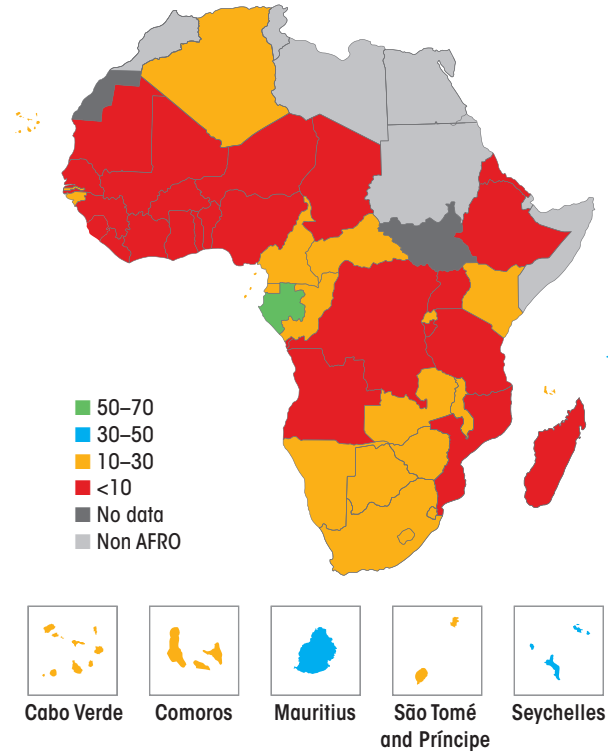
Government health expenditure as percentage of total government expenditure in the WHO African Region, 2019



Subnational level decision-making space in the WHO African Region, 2022, WHO/AFRO



Hospital bed density (per 10 000 population) in the WHO African Region, 2004–2017, WHO



Source: "Atlas of African Health Statistics 2022 – Health situation analysis of the African Region" Report published by World Health Organisation

goals. These goals are not mere milestones, but the very foundations of healthier life and well-being for millions of people," he said.

A badly managed continent means a degraded and polluted environment. Now, this too is taking several lives. In the African region recognised by WHO, all the children under five years of age are exposed to fine particulate matter (PM) 2.5, which is higher than the WHO air quality guidelines. Further, acute respiratory infection is the leading cause of death of children under five years of age in the African region. The economic cost of premature deaths from air pollution is estimated at $450 billion. The economic loss due to the lack of access to safe drinking water and sanitation is estimated to be 5 per cent of the region's gross domestic product. According to WHO, every dollar invested in sanitation could yield over six-fold return. This was recognised in 2008 when 52 countries in the continent signed the Libreville Declaration on Health and the Environment for Africa. But the Strategic Action Plan to Scale Up Health and Environment Interventions in Africa 2019-2029, adopted at the closing of the Third Inter-ministerial Conference on Health and Environment held in the Gabon in November 2018, showed that financial resources for these are limited.

Lack of political will to improve infrastructure in the health sector has resulted in 80 per cent of the people taking help from traditional health workers for treatment. The African Union's Abuja Declaration states that every country must invest at least 15 per cent of its annual budget into healthcare. In 2014, only four countries managed to achieve this.

Africa has scored some of the fastest reduction rates globally in key health objectives, but the momentum is waning. This means that for many African women, childbirth remains a persistent risk and millions of children do not live long enough to celebrate their fifth birthday

STRATEGIES FOR THE DECADE

The good news is that the continent has woken up to the importance of investing in improving public health. It can take lessons from Rwanda which is moving towards meeting the SDG target. The country has strengthened its health network by making crucial investments and improving technology. This will help improve its health indicators. Achieving SDG targets is crucial to meet Africa's Agenda 2063, which is a strategic framework for the socio-economic transformation of the continent.

The Declaration of Alma-Ata, which hoped to achieve the goal of health for all, was signed way back in 1978 in Kazakhstan. There was barely any progress on this front, so the world met again in October 2018 at the same venue to renew the pledges. The Astana Declaration was signed. If Africa meets this, it would also meet the UHC target.

African health ministers adopted the updated regional strategy for the management of environmental determinants of human health on August 25, 2022, at the 72nd session of the WHO Regional Committee for Africa in Lomé, Togo. The new strategy for 2022-32 provides guidance to member-states on addressing health and environment linkages for achieving SDGs. It has been designed to promote synergies and coordination between the health and environment sectors recognised by the Libreville Declaration, 2008.

The strategy adopted includes key milestones and targets till 2027, as well as recommendations from the WHO manifesto for a healthy recovery from the COVID-19 pandemic. By 2030, at least 30 member-states should have developed their national framework for water safety plans as well as their health national adaptation plans, in views of climate impacts. In addition, health dimension would be included in Nationally Determined Contributions of all the member-states by 2027. The strategy adopted by the health ministers has recommended establishment of "One Health" platforms to promote understanding and management of inter-linkages between human, animal and environmental health. This is a significant intervention in view of rising

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zoonotic diseases in Africa.

Integrated assessments should be periodically undertaken to address ecosystem degradation and biodiversity loss, the authors of the strategy recommended. The strategy recognises a critical lack of air quality data in the region and suggests a promotion of air pollution monitoring and consolidation of its impact on human health. ■

PHOTOGRAPH COURTESY: UNICEF

SIDE EFFECTS

Climate change is exacerbating diseases in Africa

ON FEBRUARY 13, 2023, President Lazarus Chakwera of Malawi launched a national campaign that carried the gravity of a battle cry: "*Tithetse kolera* (End cholera)". He spoke from Mgona, one of the cholera hotspots in capital city Lilongwe, as patients were ferried to health centres. He declared that the landlocked southeastern African nation's immediate challenge was to reduce the fatality rate of the current cholera outbreak from 3.2 per cent to the global average of about 1 per cent by the end of the month. The acute diarrhoeal infection, caused by consuming food or water contaminated with the bacterium *Vibrio cholerae*, has been endemic to Malawi since 1998. Cases until now remained confined to the flood-prone southern districts, occurring usually during the rainy season of November-May. But the outbreak in 2022-23 was unprecedentedly protracted—it started in the southern district of Machinga in March 2022 and spread to all the 29 districts of the country by February 2023, infecting 36,940 people and killing more than 1,200, as per a February 9, 2023 update by the World Health Organization (WHO). "This is the deadliest

outbreak of cholera in the country's history," said WHO in a statement.

What makes the outbreak a matter of concern is that the current surge in cases comes after the country had managed to bring down cholera cases to just two in 2021. Analysts see a clear link between the uptick of cholera cases and the unprecedented monsoons, major floods and a succession of cyclones that have battered the country in the past one year. The outbreak started after three tropical storms hit southern Malawi one after the other. In January 2022, the once-in-half-a-century storm Ana hit the region, followed by tropical storm Dumako in February and cyclone Gombe in March. The region was flooded and over 1 million people were displaced, who took shelter in cramped tents in swampy areas without access to safe water and sanitation. This aggravated the situation.

Till August 2022, cholera was limited to the flood-affected districts, but spread to northern and central districts during the dry season. "This upsurge in the number of cases is being reported during the country's dry season when normally there is low or no transmission of cholera in Malawi," says a December 7, 2022 report by WHO. Malawi's secretary for health Charles Mwansambo said this unusual spread of cholera has been induced by climate change impacts. "Last year, we had tropical cyclones and floods that destroyed most of the water and sanitation facilities in the southern region, and this was the start of the current problem of cholera," Mwansambo was quoted as saying by Swiss non-profit Health Policy Watch. What aided in the transmission of the infection across the country, even during the dry season, are the usual factors like mass displacement due to conflicts, lack of basic water and sanitation facilities in most parts of the country, a highly mobile fishing community in the north and

Scientists say infectious diseases like cholera could in fact be a constant hazard for the entire continent of Africa, which is particularly vulnerable to extreme weather events. Evidence shows a significant link between climate change and rise in disease outbreaks

prevailing food crisis (estimates showed 20 per cent of the country's population could be experiencing "crisis" levels of food insecurity).

Ted Bandawe, director of the Mzuzu Central Hospital in the northern town of Mzuzu, says climate change was no doubt a risk factor for cholera due to increased rainfall and warmer temperatures. "High temperatures can cause increased levels of pathogen growth and spread, while increased rainfall can lead to flooding, which can compromise water sources and lead to more cases of cholera," Bandawe says. But such outbreaks are becoming widespread and deadlier due to increased frequency, intensity and duration of natural disasters. "These lead to displacement of large populations and overcrowding in camps, without sufficient supplies of clean water and food, leading to a perfect environment for disease outbreaks like cholera," says Bandawe, adding that climate-linked health emergencies are on the rise in Malawi.

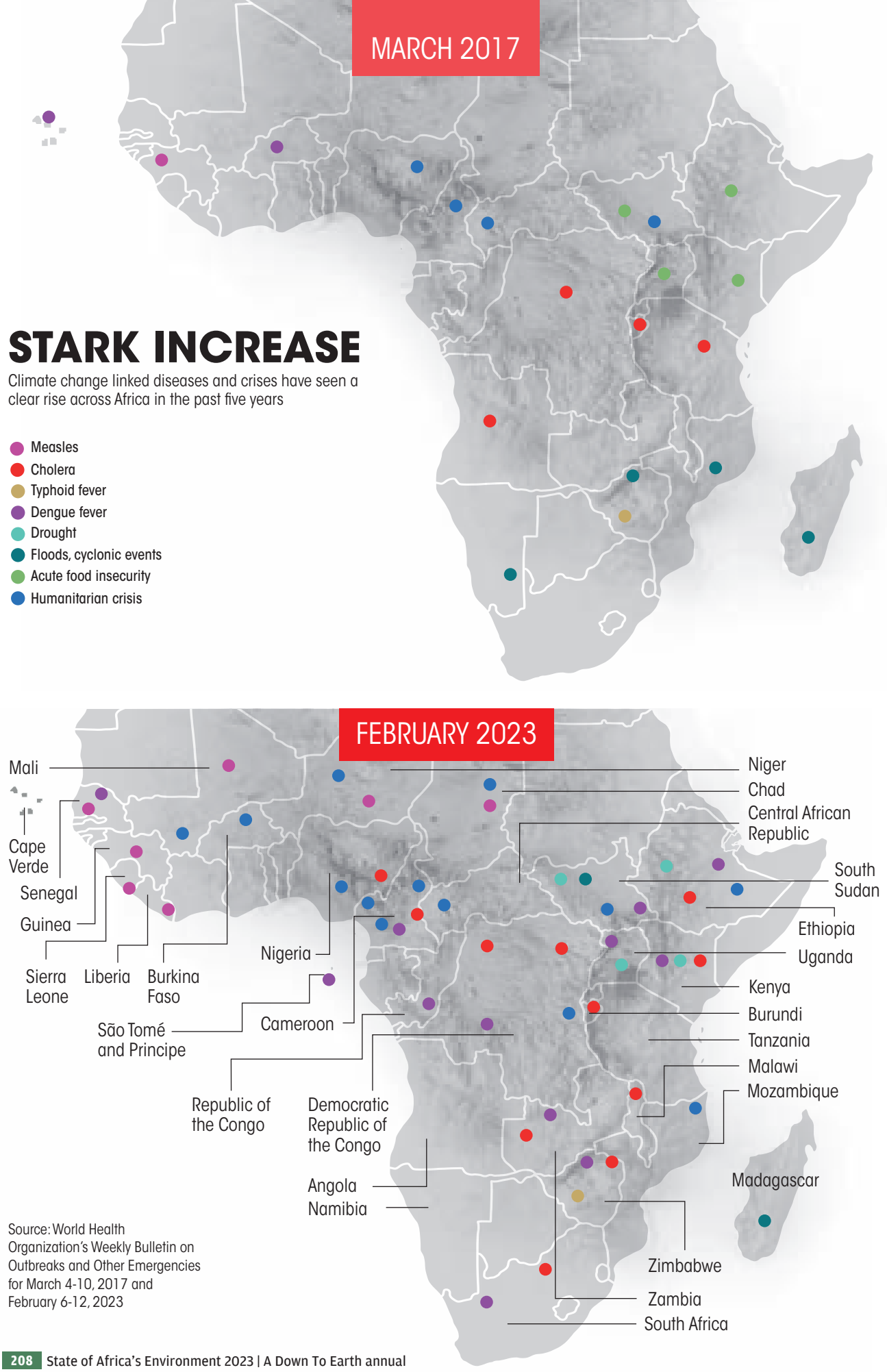
CONTINENTAL SCOURGE

Scientists say infectious diseases like cholera could in fact be a constant hazard for the entire continent of Africa, which is particularly vulnerable to extreme weather events. All forecasts, including that of the UN Intergovernmental Panel on Climate Change (IPCC), suggest that Africa is warming faster than the rest of the world on average. It will be warmer by 3.6°C by the time the world warms up by 2°C. Rainfall will decrease in northern and southern Africa, and increase in the Sahel region.

"Scientific evidence shows a significant link between climate change and the rise in disease outbreaks across the continent, especially vector-borne and water-borne ailments," says Githinji Gitahi, group CEO of global health non-profit Amref Health Africa. According to an April 2022 comprehensive and definitive assessment by WHO, climate-related health emergencies were on

STARK INCREASE

Climate change linked diseases and crises have seen a clear rise across Africa in the past five years



Source: World Health Organization's Weekly Bulletin on Outbreaks and Other Emergencies for March 4-10, 2017 and February 6-12, 2023

the rise in Africa. Of the 2,121 public health events in the continent in the two preceding decades, 56 per cent were climate-related. Waterborne diseases like cholera accounted for 40 per cent of the climate-related health emergencies; vector-borne diseases, notably yellow fever, accounted for 28 per cent of the climate-related health emergencies, while zoonotic diseases, specifically Congo-Crimean haemorrhagic fever, were the third most prevalent. In August that year, *Nature* published a study which said that 58 per cent (218 of 375) of infectious diseases faced by humanity have been at some point aggravated by climatic hazards. These include dengue, chikungunya, West Nile virus, Zika and malaria that are regularly reported by African countries.

To understand the growing prevalence of infectious diseases in a warming world, *Down To Earth* (DTE), an environment and science fortnightly published from Delhi, India, analysed WHO's weekly bulletin of outbreaks and other emergencies published between March 2017 and February 2023. The findings showed a significant rise in disease outbreaks during the five years. In the second week of February 2023, African countries reported 125 disease outbreaks. This was more than 2.8 times the outbreaks reported in the same period in 2018, when WHO registered 44 outbreaks in the continent. The increase was more than six times when compared with the first week of March 2017, when WHO registered 21 disease outbreaks. Climate change-linked outbreaks also increased—from almost four in a week in 2017 to about 11 a week in 2023.

Consider malaria, a mosquito-borne disease that has been afflicting the continent with unparalleled severity. Africa has the world's highest burden of the disease. According to WHO's "World Malaria Report 2022", some 96 per cent or 238 million of all cases and 98 per cent or 603,877 of all deaths due to the disease occurred in

A July 14, 2022 analysis by WHO shows that Africa had seen a 63 per cent rise in outbreaks of zoonotic diseases in 2012-22 compared to 2001-11. Uganda, for instance, had reported as many as 32 outbreaks of Ebola since 2000

Africa in 2021. Between 2017 and 2021, cases of malaria had risen by 17 per cent across the continent. Studies showed this spread was due to climate change-induced favourable conditions. Malaria epidemics often occur after periods of unusually heavy rainfall. In addition, warming in the east African highlands allows malaria-causing *Anopheles* mosquitoes to survive in higher altitudes.

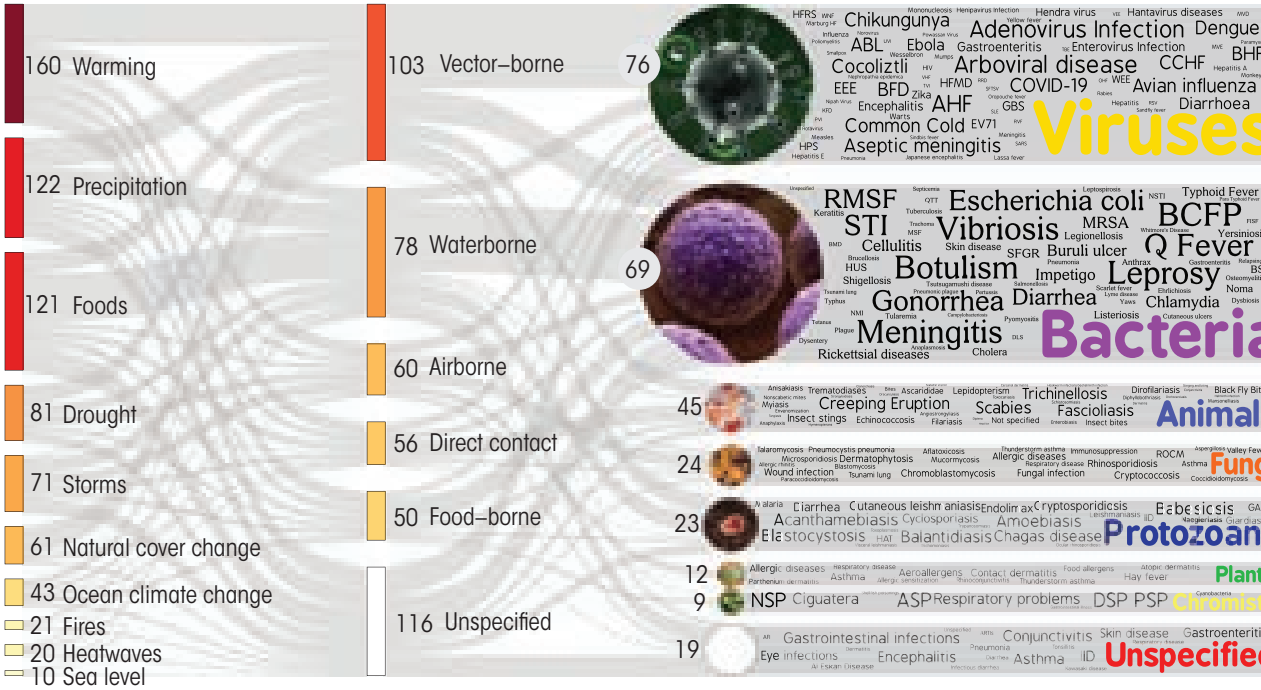
The mosquito expanded its range on the African continent, reaching higher elevations and moving southwards from the equator, aided by climate change in the last century, says a study published in the journal *Biology Letters* in February 2023. The researchers use datasets compiled by medical entomologists to track the observed range limits of African malaria mosquito vectors from 1898 to 2016. The researchers note that the changes in the range of the malarial vectors "would be consistent with the local velocity of recent climate change and might help explain the incursion of malaria transmission into new areas over the past few decades". The study says that, "If confirmed, the rapid expansion of *Anopheles* ranges—on average, over 500 km southward and 700 m uphill during the period of observation—would rank among the more consequential climate change impacts on African biodiversity that have been observed to date."

According to the researchers, malaria will spread into highland east Africa and expand at its southern limits (south of the Congo, towards the Cape), but the transmission will likely decrease as west and central Africa become prohibitively warm. As per an estimate by the Emerging Pathogens Institute, University of Florida, US, in the worst-case regional scenario of climate change, an additional 75.9 million people will be at risk from 10-12 months' exposure to malaria in eastern and southern Africa by 2080, with the greatest population at risk in eastern Africa.

Similarly, there has been a surge in cases of measles, a disease that can cause child deaths but is preventable by vaccine. Between January and March 2022, sub-Saharan Africa recorded

AGGRAVATED BY CLIMATE

More than half of known human pathogenic diseases can be aggravated by climate change



Pathogenic diseases aggravated by climatic hazards. A display of the pathways in which climatic hazards, via specific transmission types, result in the aggravation of specific pathogenic diseases. The thickness of the lines is proportional to the number of unique pathogenic diseases. The colour gradient indicates the proportional quantity of diseases, with darker colours representing larger quantities and lighter colours representing fewer. Numbers at each node are indicative of the number of unique pathogenic diseases. An interactive display of the pathways and the underlying data are available at https://camilo-mora.github.io/Diseases/. Several disease names were abbreviated to optimise the use of space in the figure. Credits: word clouds, WordArt.com; bacteria, Wikimedia Commons (www.scientificanimations.com; Source: "Over half of known human pathogenic diseases can be aggravated by climate change", published in *Nature Climate Change* in August 2022

a 400 per cent increase in measles cases. In March, South Africa declared an outbreak of the disease. Studies said that the virulence and survival of measles virus in air is mainly influenced by temperature and relative humidity. A study published in *Science News* in August 2020 stated that the measles cases were higher during the dry season.

ZOONOSES ALSO ON THE RISE

Another worrying trend because of climatic factors is the growing risk of zoonotic pathogens such as the novel coronavirus (SARS-COV-2 that causes COVID-19) that transmit from animals or birds and cause severe disease outbreaks in humans. A July 14, 2022 analysis by WHO shows that Africa had seen a 63 per cent rise in outbreaks of zoonotic diseases in 2012-22 compared to 2001-11. Uganda, for instance, had reported since 2000 as many as 32 outbreaks of Ebola, a viral haemorrhagic fever that commonly affects non-human primates like monkeys and gorillas. Of the 32 outbreaks, 19 were reported in the last decade, compared to 13 in the preceding one, as per a November 2022 WHO press release. The latest outbreak in 2022, which was declared over in January this year, has been termed the worst in two decades. The virus spread from the epicentre, Mubende district, to seven others by 2022.

Misaki Wayengera, a medical researcher and chairperson of Uganda's Scientific Advisory Committee at the Ministry of Health, says, "Factors such as increased human activity in natural habitats, population dynamics, and climate change are all involved. Increased encroachment

on natural habitats, mining, and logging create an interface between humans and animals, leading to a spillover event or species jump." For instance, bats and other animals that carry the virus move to places that happen to be human habitats after frequent droughts, often cited as a symptom of climate change.

LOW ON IMMUNITY

The burden of infectious diseases in Africa is only going to rise in a warming world. A combination of extreme weather events and resultant crises will force populations to flee homes, damage the crumbling water and sanitation infrastructure and exacerbate the prevailing food crisis. At the same time, climate change impacts are making people vulnerable to infectious diseases.

In 2000-09, every tenth Kenyan was hit by a natural disaster, as per "Climate risk management for Malaria Control in Kenya-The case of the western Highlands", a report released in 2013 by the International Institute for Sustainable Development. The impacts of climate change on health across Kenya, where over 80 per cent of the land is arid or semi-arid, are primarily in terms of direct mortality and injury from natural hazards and indirectly mediated through the environment, according to "Climate Change Impacts On Health: Kenya Assessment" a 2021 assessment report by International Federation of Red Cross and Red Crescent Societies. "About 970,000 children aged 6-59 months and 142,000 pregnant or lactating mothers in Kenya will likely suffer from acute malnutrition over the course of 2023 and are in need of treatment. This state of malnutrition among these vulnerable populations has compromised their immunity and increased their risk of exposure to disease," says Mohamed El Montassir, the Kenya Country Director of global non-profit International Rescue Committee. The drought situation in Kenya is getting worse, with over 5.3 million people currently facing famine and starvation, according to monthly data from Kenya's National Drought Management Authority.

The authority said in January 2023 that the number of affected people by December 2022 was 4.35 million, with livelihoods worth $1.5 billion lost last year alone. In fact, three countries in the Horn of Africa—Kenya, Ethiopia and Somalia—had entered the sixth consecutive rainy season with no rain, the UN High Commissioner for Refugees said in a statement on February 28, 2023. These countries have been experiencing an ongoing drought since late 2020. Millions of people had moved to relief shelters, while those left in villages scavenged for food and water. The trail of diseases was getting denser day by day.

According to WHO, climate emergencies accounted for 72 per cent of all recorded public health events in 2021. This was a significant increase than the 58 per cent recorded in 2011, according to Mary Stephen, a public health expert at WHO. While Africa has progressed significantly on its disease-control programmes, leading to a rise in overall life expectancy, the climate change-induced disease outbreaks would not just undo it but also add to the huge disease burden. "The foundation of good health is in jeopardy, with increasingly severe climatic events. Although the continent contributes the least to global warming, it bears the full consequences," said Matshidiso Moeti, WHO Regional Director for Africa. ■

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STILL NEGLECTED

More than 40 per cent of those affected by Neglected Tropical Diseases in the world live in Africa

AROUND 20 people have gathered at a grassy patch in front of a tin shed in Gitare village in Nakuru County, Kenya, to get treatment for cutaneous leishmaniasis (CL), a disease caused by a protozoa called *Leishmania* which passes from the rodent reservoir hyrax (*Procavia capensis*) to humans through sandflies. David Kamare, coordinator for disease surveillance for Neglected Tropical Diseases (NTDs) at Gilgil town in Nakuru and part of the team of clinicians at Gitare, begins treating 14-year-old John Nderitu. "If I start with the little children, there would be so much crying that it would be impossible for me to treat all the patients," he says.

The reason for the children crying becomes clear once treatment begins. CL manifests as scars on the skin, under which sodium stibogluconate (SSG) has to be injected—for a scar with a diameter of 3 cm, the syringe needle is injected around 10 times under the scar. The process is painful and blood flows out profusely. John Nderitu braves the pain only with his grit, as anesthesia is not available.

Nderitu is lucky that his illness was diagnosed early; the lesions on his skin developed in

August 2017, but his treatment began in March 2018 after his friends from school identified the disease. Others end up without treatment for years.

CL is a zoonotic disease. Young boys are more likely to catch the infection as they play near the rocky caves and go hunting in the forests. The rodent, hyrax, is found in the rocky region and the boys kill it for food. As they carry the animal home, sandflies that live on the animal transmit the pathogen from the rodent to the children. The area has witnessed massive deforestation, which too could have increased the contact between hyrax and people. "The animals form a part of our diet, and the government should spray insecticides in the area to kill the sandflies. But this rarely happens," says Leah Nyambura, chief of Gitare village.

LACK OF MEDICINES

Since June 2016, the team of clinicians identified 152 cases in Gitare. The health centre did not have enough medicines to treat the patients. They collected money among themselves to buy the syringes. "We have found that cryotherapy along with SSG is useful to treat CL, but we do not have any provision to administer this to patients," says Kamare. Cryotherapy would require sterile cold packs, which are not available.

CL does not get government attention, and Kenya does not even have guidelines or a treatment protocol. However, the country has guidelines for a related disease, visceral leishmaniasis (VL), which is also spread by sandflies. Here, the sandflies take over old termite hills and when children play around them, they contract the disease. This disease is common in Baringo County. "It is difficult to control the disease in places like Baringo as people migrate

A total of 20 diseases have been classified as Neglected Tropical Diseases, and estimates show that 40 per cent of the global disease burden of these has been reported from Africa

extensively and sleep in the open," said Samuel Chirchir, who used to work with the Kenya Medical Research Institute (KEMRI).

Josephat Kiptui, who purchased a house in Baringo, knew about the dangers of termite hills and was actively destroying them, but this did not help protect his seven-year-old daughter, Brigid, from contracting the disease. Diagnosis was difficult. First she was treated for malaria, and then tested for HIV, and it was only when the clinicians suggested that she be treated for pneumonia that Kiptui put his foot down and brought her to the only treatment centre in Baringo, the Kimalel Health Centre (KHC). Around 90 per cent of patients who were treated here were from East Pokot. More would have come, but the Pokot tribe in the region does not get along with the Tugen tribe that lives around KHC, and patients are averse to come there unless there is an emergency. "We are trying to improve the clinical infrastructure at East Pokot," says Richard Wamai, professor of Global Public Health at Northeastern University in Boston, Massachusetts, US. He and his team got funds from Probitas Foundation in Spain and Izumi Foundation in Japan to renovate the Chemolingot sub-county hospital and equip the laboratory.

"Awareness is important. That is why we have involved Kaperur, a community-based organisation, in the programme. The members refer patients to the health facility," says Elijah Plilan, public health officer at Chemolingot in Baringo. "We tell the nomadic population to carry their mosquito nets with them, check the area for sandflies, destroy old termite hills and build safe houses," he said. This would ensure that there is timely diagnosis and treatment of VL in the areas and help patients by reducing the cost of hospitalisation. "Most residents of East Pokot have the odds stacked against them. The sub-county is sparsely populated and highly marginalised. They are housed far away from administrative centres and government health personnel hardly visit this area," says Hellen Nyakundi, a public health specialist managing the Kala Azar project in East Pokot along with Wamai. "There is little focus on either CL or VL as the burden is not as high as diseases like malaria and HIV," says Damaris Matoke, senior research officer at KEMRI. "There are no special provisions to control the sandflies and people get protected indirectly

PHOTOGRAPH COURTESY: SCHISTOSOMIASIS CONTROL INITIATIVE

through the malaria programme under which treated bed nets and residual spraying is provided," said Matoke.

DISEASE BASKET

Along with CL and VL, a total of 20 diseases have been classified as NTDs, and estimates show that 40 per cent of the global disease burden of these has been reported from Africa. The World Health Organization (WHO)'s regional director for Africa, Matshidiso Moeti, says had sub-Saharan Africa eliminated NTDs by 2020, it could have saved almost US $52 billion in productivity over the next decade.

In Uganda, another neglected disease, schistosomiasis or bilharzia, is wreaking havoc. The disease is caused by a parasitic worm which spends a part of its lifecycle in snails present in the lakes and waterbodies. People exposed to this water or the fish that grows in it contract the disease and, in turn, shed the parasitic eggs in their faeces and urine. This then makes its way back into the lake, and the cycle starts again. "Bilharzia is human-made disease resulting from humans failing to observe hygiene in their surroundings," says Moses Adriko, programme officer in charge of controlling Bilharzia at Uganda's Ministry of Heath. The disease is endemic in 82 of Uganda's 127 districts and has affected 17 million people living around waterbodies and rice fields. A survey carried out under the Performance Monitoring and Accountability 2020 (PMA) by the Ministry of Health and Makerere School of Public Health and concluded in June 2018, that schistosomiasis affected three in 10 people in Uganda, with children between the age of 2 and 4 at the highest risk.

The disease can have a negative economic impact on households, particularly the poor, who do not have adequate resources to seek treatment. "Schistosomiasis is an urgent public health

problem in Uganda," explains Fredrick Makumbi, PMA 2020's principal investigator. "We must work together across the health, water and sanitation sectors to develop comprehensive solutions to combat the disease throughout the country." The Ministry of Health has provided medication to 44 districts where it was administered every year in schools and surrounding communities. The remaining districts has gotten medication after every two years because the problem was not acute there. The drug, Praziquantel, was provided by WHO.

Development organisations such as Beijing-based Sinoc Investment company, UN Children's Fund (UNICEF) and Save the Children Fund have also tried to sensitise the communities to keep the environment around the lakes clean. Simon Kaddu, district health officer, said this intervention could help to eradicate other diseases like cholera too. Adriko explained that there was a possibility of eliminating the disease by 2030 because of the steps undertaken by the ministry to generate awareness.

WHO notes that 47 African countries have already eliminated at least one NTD as a public health problem. Key milestones in 2022 included Togo, which became the first country to eliminate four NTDs, namely Guinea-worm disease, elephantiasis, sleeping sickness, and trachoma. In the same year, trachoma was eliminated in Malawi, and Guinea-worm disease in the Democratic Republic of the Congo.

When it comes to NTDs, good news such as the elimination of lymphatic filariasis in Togo, trachoma in Ghana and Guinea worm disease in Kenya are rare. The London Declaration—signed by countries endemic to NTDs and other stakeholders in January 2012—pledged to control or eliminate 10 NTDs by 2020 and then the Expanded Special Project for Elimination of Neglected

47 African countries have already eliminated at least one Neglected Tropical Disease as a public health problem. Key milestones in 2022 included Togo, which became the first country to eliminate four such diseases

Tropical Diseases (ESPEN) too planned to eliminate NTDs in Africa by 2020. These neglected diseases have been given traction in the Sustainable Development Goal 3 (SDG) 3 on "Good Health and Well-being", which has set the target for elimination by 2030. This would mean a 90 per cent reduction in the number of people contracting NTDs by 2030.

NTDs have been termed as the litmus test for attaining Universal Health Coverage (UHC). However, the link is not direct. The index to monitor progress in UHC has been developed, but this does not include progress in control of NTDs. Recently, researchers from WHO offices in Geneva and Congo developed an index which can be compared with the UHC Index to see if the countries which are likely to meet the UHC target are doing well in the NTD sector too. The results show that this theory did not hold true. For example, in 2015, South Africa did not provide preventive chemotherapy for schistosomiasis and soil-transmitted helminthiases, but the UHC service coverage index suggested that South Africa was the best performing country in the African region.

There are countries like Ghana, Malawi, Sierra Leone and Senegal where the NTD index exceeded the UHC Index and researchers assumed that it was possible that medicines and treatment were being provided independently by other health agencies. It would be good if these systems are looked at to deliver other essential services to the poor, says a study published in *The Lancet Global Health* on September 1, 2018.

"Achieving the SDGs simply cannot be done without eliminating NTDs," says Moeti. However, there is hope both for Kenya and Uganda in the future. "There is high level commitment to eliminate these diseases and we have a well-coordinated plan to ensure that all poor people get the treatment," says Sultani Matendechero, manager of the National Neglected Tropical Diseases Program in Kenya. "We should not call them neglected tropical diseases. We do not want to neglect them anymore," adds Matendechero. ■

PHOTOGRAPH COURTESY: UNICEF

A GENERATION INTERRUPTED

Children born during the pandemic might be the next development challenge for the world, Africa specifically

IT IS a different world for the 256 million children born during 2020-21. In a pre-COVID-19 scenario, their parents would have been relieved to bring them into a world where the current average human life expectancy is around 82 years. "At the start of 2020, more children were living to see their first birthday than at any time in history. Child mortality had fallen by 50 per cent since 2000. Maternal mortality and child marriages were on the decline and more girls were going to and staying in school than ever before," says Henrietta Fore, executive director of the UN Children's Fund (UNICEF). One could argue that those 256 million children would have indeed inherited a planet better suited for human life in comparison to a decade ago—had they not been born in the shadow of COVID-19. The pandemic

had dashed this generation's hope of a better future.

The COVID-19 pandemic caused a massive collapse in human capital—the knowledge, skills, and health that people accumulate over their lives—at critical moments in the life cycle, primarily affecting children and young people in underdeveloped and developing countries, according to a report by the World Bank. The development of millions in low- and middle-income countries had been derailed, according to the first analysis of global data on young people who were under the age of 25 at the onset of the pandemic. The report, "Collapse and Recovery: How COVID-19 Eroded Human Capital and What to Do About It", analysed global data on the pandemic's impacts on young people at key developmental stages: early childhood (0-5 years), school age (6-14 years) and youth (15-24 years). Today's students could lose up to 10 per cent of their future earnings due to COVID-19-induced education shocks. The cognitive deficit in today's toddlers could translate into a 25 per cent decline in earnings when these children are adults, World Bank has found. Due to the pandemic, preschool-age children in multiple countries have lost more than 34 per cent of learning in early language and literacy and more than 29 per cent of learning in mathematics compared to pre-pandemic cohorts. In many countries, even after schools had reopened, preschool enrollment had not recovered by the end of 2021; it was down by more than 10 percentage points in multiple countries. Children also faced greater food insecurity during the pandemic.

COVID-19 also dealt a heavy blow to youth employment, the paper has found. Forty million people who would have had a job in the absence of the pandemic did not have one

The COVID-19 pandemic caused a massive collapse in human capital at critical moments in the life cycle, primarily affecting children and young people in underdeveloped and developing countries

at the end of 2021, worsening youth unemployment trends. Youth earnings contracted by 15 per cent in 2020 and 12 per cent in 2021. New entrants with lower education will have 13 per cent fewer earnings during their first decade in the labour market, the report found. Evidence from Brazil, Ethiopia, Mexico, Pakistan, South Africa, and Viet Nam shows that 25 per cent of all young people were neither in education, employment, nor training in 2021.

Human capital is key to unlocking a child's potential and enabling countries to achieve a resilient recovery and strong future growth, says a press note by World Bank. "The pandemic shuttered schools and places of employment and disrupted other key services that protect and promote human capital, such as maternal and child health care and job training."

The pandemic and school closures threatened to wipe out decades of progress in building human capital, World Bank Group President David Malpass states in the press release. "Targeted policies to reverse the losses in foundational learning, health, and skills are critical to avoid jeopardising the development of multiple generations," he says. The window for addressing setbacks in human capital accumulation is small, as gaps in the early stages of the life cycle tend to widen over time, the statement added. Without urgent action, the pandemic also threatens to deepen poverty and inequality.

When COVID-19 broke out in late 2019, the entire focus of healthcare administrators and scientists was on adults and older population who were more vulnerable to the viral infection; children were considered to be the least affected by it. According to the World Health Organization (WHO), between December 30, 2019 and October 25, 2021, children under the age of five accounted for just 2 per cent of the total global cases and 0.1 per cent of deaths; those in the age group of 5-14 years accounted for 7 per cent of cases and 0.1 per cent of deaths. But in just a few months, the pandemic began to show its myriad impacts on children which will have a lasting effect on their health, education and ability to earn.

As the "World Inequality Report 2022" by Paris-based research initiative World Inequality

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Lab says, those born today will grow up in a world that is extremely unequal in terms of access to wealth and income. Data with the UN Children's Fund (UNICEF) and UK-based non-profit Save The Children projects that, as of December 2021, the proportion of children living in multidimensional poverty in developing countries—measured in terms of monetary hardship and deprivation in one or more life aspects such as education, health, housing, nutrition, sanitation and water—has increased to 52 per cent from 46-48 per cent pre-pandemic. This means that in less than two years, an additional 100 million children have plunged into poverty. The data further shows in least developed countries, including a majority of African nations, multidimensional child poverty has increased to 56 per cent from 48 per cent in 2019—meaning, 40 million more children in these countries are now poor. Before the pandemic, in 2019, some one billion children worldwide experienced at least one of the deprivations.

Global organisations have also noted alarming health concerns among children. Recent data from UNICEF and WHO shows that over 23 million children missed essential vaccines in 2020. Almost 13 per cent of adolescents (10-19 years) now struggle with poor mental health. Children's nutrition status has also taken a hit during the years of the pandemic. In September 2021, UNICEF noted in a report that two in every three children between six months and two years did not receive the nutrition needed for healthy growth. In December that year, the organisation stated that even though malnutrition had seen a decline in recent years, in 2020 the pandemic resulted in an additional 50 million children suffering from wasting (low weight for height), the most life-threatening form of the condition. Earlier in June 2021, WHO estimated that 149 million under-five children became stunted (low height for age) in 2020.

It would take seven to eight years of concerted efforts to bring this pandemic generation back to the pre-COVID-19 level. The importance of this generation comes from the fact that by 2040, it will account for 46 per cent of the workforce in a country like India

"The increase in the number of undernourished [children] was more than five times greater than the highest increase in undernourishment in the last two decades," the UN Food and Agriculture Organization says in a statement from July 2022.

Education has also suffered with lockdowns keeping children out of classrooms. In 2020, at the peak of the lockdowns across the world, some 1.5 billion students were out of school, estimates the UN Educational, Scientific and Cultural Organization. This learning loss, now termed "learning poverty", is estimated to incur a US $10 trillion loss in lifetime earnings, says the World Bank.

According to estimates of various UN agencies, it would take seven to eight years of concerted efforts to bring this pandemic generation back to the pre-COVID-19 level. The importance of this generation comes from the fact that by 2040, it will account for 46 per cent of the workforce in a country like India. The latest global Human Capital Index (HCI), prepared by the World Bank, says the pandemic generation will be the worst victim of the event. HCI measures "the human capital that a child born today can expect to attain by her 18th birthday". This includes the health and education entitlements of a newborn now and how it would impact his or her future productivity. Its analysis shows the adult generation of 2040 would be stunted; left behind in terms of human capital and might well be the toughest development challenge for the world.

Economic impacts of the pandemic would devastate this generation the most, including the foetus in utero, for the simple reason that a poor household will not spend much on health, food and education. According to HCI estimates, child mortality will increase by 45 per cent in 118 low- and middle-income countries. As the recovery gets underway, poor and developing countries lag behind rich ones. The impacts would be much higher among children of these countries. ■

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THE MAGIC BULLET'S TOLL

Antibiotic resistant diseases are undoing the great strides in modern treatment in Africa

WHAT IF a saviour turns into a killer? After 80 years of use, overuse and abuse of antibiotics—termed magic bullets—microbes have become resistant to them. Antibiotic resistant diseases are undoing the great strides in modern treatment. A pan-Africa analysis brings out this new scourge – the antimicrobial resistance.

Limited access to resources and erratic use of antimicrobials has magnified the antimicrobial resistance (AMR) infections in Africa, according to a new study by the African Union. AMR accelerates due to the misuse and overuse of antimicrobials in humans, animals and crops. Only five of the 15 antibiotic-resistant bacteria listed by the World Health Organization (WHO) as priority pathogens are being tested in the continent, stated the study published on September 15 2022.

Some 34 uncategorised antibiotics were also found to be in circulation in 14 African countries, increasing the risk of AMR infections. Only 1.3 per cent of the 50,000 laboratories across sub-Saharan Africa perform bacteriological testing. Failure to test priority resistant pathogens translates to substandard healthcare, where antimicrobials are irrationally used to treat infections.

Some 12 African countries have high drug resistance index scores, indicating the impact of rising AMR. A score higher than 25 per cent is of significant concern, while 12 countries scored at least 50 per cent. Only four drugs — amoxicillin, doxycycline and combinations of sulfamethoxazole or trimethoprim and ciprofloxacin — comprised more than two-thirds of all the antibiotics used, according to the data from the 14 Mapping Antimicrobial Resistance and Antimicrobial Use Partnership (MAAP) countries.

More potent medicines to treat more resistant infections such as — severe pneumonia, sepsis and complicated intra-abdominal infections — were unavailable. It suggests limited access to some groups of life-saving antibiotics. Erratic consumption of unrecommended combinations of antibiotics was also cited by the researchers. Some 3.4 per cent of the total antibiotic consumption across the 14 countries is from the combinations which are not recommended by the WHO. The bulk of the medicines used in this case was a mixture of ampicillin and cloxacillin.

The antibiotics listed on the national essential medicine lists were not in line with the WHO's list, the researchers noted. The medicines used in these countries were often not aligned with the national essential medicine lists. Some 34 uncategorised antibiotics in circulation are not

Some 34 uncategorised antibiotics were also found to be in circulation in 14 African countries, increasing the risk of AMR infections. Only 1.3 per cent of the 50,000 laboratories across sub-Saharan Africa perform bacteriological testing

included in the national essential medicine lists. Some 88 per cent of the 180,000 samples tested had no information on patients' clinical profiles, while the remaining 12 per cent had incomplete information. "Across Africa, even where data on antimicrobial resistance is collected, it is not always accessible. As a result, health experts cannot develop and deploy policies that would limit AMR," said Nqobile Ndlovu, CEO of the African Society for Laboratory Medicine.

Three pathogens — Enterobacterales, Staphylococcus Aureus and Pseudomonas Aeruginosa — are of immediate concern in sub-Saharan Africa. Enterobacterales are a large order of different bacteria that commonly cause infections in healthcare settings. Staphylococcus Aureus is the leading cause of skin and soft tissue infections such as — abscesses (boils), furuncles and cellulitis. Pseudomonas is a type of bacteria found in soil and water.

Africa has the highest mortality rate from AMR infections globally, with 27.3 deaths per 100,000 attributable to AMR, according to a Lancet study. Antimicrobial resistance is one of humanity's top 10 global public health threats. Some 4.1 million people across Africa could be dead by 2050 if action is not taken to resist the resistance, according to the WHO. The MAAP carried out a multi-year, multi-country study. MAAP is the first initiative to systematically collect, process and evaluate large quantities of antimicrobial resistance and antimicrobial consumption data in Africa. MAAP reviewed 819,584 AMR records of 205 laboratories from 2016-2019. They belong to Burkina Faso, Ghana, Nigeria, Senegal, Sierra Leone, Kenya, Tanzania, Uganda, Malawi, Eswatini, Zambia, Zimbabwe, Gabon and Cameroon. MAAP also reviewed data from 327 hospitals and community pharmacies and 16 national-level datasets on antimicrobial consumption in 14 African countries.

A CONTINENT-WIDE INFLICTION

In rural and urban markets of Nigeria, antibiotics are sold openly and without any prescription by hundreds of vendors such as Sadiq Abdullahi in Kpana Market in Utako district of Abuja.

CLIMATIC SPIKE

A warming planet will induce the development of antibiotic resistance

CLIMATE CHANGE is a new trigger for antibiotic resistance. Global warming is increasing the pace of reproduction in bacteria and leading to development of resistance. Researchers from the University Medical Center in Göttingen, Germany, conducted a 30-country observational study on six-year prevalence of carbapenem-resistant Pseudomonas aeruginosa, Klebsiella pneumoniae, multidrug resistant E coli, and Methicillin-resistant Staphylococcus aureus and found that these were more prevalent during the warm-season mean temperature. "These results reveal two aspects: climatic factors significantly contribute to the prediction of AMR in different types of healthcare systems and societies and climate change might increase AMR transmission, in particular carbapenem resistance," the researchers said at the European Congress of Clinical Microbiology and Infectious Diseases in Amsterdam, the Netherlands in April 2019.

Earlier, a study published in *Nature Climate Change* in May 2018 established this link. Epidemiologists from USA and Canada found higher local temperatures correlated with a higher degree of antibiotic resistance in common bacterial strains. They looked at antibiotic prescription rates and found that increased rate of prescriptions were associated with increased antibiotic resistance across all pathogens investigated. They then compared this database to local temperatures and found a strong correlation between higher local average minimum temperatures and antibiotic resistance. Increase in local average minimum temperature by 100 C were found to be associated with 4.2, 2.2 and 3.6 per cent increase in antibiotic resistant strains of E coli, K pneumoniae, and S aureus, respectively. "Warmer temperatures induce the development of antibiotic resistance by spurring enzymatic activity inside bacterial cells, which leads to increase in bacterial populations. Higher temperatures also aid the transmission of resistance genes among bacteria and increase bacterial-animal interactions for nutrients
which allows new resistant strains to propagate," says Jyoti Joshi, Head-South Asia, Center for Disease Dynamics, Economics & Policy, New Delhi. Notably,
both climate change and antimicrobial resistance are listed among the top 10 global health threats by the World Health Organization.

Abdullahi sells antibiotics like amoxicillin, ciprofloxa cin, metronidazole, penicillin and clindamycin. It's an open, hot and filthy outlet. People crowd his shop as he sells these antibiotics at prices much lower than those of the registered pharmacy. Vendors like Sadiq Abdullahi do not ask customers for prescriptions and sell any amount of antibiotics, disregarding treatment guidelines. Abdullahi sources his drugs from sellers based on the outskirts of Abuja. But these medicines do not even have the mandatory codes for verification of the country's National Agency for Food and Drug Administration. Despite his lack of medical qualification, Abdullahi is willing to sell antibiotics to Jumai Abdullahi, a young woman who believes—without medical diagnosis—that she is suffering from typhoid. She represents what is emerging as one of the major reasons for abuse of antibiotics—self-medication. But self-medication is only one of the many ways antibiotics are being misused and this is leading to resistance in microbes. More than 70,000 people are dying across the world each year due to infectious diseases that have become resistant to antibiotics—the only line of treatment that could have saved their lives. By 2050, the death count will increase to 10 million each year, as much as those killed in the Rwandan genocide—one of the bloodiest in history. Since the development of antibiotics in the 1940s, these drugs have been used extensively. But over the years, the world is using them indiscriminately and inappropriately. Even low- and middle income countries matched or surpassed consumption in high-income countries between 2000 and 2015. Attempts to combat this resistance only end up throwing new problems. It impacts our overall development agenda now, like the United Nations' Sustainable Development Goals (SDG) which the world needs to meet by 2030. For example, SDG 1 relates to ending poverty, but this is unlikely as antibiotic resistance (ABR) or antimicrobial resistance (AMR) is striking the poor the most and they have to bear the high cost of treating resistant bacterial infections. Similarly, at stake is the SDG 2 to end hunger. Untreatable infections in food animals are threatening food security. To

achieve the SDG targets, the world has decided to focus on the poorest countries in Africa and Asia. Unfortunately, it is in these continents that antibiotic misuse is rampant. People in Ghana too abuse the magic bullets. Ibrahim Ahmed, a resident of Wa Municipality in the Upper West Region, grinds tablets of penicillin and mixes it with honey. He feeds this mixture to his three children during the peak of the harmattan, a season that occurs between November and March, when children suffer from cough due to the dry and dusty wind. There is also a practice where people break open a capsule and sprinkle its content over a wound to avoid infections instead of taking it orally. In Zambia's capital Lusaka, when Friday Malimakau gets a cold, he goes to the pharmacy where the pharmacist recommends antibiotics, antihistamines and antacids. Malimakau has been doing this for as long as he can remember. Similarly, Melody Malawo, also a resident of Lusaka, gets antibiotics whenever she feels feverish. "When I go to a hospital, they too give me antibiotics. So now I just go to the nearest pharmacy to save time," says Malawo. Bad as the situation might be in Africa, India too fares poorly. A Drug Resistance Index (DRI) developed by researchers from Center for Disease Dynamics, Economics & Policy (CDDEP), Washington and Rollins School of Public Health, Emory University, Georgia was used to track global trends in effectiveness of antibiotic therapy in 41 countries in 2018. The result showed that high-income countries had the lowest DRIS and low-income and middle income countries had high DRIS. Among the 41 countries, India was the worst performer.

Pressures for a profitable yield with a quick turnover have led to a record increase in global antibiotic consumption—131,109 tonnes in 2013, which is likely to increase by 52 per cent in 2030

CONSUMPTION IS RISING

Other than misuse by humans, antibiotics are used in rearing animals and to protect plants from diseases. Pressures for a profitable yield with a quick turnover have led to a record increase in global antibiotic consumption—131,109 tonnes in 2013, which is likely to increase by 52 per cent in 2030, according to research by CDDEP. This is far more than antibiotics used in humans. South Africa, along with its BRIC partners (Brazil, Russia, India and China), has shown the largest percentage increase in antibiotic consumption this decade. Import data for antimicrobials between 2014 and 2015 estimates procurement for animal health at 23 to 36 per cent and for human use between 74 and 77 per cent. These figures were published in South Africa's first national Surveillance for Antimicrobial Resistance and Consumption of Antibiotics Surveillance Report in November 2018.

Antibiotics are being misused in other ways too. Victor Yamo of the World Animal Protection in Kenya explains how in dairy farming, antibiotics are being misused to treat mastitis—inflammation of the mammary gland—instead of following animal husbandry practices. Instead of cleaning the cowsheds, farmers use large amounts of antibiotics to prevent diseases. Reportedly, dairy farmers also use antibiotics to increase the shelf life of milk. Abubakar Bala Mohammed, who has spent 25 years in veterinary practice in Abuja, says that farmers use antibiotics without consulting professionals, and in many cases, they mix three to five antibiotics in the water and give it to animals. Dooshima Kwange of the Department of Veterinary and Pest Control Services, Federal Ministry of Agriculture and Rural Development, predicts another scarcity scenario. Nigeria's population will reach 400 million by 2050. Kwange says there will be more pressure on livestock production to ensure food is available to everyone. Though not much is known about the use of antibiotics in cultivation of crops in India, many are used for this purpose. India's Directorate of Plant Protection, Quarantine & Storage has approved the use of two antibiotics—streptomycin and tetracyline—in plants. However, instead of being used only to treat bacterial diseases, they are often mixed with pesticides and used liberally on even healthy plants.

BACTERIAL INFECTIONS CAUSED MOST DEATHS IN SUB-SAHARAN AFRICA IN 2019

The region saw 230 deaths per 100,000 people; just 5 pathogens caused over half the infection deaths globally

SUB-SAHARAN Africa saw the greatest number of deaths due to bacterial infections in 2019, with 230 deaths per 100,000 people, a recent study found. The analysis found that common bacterial infections were the second-leading cause of death in 2019. Of the 33 bacterial pathogens studied, five were responsible for more than half of the deaths. However, the deadliest bacterial pathogens and types of infection varied by location and age, the study said. Around 13.7 million infection-related deaths were reported in 2019. The study was published in the medical journal *The Lancet* November 21, 2022, by the team of Global Burden of Disease (GBD) 2019 antimicrobial resistance collaborators. This is one of the first studies to present comprehensive global estimates of deaths associated with 33 bacterial pathogens across 11 major infectious syndromes. Deaths associated with the 33 bacterial pathogens comprised 13.6 per cent of all global deaths and 56.2 per cent of all sepsis-related deaths in 2019. The Central African Republic saw the highest age-standardised mortality rate, with 394 deaths per 100,000 people.

Age-standardised mortality rate is a weighted average of the age-specific mortality rates per 100 000 people, where the weights are the proportions of people in the corresponding age groups of the World Health Organization standard population.

Years of life lost (YLL) is a measure of premature mortality that takes into account both the frequency of deaths and the age at which it occurs. The substantial YLL associated with these bacteria in sub-Saharan Africa magnifies the burden of infections in the region compared with other areas. Of 13.7 million infection-related deaths, 7.7 million deaths in 2019 were associated with the 33 bacterial pathogens, both resistant and susceptible to antimicrobials, estimated in this study. Meningitis and other bacterial central nervous system infections; cardiac infections; peritoneal and intra-abdominal infections and lower respiratory infections and all related infections in the thorax were some of the infectious syndromes studied.

The study also looked at bacterial infections of the skin and subcutaneous systems; infections of bones, joints, and related organs; typhoid, paratyphoid, and invasive non-typhoidal Salmonella; diarrhoea; urinary tract infections and pyelonephritis; bloodstream infections; and gonorrhoea and chlamydia. Among the investigated bacteria, five leading pathogens — staphylococcus aureus, escherichia coli, streptococcus pneumoniae, klebsiella pneumoniae and pseudomonas aeruginosa — were responsible for 54.9 per cent of deaths.

The study pointed out that even though more than half of bacterial deaths were caused by one of these five pathogens, only S pneumoniae has been the focus of global surveillance and public health initiatives. Infectious diseases like human immunodeficiency virus/ acquired immunodeficiency syndrome (HIV/AIDS), tuberculosis and neglected tropical diseases have their own sustainable development goal (SDG) indicators(SDG 3.3). They also have substantial global public health investments like The Global Fund to Fight AIDS, Tuberculosis and Malaria.

However, the bacterial pathogens mentioned in the study and with a greater fatal burden were not a major focus of any global public health initiatives.

The deadliest infectious syndromes and pathogens varied by location and age, the study said. Age-standardised mortality rate associated with these bacterial pathogens highest in sub-Saharan Africa. The region sees 230 deaths per 100,000 people, but the number dips to 52.2 deaths per 100,000 population in high-income areas.

S aureus was the leading bacterial cause of death in 135 countries and was also associated with the most deaths in individuals older than 15 years globally. Among children younger than five years, S pneumoniae was the pathogen associated with the most deaths.

In 2019, more than 6 million deaths occurred as a result of three bacterial infectious syndromes. Lower respiratory infections and bloodstream infections caused more than 2 million deaths each and peritoneal and intra-abdominal infections caused more than 1 million deaths.

Deaths associated with these bacteria would rank as the second leading cause of death globally in 2019, the study said, when compared with GBD Level 3 underlying causes of death. Hence, they should be considered an urgent priority for intervention within the global health community, the study urged. Strategies to address the burden of bacterial infections would include infection prevention, optimised use of antibiotics, improved capacity for microbiological analysis, vaccine development, and improved and more pervasive use of available vaccines.

Every year November 18-24 is observed as World Antimicrobial Awareness Week (WAAW). Global estimates showed that in 2019, nearly five million human deaths worldwide were associated with bacterial antimicrobial resistance, of which 1.3 million human deaths were directly attributable to bacterial AMR.

The consequence of this indiscriminate use is that the environment is accumulating antibiotic residues. In China, antibiotics are finding their way into the foodchain through waste products. More than 50,000 tonnes of antibiotics ended up being absorbed in the water and soil, found the Guangzhou Institute of Geochemistry of the Chinese Academy of Sciences. The average concentration of antibiotics in Chinese rivers was about 303 nanograms per litre, compared with nine nanograms in Italy, 120 nanograms in the US, and 20 nanograms in Germany. These levels are much higher than AMR industry alliance's safe standards—20-32,000 nanogramme per litre, depending on the antibiotic.

Data from surveillance systems shows an interesting picture of antibiotic use in China. The level of antibiotics in the waterways of the populous eastern region was six times higher than concentrations in the central and western regions. Southern regions consumed much more antimicrobials than those in North China. Reason: warmer temperatures in the South led to more outbreaks of diseases compared to north China's colder climate.

An assessment of antibiotic pollution in rivers across the world shows similar scenarios. Researchers from University of York tested samples from 711 sites in rivers of 72 countries across six continents for the presence of 14 antibiotics. Antibiotics were found in 65 per cent of the samples. In Bangladesh, the antibiotic metronidazole was found to be 300 times the safe level. Trimethoprim, an antibiotic used to treat urinary tract infections, was found at 307 of the 711 sites tested. Ciproflaxacin frequently exceeded safe levels, surpassing the safety threshold at 51 places. The team found that safe limits were most frequently exceeded in Asia and Africa—primarily in Bangladesh, Kenya, Ghana, Pakistan and Nigeria. "Our data shows that antibiotic contamination of rivers could be an important contributor to AMR," says Alistair Boxall of the York Environmental Sustainability Institute.

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Constant presence of antibiotics in the environment leads to resistance. The revenge of the bug on human health is already visible in Nigeria, where epidemics of meningitis and inflammation of brain tissue are quite common. While meningitis can be caused by viral and fungal pathogens, three predominant bacteria— Neisseria meningitidis, Haemophilus influenzae b and Streptococcus pneumoniae— are responsible for more than 70 per cent of bacterial meningitis cases. Even after mass vaccination campaigns using a conjugate vaccine, MenAfriVac, the National Centre for Disease Control's (NCDC) report in December 2019 shows about 2,770 suspected cases. Garba Iliyasu, an infection disease expert at the Aminu Kano Teaching Hospital and a Lecturer at the Department of Medicine, College of Health Sciences, Bayero University Kano says that the major challenge with meningitis is the increasing resistance to penicillin. Antimicrobial Use and Resistance in Nigeria: Situation Analysis published in 2017, says that 30.8 per cent of all N meningitidis isolates, 66.7 per cent of H influenzae isolates and 45.2 per cent of S pneumoniae isolates were resistant to penicillin. Iliyasu says that this resistance is making it difficult for the poor to access the treatment. In Nigeria, resistance is not limited to meningitis. Adefolarin Opawoye, an infection diseases expert at the Aminu Kano Teaching Hospital in Kano, North western Nigeria, says cases of resistant to antibiotics are growing in hospitals and some patients are resistant to all the available antibiotics in the country. In patients who get infected by organisms that produce Extended Spectrum Beta Lactamases (esbl), drugs like ciprofloxacin and augmentin no longer works. “Then you have to move on to much more powerful substitutes like piperacillin-tazobactam and meropenem. The cost of drug treatment alone rises to 100,000-150,000 Naira ($260- $420),” he says. Cases of antibiotic-resistant Urinary Tract Infections (UTIS) caused by bacteria which produce ESBL is one of the leading causes of clinic visits by women in Nigeria. According to the 2017

PHOTO COURTESY: WHO

AMR country report, 63 studies on UTIs conducted in 26 States and Abuja showed that the pathogens were resistant to all drugs commonly prescribed for UTI in the country. Resistance rates were highest for ampicillin and cotrimoxazole where most organisms show 100 per cent resistance. In Zambia too, Jereme Kanika, a pharmacist says most of the antibiotics especially the first line drugs like penicillin are now failing to work on the patients because of being abused the most. "When penicillin fails to work on a patient, we introduce them to a more strong and expensive antibiotic," he said. Other than the cost of newer antibiotics, the extended periods of treatment too takes its toll on the patients. In Uganda, Joy (name changed) who lives is Wobulenzi, Luwero District in Central Uganda contracted an UTI from a dirty toilet. "The infection was itchy and painful and I bought some tablets from the pharmacist, but they didn't work on me and I changed medication. This time, I was given an ointment that I had to insert and some tablets. I got well but it took seven months," she says.

In Uganda there are reports which show that antibiotics are becoming useless. A study Antimicrobial-Resistant Infections among Postpartum Women at a Ugandan Referral Hospital published in 2017 shows that at the Mbarara Regional Referral Hospital, of the 25 UTIs studied, nine of 11 (82 per cent) caused by Enterobacteriaceae tested positive for ESBL production (and therefore multi drug resistant) and 17 out of 22 (77 per cent) were resistant to ciprofloxacin, one of the most sought-after antibiotic to treat bacterial and fungal infections. Alex Owusu-Ofori, head of the Clinical Microbiology Unit of the Komfo Anokye Teaching Hospital in Kumasi in the Ashanti Region of Ghana, says that about 70 per cent of the most common bacteria that cause urinary tract infections are resistant to the commonly-used antibiotics in some hospital. Patients with resistant infections remain sick for longer periods, stay longer in hospitals, pay more for their treatment and are more likely to get complications and die. Multi-drug resistant cases of tuberculosis are common and a cause for concern, says Angela Ama Ackon, deputy director, Ghana's Ministry of Health.

South Africa, like many other countries, has entered a post-antibiotic era, according to Marc Mendelson, chair of South Africa's Ministerial Advisory Committee on amr. Mendelson sees doctors struggling to treat pneumonia and infections of the urinary tract, bloodstream, skin and soft tissue, all caused by bacteria. Things are worse in Kenya as a study published in *PLOS* in February 2019 reveals. Researchers analysed 624 samples collected from Kenyatta National Hospital, situated in Nairobi, and found AMR rates higher than local and international reports. Eveylne Wesangula, a member of the Pharmaceutical Society of Kenya, says there is not much data available on AMR and no action can be taken without data. Wesangula says the Ministry of Health has rolled out a surveillance strategy that will recruit 28 hospitals as sentinel surveillance sites by 2022. This will help the process of collecting and analysing data at the national level. Before this, a study published in BMC Infectious Diseases in 2017 had shown that prevalence of antibiotic resistance in Africa was comparable with the rest of the world, but information is not available for 42.6 per cent of the countries in the continent.

South Africa, which reported its first case of MDR-TB before 2000, has found success in shorter treatment protocols. Usually, MDR-TB patients have to undergo treatment for 24 months, but South Africa has shifted to new oral drugs which translate to shorter, injection-free treatment of nine months. According to Norbert Ndjeka, director of drug-resistant TB, TB and HIV, in South Africa's department of health, 67 per cent of MDR-TB patients are now treated successfully compared to 40 per cent a decade ago. South Africa has also adopted decentralised healthcare since 2011 for TB patients. Now patients can access diagnoses and treatment close to where they live, and even receive it at their homes. "These days only very sick, bedridden patients or those who react badly to medication are admitted to TB hospitals," says Jacques Cronje, medical manager of Sonstraal TB hospital in Paarl, a town in the Western Cape province.

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Most countries in Africa started working on AMR only after WHO's intervention. In November 2016, an AMR coordinating body was set at the Nigeria Centre for Disease Control (NCDC). In January 2017, the "One Health" AMR Technical Working Group was launched to conduct a situation analysis on AMR and the NCDC developed the Antimicrobial Resistance National Action Plan (AMR-NAP). Inweregbu Stella of NCDC says the government conducted a situation analysis in 2017 and found there was no AMR laboratory surveillance system, no dedicated funding to control AMR and limited collaboration among the health, animal-health and environmental health sectors on AMR. Since then, NCDC has established nine surveillance sites to begin collection of AMR data. Zambia too has prepared an elaborate Multisectoral National Action Plan, which was launched in November 2017. One of the focus areas of Zambia's nap is to collect high quality data on the prevalence of AMR and drug resistant infections and on the use of antimicrobial medicines in humans and animals. The Zambia National Public Health Institute, the technical disease intelligence arm of the ministry of health is establishing a national public health laboratory network that will further improve the ability to monitor AMR. "We have mounted a very effective surveillance system, which at hospital level, routinely collects specimens to check how effective our drugs are to the various diseases," says Kennedy Malama, permanent secretary, Ministry of Health. This has already yielded results as data shows that while there is resistance to some antibiotic drugs in one part of the country, the same drug continues to be effective in other parts. The country has also strengthened the surveillance system through the Zambia National Health Strategic Plan (2017-2021), which

PHOTO COURTESY: WHO

has proposed that laboratory services will be set in hospitals and health centres across the country. Additionally, the Ministry of Health also provides point of care testing to the rest of the health centres and some health posts as part of the National Biomedical Laboratory Strategic Plan 2018- 2022. The country has also put in place systems to monitor the environment. Ghana launched its National Action Plan in 2017, which will ensure collaboration between various ministries. The policy and action plan regulates efforts to improve awareness and knowledge of AMR; provide evidence-based knowledge to reduce the burden of AMR; reduce the occurrence of infections in establishments; optimise the use of antimicrobials in animal and human health; and, create an enabling environment for sustainable investment in AMR reduction. To back the implementation of the AMR policy, President Nana Akufo-Addo has asked the Ministry of Health and the Attorney-General Department to move selected aspects of the policy into legislation. Some of the features in the policy could become legislation and this may include rules regarding prescribing of antibiotics and good laboratory practices and restricting the use of antibiotics in animal husbandry. This action according to Angela Ama Ackon, deputy director, Ministry of Health is a display of high level of commitment by the government to combat the threat of AMR in the country.

The Interagency Coordination Group (IACG) on Antimicrobial Resistance was set up in 2016 by the UN to formulate a blueprint to fight against antimicrobial resistance. It recommended a "One Health" response in April 2019 to deal with the problem. One Health approach keeps humans, animals, the foodchain, the environment, and the inter-connectedness between them as one entity while taking step to fight the problem. Under this, while the countries will need to ensure that those who need antimicrobials, vaccines and diagnostics should not be deprived, at the same time, their use for growth promotion in animals and agriculture has to be phased out. The group also recommended that funds should be made available to increase innovation in new antimicrobials, diagnostics, vaccines and waste management tools. In 2018, an assessment

of NAPs by IACG pointed out that more than formulating action plans, implementation is a challenge, especially in resource-constrained settings of low- and middle-income countries. The group identified the major challenges in implementation—lack of awareness and political will, finance, coordination, monitoring and data and technical capacity. To ensure implementation, IACG suggested that interventions must be mainstreamed into broader health, agricultural and environ mental projects. Availability of funds is also crucial for the success of the NAP. Moreover, increased regional cooperation is essential for the effective implementation of NAPs. The world has taken a multipronged attack on AMR. In May 2018, the Global Antimicrobial Resistance Research and Development Hub was launched during the 71st session of the World Health Assembly to help countries decide the allocation of resources for R&D on AMR by identifying gaps and overlaps. It will also promote coordination among governments in the fight against AMR. In June 2019, FAO, OIE and who launched the AMR Multi-Partner Trust Fund to scale up efforts to support countries to counter the threat of AMR. The AMR Trust Fund has a five-year scope (through 2024) and has received an initial contribution of US $5 million from the Government of the Netherlands. The immediate funding requirement is US $70 million, which will provide technical support to countries designing naps and scale up local action. To achieve this, countries could also modify their NAPs based on learning from within and outside the country. The Centre for Science and Environment, a New Delhi based non-profit,

Evidence of the rampant misuse of antibiotics is overwhelming. The question is how to ensure that medical practitioners and people know what is "right" for their health. We should ensure that doctors do not over-prescribe; people do not misuse

is working with the Zambian government to improve implementation of their NAP. It has helped the country to reprioritise nap based on current ground level scenario, implementation progress and available resources. It also provides an understanding of how each sector—human health, animal and environment—perceive each activity and what timeline each would prefer to implement them. The two stakeholders have also worked on AMR surveillance. A five-year roadmap to phase-out anti biotic misuse in food-animal sector, particularly non-therapeutic antibiotic use and use of critically important antibiotics in therapeutic applications has been developed as well.

Evidence of the rampant misuse of antibiotics is overwhelming. The question is how to ensure that medical practitioners and people know what is "right" for their health. We should ensure that doctors do not over-prescribe; people do not misuse.

An opportunity lies in SDGs. The environmental dimensions that support AMR are part of SDGs. Though antibiotic resistance has not been given adequate attention in SDGs, course correction is underway. In 2019, who proposed to track two priority pathogens in bloodstream infections, namely E coli and Staphylococcus aureus to serve as sentinels of progress. This indicator connects the Monitoring and Evaluation Framework put together by WHO, FAO and OIE. This indicator is part of SDG 3(d), which is to strengthen the capacity of countries for early warning, risk reduction and management of national and global health risks. While using AMR as an indicator to track progress on SDGs is an important stepping stone, we must keep in mind the fact that only 10 years are available for efforts to take effect on the ground. However, the very fact that there are multiple areas in the SDGs where action on AMR can take place is an opportunity. ■

ISTOCK PHOTO

CRISIS OUT IN OPEN

The economic cost of poor sanitation and hygiene accounts for more than 5 per cent of gross domestic product of many countries in Africa

THE BURDEN of eradicating the scourge of open defecation has shifted to sub-Saharan Africa from India after the recently published report by the WASH Institute showed that there had been a huge drop in open defecation in India. Around 196 million of the 494 million people practising open defecation in the world are from sub-Saharan Africa, according to the Joint Monitoring Programme (JMP) report released on Water, Sanitation and Hygiene (WASH) by the World Health Organization (WHO) and Unicef on July 1, 2021. The recent JMP report also states that sub-Saharan Africa lacks access to safe sanitation. About a billion people in the region lack safely-managed sanitation. The report also

states that half of the 771 million people still lacking even basic drinking water services in 2020 lived in sub-Saharan Africa. Majority of the population in sub-Saharan Africa lacks access to basic sanitation. According to UNICEF, the use of improved facilities that are not shared with other households is 'Basic Sanitation'.

There has been a reduction in open defecation to 18 per cent from 32 per cent in the countries of sub-Saharan Africa. But this has been replaced majorly by unimproved and limited sanitation which increased to 50 per cent from 45 per cent. According to the definition of the JMP report, the use of improved facilities that are shared with other households is 'limited sanitation'. According to UNICEF, these are again not safe sanitation practices. Communities usually tend to go back to open defecation if they adopt such unsafe sanitation practices.

The rural areas of these countries, where the most number of people reside, show the same pattern. Usage of improved sanitation facilities that are not shared with other households and where excreta are safely managed and treated offsite is "Safely Managed Sanitation". Open defecation in rural areas of sub-Saharan Africa decreased from 47 to 27 per cent. But unimproved and limited sanitation increased to replace it. Disposal of human faeces in fields, forests, etc or with solid waste is "Open Defecation", according to the JMP 2021.

A report released by Delhi-based non-profit Centre for Science and Environment, New Delhi, titled "Tanzania-State of Sanitation" states that the majority of the population in

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Tanzania uses pit latrines without washable slabs in rural areas where 70 per cent of its population resides. This unimproved sanitation practice in Tanzania not only leads to ground water contamination but also causes serious health problems. According to WHO and UNICEF, the use of pit latrines without a slab or platform, hanging latrines or bucket latrines is known as "Unimproved Sanitation". The Demographic Health Survey of Tanzania shows a prevalence of diarrhoea among children aged less than 6 years to those aged 6 months. The practice of unimproved sanitation also leads to economic losses of $7.1 million annually. Since early 2000, the country has been working on promoting safe sanitation and its recent development plans talk of improved sanitation. Tanzania has identified that there is a need to understand safe toilet technologies and options for management of faecal sludge both through capacity building and legal framework. Just like Tanzania, other countries need to put their act together to reach SDG 6.

Poor faecal sludge management and sanitation caused 115 deaths per hour from excreta-related diseases in Africa, according to a joint study by the UN Environment Programme and the International Water Management Institute, an international research organisation.

The report, titled "Fecal sludge management in Africa: socio-economic aspects, human and environmental health implications", was released on World Toilet Day in 2020 (November 19). The day is observed every year to raise awareness about the 4.2 billion people living without access to safely managed sanitation. Faecal sludge is a mixture of human excreta, water and solid substances such as toilet paper or other cleansing materials as well as menstrual hygiene materials that are disposed of in pits, tanks or vaults of on-site sanitation systems. Faecal sludge contains a high number of microorganisms originating from faeces, many of which are pathogenic. Direct and indirect contact with untreated faecal sludge poses a significant health risk.

Some 300 million of the two billion people lacking basic sanitation facilities globally live in Africa. Access to sanitation facilities remains a challenge for urban populations in many sub-Saharan African cities, particularly for people living in poor peri-urban areas. The report noted that poor faecal sludge management also contributed to huge economic losses in Africa. The analysis found that sustainably managing faecal sludge in Africa was hindered by a number

KATHERINE ANDERSON / WSSCC

of factors. These included population growth and urbanisation, over-reliance on financial aid for construction of treatment plants, low revenue generation from users of treatment facilities, poor operation and maintenance and inefficient institutional arrangements for faecal sludge management. It also said African countries should make direct investments to very poor households, in order to achieve the UN-mandated Sustainable Development Goal 6: Water and sanitation for all by 2030.

African Heads of State committed to five new Presidential Compacts or commitments at the United Nations 2023 Water Conference in New York City on March 23, 2023. The pledges were one of several potentially game-changing commitments on the penultimate day of the conference that could equip countries with data on the state of their water resources. The vision behind the move — that took place in the global event's second session — is to accelerate access to water and sanitation services, which includes increasing budget allocations, reducing open defecation and delivering climate-resilient services.

The announcement took place at a meeting hosted by the Netherlands, a co-host of the UN Water Conference. UNICEF, the UN-hosted Sanitation and Water for All global partnership (SWA), and think-tank IRC WASH were other conveners of the meeting. Presidents Sahle-Work Zewde of Ethiopia, Nana Addo Dankwa Akufo-Addo of Ghana, George Manneh Weah of Liberia, Yoweri Kaguta Museveni of Uganda and Emmerson Dambudzo Mnangagwa of Zimbabwe together committed to the five Presidential Compacts.

Ethiopia, in east Africa committed to revise its loan policy and directives to accommodate loan access for water and sanitation for businesses and consumers. It will also strengthen accountability among water and sanitation stakeholders (policymakers, service providers and the community) and development partners by establishing a strong accountability framework which aligns with the ONEWASH National Programme. Ghana in west Africa pledged to establish a National Sanitation Authority, reduce inequalities in water and sanitation services,

particularly in poor and rural communities, and make Ghana's cities some of the cleanest in Africa. Liberia, also in the west of the continent, will increase access to basic sanitation by ending open defecation, as well as create a unifying monitoring mechanism at all governance levels (national, county, district, and community) to improve institutional coordination. Uganda, in the Great Lakes region, committed to increase public financing for water, sanitation and hygiene (WASH). Zimbabwe, in the south of the continent, will create a State of Emergency on Water and Sanitation which will trigger budget and coordination prioritisation.

These commitments found support from the former four entities. Catarina de Albuquerque, CEO of SWA said: "We are so pleased and encouraged to see these government leaders stepping up, committing, prioritising water and sanitation at the highest levels and taking action and accountability for the human rights to water and sanitation." She added that "the only way to make sustainable change is through the political prioritisation at the highest level that we see here today. SWA commits to mobilise our more than 350 partners to support and learn from these Presidential Compacts."

COST MATTERS

Improved sanitation comes with a high price tag. Many of Africa's relatively prosperous countries find it unaffordable. Take Kenya for example, which aims 100 per cent coverage of safe water and basic sanitation services by 2030. For this, it annually requires US $12.9 billion for water supply, US $4.8 billion for sewerage, US $601 million for basic sanitation and 57 million for basic hygiene. "But, the government budget available for sanitation is only 6.5 per cent," said Vincent Ouma, of the Kenya Water and Sanitation Civil Societies Network (KEWASNET), a national network of water civil society organisations in Kenya.

Going by WHO, unimproved sanitation facilities do not help hygienically—as excreta is not separated from human contact—and, hence, pose health risks. In Sub-Saharan Africa, most people depend on unimproved facilities that belong to the apartheid era—uncovered pit latrines

Technology options are also limited. According to the Kenya Demographic and Health Survey (2014), over 60 per cent of rural households rely on non-improved sanitation facilities. Different agencies work to promote viable toilet designs. "Most of the toilets are dry pit toilets. The efficacy of such toilets lies in its reusable nature. But due to the lack of acceptance among people for faecal matter to be used as manure, the user usually shuts it down and builds a new toilet or calls the companies to clean it up. The management of faecal matter is our top concern," said Janet Muse, head, wash Hub, a dedicated cell of Ministry of Health, Kenya. "The EcoSan Promotion Project is one such pilot project which was implemented in the areas of Nyanza, Western and North Eastern provinces. Despite health, sanitation and economic benefits, this toilets model had very low acceptance among rural households," added Janet.

Plan Kenya introduced CLTS in Kenya in May 2007. The idea had instant acceptance. In 2010, Ministry of Public Health and Sanitation embarked a pilot project in the six districts of Nyanza and Western Kenya. Later, the ministry adopted CLTS as a key strategy at national level. This led to the launch of the Open Defecation-Free (ODF) Rural Kenya Campaign in May 2011. But, meanwhile, it lost the tempo. A study published in East African Medical Journal on assessment of CLTS in rural areas, concluded that it failed to result in open defecation free status as expected. The study cited inadequate monitoring of the process, inadequate funds and conflicting work demands of government officials as the reasons. In 2014, there were only 3,131 certified ODF villages of the 11,641 villages. "Counties need constant support to develop legislations, policies and effectively utilise available financial resources and channelise more resources," said Kimanthi Kyengo, director, Ministry of Water and Irrigation.

PHOTOGRAPH COURTESY: UNICEF

THE HEALTH COST

African women and children are bearing the brunt of the continent's sluggish pace in sanitation, with health, nutrition, education, gender equality and poverty reduction being at stake. The situation is dismal in Sub-Saharan Africa where countries have not attained safely managed sanitation services and are still at the basic services level, according to the UNICEF. The scenario is no better in East Africa where over half the people in informal settlements live in unsanitary conditions. At present, in this region there is no country with more than 68 per cent access to adequate sanitation. Rwanda appears to be the only one to achieve this percentage and above. Despite commitments by several governments and the United Nations' recognition of sanitation as a basic human right, it still remains neglected. At the current rate of progress, universal access to safely-managed sanitation, the aim of the Sustainable Development Goals (SDGs), won't be achieved until 2107—77 years behind schedule.

The knock-on effects of poor sanitation are considerable. According to a study done by Lixil Corporation, which specialises in water and housing products, global research firm Oxford Economics and the UK-based WaterAid, lack of proper sanitation costs the global economy a staggering US $222.9 billion annually. Of this, mortality rate accounts for $122.8 billion, medical treatment $56.6 billion, lost productivity $16.5 billion and the time spent on finding a toilet $27 billion. Africa accounted for about $19.3 billion of this total cost after the launch of the SDGs, of which about 75 per cent came from sanitation-related deaths. In many countries, the economic cost of poor sanitation and hygiene amounts for more than 5 per cent of their gross domestic product.

The problem is particularly acute in Sub-Saharan Africa. The region, as the name suggests, lies south of the Sahara desert and has been an area of concern for global communities as its countries and island states are among the poorest and least developed in the world; half of the region's population live on less than a dollar a day. Estimates show that the region is home to about one-fourth of those defecating in the open worldwide. On an average, these people spend some 2.5 days worth of time in a year trying to find a private location to defecate, according to a 2012 assessment of 18 countries by the World Bank under its Water and Sanitation Program (WSP). This results in losses to the tune of US $500 million a year to these countries, which account for half of the population in the continent. Women shoulder a huge proportion of this cost as they spend additional time finding a safe place for urination or accompanying young children or sick or elderly relatives to relieve themselves.

What's bizarre is most countries that have witnessed improvement in reducing open defecation have done so by providing unimproved means of sanitation. JMP data shows that at the beginning of the MDG period, some 32 per cent people in Sub-Saharan Africa defecated in the open. The figure fell by 9 per cent by 2015. During these 15 years, the figure for those practising unimproved sanitation increased from 29 to 31 per cent. Going by WHO, unimproved sanitation facilities do not help hygienically—as excreta from is not separated from human contact—and, hence, pose health risks. In Sub-Saharan Africa, most people depend on unimproved facilities that belong to the apartheid era—uncovered pit latrines, buckets and even plastic bags. ■

7 WATER

HIGHPOINTS

Africa's aquifers hold 0.66 million km³ of water. This is more than **100 times** the annual renewable freshwater resources stored in dams and rivers

In sub-Saharan Africa **400 million** people don't have access to safe drinking water

Adult females and children in sub-Saharan Africa spend **40 billion** hours a year collecting water

Africa loses **5%** of its GDP every year due to water scarcity

PHOTOGRAPH: RIVONALA RAZAFISON

ON WATER

In Africa, people spend 40 billion hours a year collecting water

MADAGASCAR, THE world's fourth-largest island, located just across the Mozambique Channel from the coast of mainland Africa, became notoriously known in late 2021 as the country where water had become more expensive than food, particularly in its drought-hit southern regions. This situation continued in 2022. In Madagascar's southernmost Androy region, 20 litres of water were priced at 2,000-4,000 Malagasy ariaries (US $0.46-91)—almost half the daily salary of a poor peasant—outside the regional capital city of Ambovombe, according to local businessperson Tsimanaoraty Paubert. Many in Madagascar's capital Antananarivo and its suburbs risked their lives to access water for basic human needs. "I hardly sleep at night. I have to stay awake till midnight in order to collect water at the drinking fountain near my home," said local photojournalist Hervé Leziany.

Water had become a luxury in his neighbourhood located in the western suburbs of the country's main city, and was only available between 11 pm and 2 am. In the eastern suburbs of Antananarivo, some woke up at 1-2 am to fetch water at the only community-managed well on

a downhill marsh, which local residents had been visiting for years. "The stock is not sufficient for everyone. If you are late, you have to wait for the water level in the facility to rise again before getting the chance to fill up your cans. The well dries up quickly and takes hours to replenish itself," said Fetra R. The 25-year-old man and his wife had, for months, ensured water for households out of the state-owned electricity and water company Jirama's clients' network. They earned 500 ariaries for every 20 litres they delivered, against 300 ariaries previously. They intended to scale up their price given the challenges they were facing amid the mounting water scarcity. "I intend to set the price at 700 ariaries if the problem continues."

Water unavailability had pushed upset students at the Antananarivo University campus to take to the streets and clash with the police in November 2021. Social media users, for their part, constantly showed their anger at the government. The company Jirama was accused of being unable to deliver quality service. Its water appears to be unsafe, observed civil society organisations who voiced their concerns about the soaring socioeconomic hardships and precarious conditions across the island. Many tried to avail water for domestic purposes in whatever way they could, mostly from the insalubrious water sources in Antananarivo's plains and elsewhere. Day and night, those having cars collected stagnant water from riverbanks kilometres away from the city. People in rural areas did the same, using carts, motorcycles, bicycles and any other means of transport they could avail. Meanwhile, farmers, especially rice growers, were on alert. "The same quantity could be obtained at 500 ariaries ($0.11). But the resale results in the water's price rise at the final consumers' level," a source said. Thus, the poorest travelled outside the town to collect water from puddles that formed on the road after the rare times that it rained.

The drought and water scracity across Madagascar, one of the world's poorest countries,

Drought and water scarcity across Madagascar, one of the world's poorest countries, appears paradoxical. Available renewable water resources were said to be among the highest in the world, according to estimates from 2016

appeared to be paradoxical. Available renewable water resources in the country averaged at 23,057 cubic metres per capita annually from 2001 to 2013 and were 13,169 cubic metres in 2013, according to the outcome of the World Bank-funded natural capital accounting presented in 2016. Such indices were said to be among the highest in the world. According to a government document, the country annually receives 809 billion cubic metres of rainfall when the surface flow is estimated at 258 billion cubic metres and the stock is 28 billion cubic metres. Madagascar's national water assets are made of 21 billion cubic metres of surface water and 0.106 billion cubic metres of groundwater. Tailwater comprises about 6 billion cubic metres of surface water and 6.6 billion cubic metres of groundwater.

"The current disruption in the water resource availability in Madagascar is due to a significant shift in the water cycle. The issue is being frequently felt in the highlands," said Herinjanahary Ralaiarinoro, head of the hydrology unit service within the country's meteorology department. "The rainy season has become shorter than before. While the heavy showers fall in January, it stops raining in March" he added. This short time, he explained, was not enough for the aquifers to be fed. "A shortened wet season means prolonged drought. The water availability declines by April and this continues until the next rainy season, which is delayed year after year because the low rate of atmospheric humidity affects cloud formation," said Ralaiarinoro.

The water scarcity is likely to amplify in the future. "Like in 2019-20, the country experienced a prolonged dry season in 2022 related to the La Niña phenomenon in the Pacific Ocean. The rainfalls were delayed. The onset of the rainy season was somewhat dry," said Mamiarisoa Anzèla Ramarosandratana, head of the climate adaptation section within the meteorology department. She added that the current prolonged drought was the logical continuation of the low rainfall registered in 2019-20 and 2020-21. For these years, Madagascar received only around 60 per cent of its usual average rainfall, the lowest in 30 years. "This would furthermore accentuate the

AFRICA'S AQUIFERS HOLD MORE THAN 20 TIMES THE WATER STORED IN THE CONTINENT'S LAKES, BUT THEY AREN'T THE ANSWER TO WATER SCARCITY

Due to changing climate and growing population, many of Africa's surface water resources like dams and rivers are overused and slowly depleted

GAATHIER MAHED

DISCOVERIES OF aquifers—underground earth formations that hold water—often create excitement around their ability to ease water scarcity in a region.

For instance, about 10 years ago, a large aquifer was discovered in Kenya's Turkana region. This is one of the hottest, driest parts of Kenya and it frequently suffers from drought. The government claimed that the aquifer could supply the entire country with water for 70 years. More recently, the US announced the discovery of five aquifers in Niger, one of Africa's most water-scarce countries, containing over 600 billion cubic metres of water. To put it into perspective, Egypt's current water demand is 114 billion cubic metres of water per year.

These are welcome announcements. Due to a changing climate and the increasing demands of a growing population, many of Africa's surface water resources, like dams and rivers, are under strain. They are being overused and slowly depleted.

Alternative water sources, like aquifers, need to be explored. Based on Africa's geology, we know aquifers are highly prevalent across the continent. But, as a groundwater and aquifer expert, I want to highlight that they are not always going to help address water scarcity. For instance, early research findings deemed Kenya's Turkana aquifer water unfit for use due to high salinity.

It's important to bear these challenges in mind so that expectations can be managed. It is also useful for planners and governments, as they need to think of other ways around the water scarcity problem.

AFRICA'S AQUIFERS

The volume of groundwater held in African aquifers is estimated to be 0.66 million cubic km. This is more than 100 times the annual renewable freshwater resources stored in dams and rivers, and 20 times the freshwater stored in Africa's lakes.

The size and shape of an aquifer is based on the body of rock beneath the Earth's surface. Some can be in the form of caves and hold water on a large scale. Some can range from a few metres to hundreds of metres in thickness, with multiple layers. Aquifers can also extend for many kilometres or be localised in certain areas.

Water gets into these aquifers in different ways. Some are filled by new rainfall, others hold old, or ancient, rainfall. In Africa, most are found less than 50 metres below the ground's surface.

Many of Africa's aquifers are spread across country borders, meaning countries have to share the water resource. The largest volumes of groundwater in Africa are found in large aquifers in Libya, Algeria, Egypt and Sudan. There are various ways to tap into aquifers, including hand-dug wells, drilled wells and boreholes, and natural springs.

TAPPING INTO THE GROUNDWATER

Some countries have already taken steps to tap into aquifers. South Africa has two massive aquifers. The largest stretches from Cape Town to Gqeberha, a city 750 km away. This geological formation covers a surface area of 37,000 square km and ranges in thickness from 900 metres to 4,000 metres. The other big one is the Cape Flats aquifer. It is estimated that by 2036, almost 5 billion South African rand (about US $274 million) will have been invested to tap these aquifers. They will yield about half of the amount of water in the Berg River dam, which provides almost 20 per cent of Cape Town's supply.

Another large aquifer on the continent, containing only ancient trapped water, is the Nubian Sandstone in North Africa. It covers about 2 million square km and spans Libya,

Egypt, Sudan and Chad. It contains more than 150,000 cubic km of groundwater—more water than the Nile River discharges in 500 years. The countries it spans are tapping into the aquifer and have agreed on its fair use.

Libya has undertaken the Great Man-Made River project to pipe water hundreds of kilometres from the Nubian sandstone to the coast by means of gravity flow.

CHALLENGES IN USING AQUIFERS

But aquifers are not a silver bullet. There are many factors to consider when using them as a water source:

Distance: The distance between the aquifer and where the water is needed can be an obstacle. In some places, this distance is covered by women carrying buckets and walking for many kilometres. Construction of pipelines and infrastructure can be costly.

A related challenge is the depth required to drill for groundwater, which can incur great costs. A type of X-ray is done of the surface to confirm whether there are groundwater resources worth exploiting, and then there is the expense of a drilling rig.

Water quality: Water quality in an aquifer is not always good. Sometimes it is polluted by human activity; sometimes the water takes on characteristics of the surrounding material in the ground.

An example is outside Gqeberha, which has one of the largest drilled wells in the Southern Hemisphere. It yields about 100 litres per second. Unfortunately, the iron content of the water is above the required standards. It has to be treated before it is drinkable.

Unsustainable groundwater use: Overpumping is becoming common in certain areas, especially cities. Cape Town and Nairobi are reporting hundreds of well points being drilled for residents to use. Cases of wells drying up and water levels dropping rapidly have been reported in places.

Industrial activity, agriculture and chemical leaks can also affect groundwater quality.

Overpumping can also cause seawater to get into groundwater. The more dense seawater migrates to replace the freshwater removed from an aquifer. This has devastating implications for the storage capacity of the aquifers as well as the overall groundwater quality. It has been seen in certain coastal aquifers. Saline intrusions are very difficult to address.

Meeting water needs: Despite these concerns, aquifers have the capacity to provide some water in almost all parts of Africa. Groundwater is part of the solution to water scarcity, but not the entire solution. It should be used in a way that keeps it available long into the future.

(Gaathier Mahed is senior lecturer in Nelson Mandela University, Port Elizabeth, South Africa; Courtesy: The Conversation)

water scarcity in 2021-22," warned Ramarosandratana.

The government had, through Jirama, launched cloud-seeding operations to cope with the drought-induced water scarcity. "We have conducted over 30 operations since November 2021," Miakadaza Harinjaka Randriamahandry, a meteorological technician, said in January 2022. Localities in the Malagasy highlands areas benefited from the initiative. Days ahead of Christmas, it rained in Antananarivo. However, in just a few days the high temperature without rains returned.

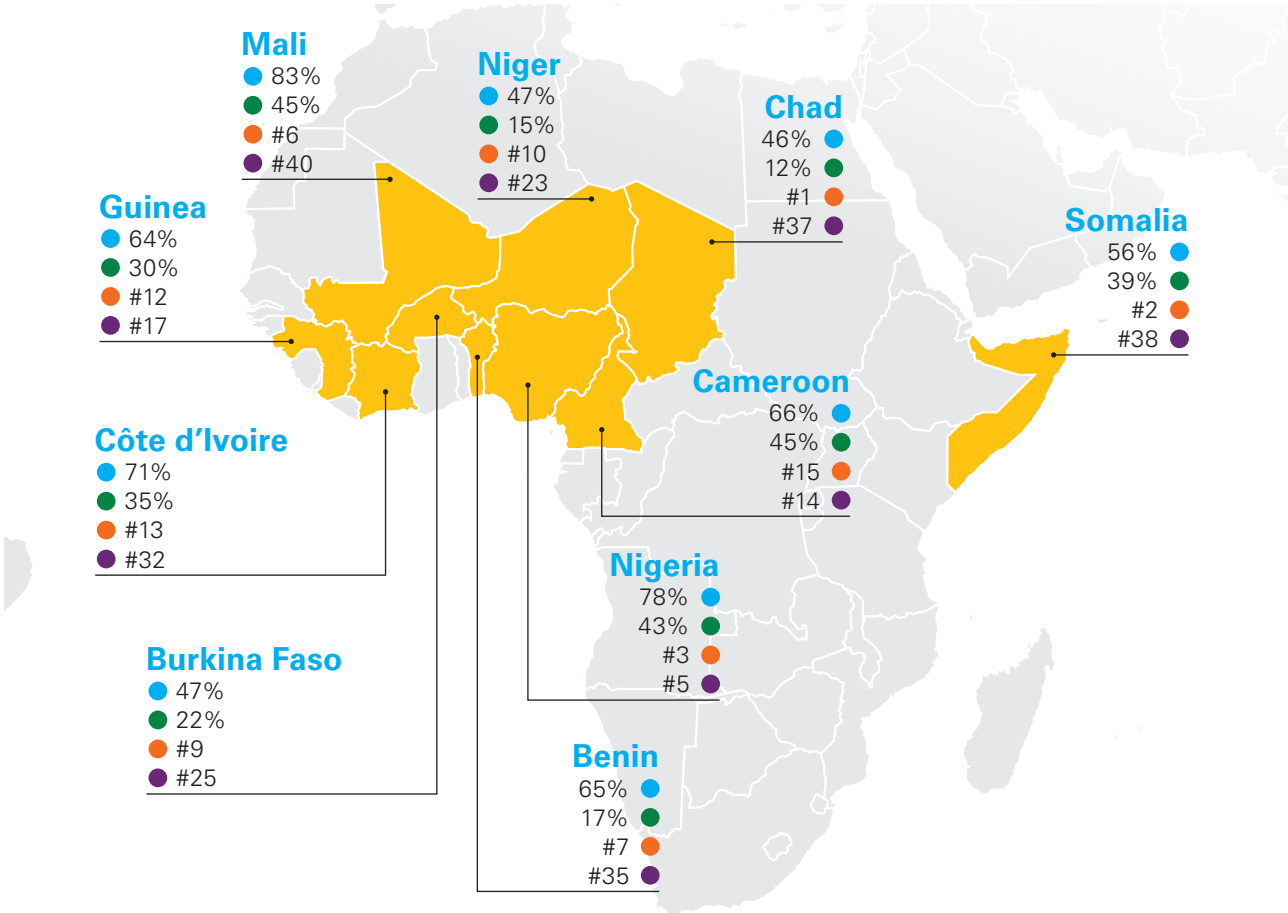
The objective of the Malagasy government to attain 100 per cent access to drinking water by 2030—against the 43 per cent in 2022—would be a utopia without long-term measures. Besides global warming, the change in the hydrology cycle in the country is also likely linked to its high rate of deforestation. "Without forests, we have lowered humidity in the atmosphere. We need to maintain the existing forest cover in order to let precipitation infiltrate the ground," said Ralaiarinoro. Since 2019, Madagascar has aimed to plant 60 million trees per year in an attempt to reconstruct its green architecture and restore ecological balance.

A PAN-AFRICA PROBLEM

Madagascar reflects one of Africa's main development challenges: providing clean water to all. According to US-based non-profit World Resources Institute's aqueduct global water risk mapping tool, Africa is one of the world's most water-stressed continents. About a third of the population lives in drought-prone areas. As per the 2021 edition of the World Meteorological Organization (WMO)'s "State of Climate Services" report, in the past five decades, Africa was hit by 1,695 disasters related to weather, water, and climate, which have caused 0.73 million deaths

MULTIPLE BURDENS

Nearly two of five deaths due to lack of sufficient access to water, sanitation and hygiene are from 10 countries in sub-Saharan Africa



	Benin	Burkina Faso	Cameroon	Chad	Côte d'Ivoire	Guinea	Mali	Niger	Nigeria	Somalia
% of the population with access to at least basic drinking water	65	47	66	46	71	64	83	47	78	56
% of the population with access to at least basic sanitation	17	22	45	12	35	30	45	15	43	39
Global rank: under five deaths from unsafe WASH as proportion of child population	7	9	15	1	13	12	6	10	3	2
CCRI rank: (climate and environmental hazards, out of 163 countries)	35	25	14	37	32	17	40	23	5	38

Note: Ranking scales decrease, with children in higher ranked countries facing a higher proportion of deaths due to unsafe WASH and a higher level of risk to climate threats.

Sources: WHO/UNICEF Joint Monitoring Programme, *Progress on Household Drinking Water, Sanitation and Hygiene 2000–2020:*, 2021; WHO *Global Health Estimates 2020* and UNICEF, *The Climate Crisis is a Child Rights Crisis: Introducing the Children's Climate Risk Index*, 2021.

and an economic loss of $38.5 billion.

While floods accounted for 60 per cent of the disasters and 4 per cent of the deaths, droughts were behind 16 per cent of the disasters and 95 per cent of the deaths—the highest human loss due to drought in the world. This is a double whammy for sub-Saharan Africa, where 90 per cent of the rural population depends on agriculture for income and 95 per cent of agriculture is rainfed.

Potable water is a prized commodity, particularly in sub-Saharan Africa, where more than 400 million people do not have access to safe drinking water. In the past quarter-century, the region's population has doubled but access to water has progressed by just 20 per cent. A study by the UN Children's Fund (UNICEF) showed that 66 per cent of the population in sub-Saharan Africa had to walk long distances to collect water. As per an estimate by UN Women, adult women and children in sub-Saharan Africans spend 40 billion hours a year collecting water. This is equivalent to a year's worth of labour by the entire workforce of France, or, to put it in a simple timeframe, more than 4.5 million years—a length of time the modern humans have not yet travelled on the evolutionary scale.

WATER DIVIDE

Access to safe water has traditionally been a rural challenge, where people have to walk long distances to sources like rivers, streams, ponds, wells and springs. "In rural Kenya, the average total coping costs for an unreliable or distant water supply are about $38 per month. In comparison, the average water bill of a typical household in Nairobi that is connected to a piped system is only $4.46 per month," shows an estimate by global water lobby Water.org. The

Africa is one of the world's most water-stressed continents. About a third of the population lives in drought-prone areas. Potable water is a prized commodity, particularly in sub-Saharan Africa, where more than 400 million people do not have access to safe drinking water

comparison highlights the economic burden that falls more heavily on unconnected rural customers than on households with piped connections, but Wangai Ndirangu, head of capacity building in sustainable water management network WaterCap Kenya, says the situation is worse for the urban poor. Population growth in cities and towns due to migration from rural areas, coupled with poor planning and management, hinders access. "With nearly 600,000 people in Kenya moving to towns each year, infrastructure quickly gets overwhelmed," Ndirangu says. "In urban Kenya, water is a factor in poverty. It is less accessible to the poor. The poorer one is, the more unlikely one is to be able to afford clean drinking water," he adds.

The UN Human Rights Office shares this observation in a 2019 pilot study to assess the right to water in Kenya's informal settlements. It found that while urban areas have better access than rural areas, inequalities are particularly acute in informal urban settlements where residents depend on unreliable water services from formal and informal providers. Water supply has been privatised by "cartels" and a majority of respondents to the study spent more than 3 per cent of monthly household income on water, which is above the international standard for affordability, notes the assessment.

The situation is no better in South Africa, where the average municipal water tariff was 1,300 per cent higher in 2020 than in 1996. It is expected to increase at a rate higher than that of inflation, between 6 per cent and 10 per cent, Michelle Dickens, chief executive officer of South Africa-based information services firm TPN Credit Bureau, said in a media report on June 24, 2021. In Somalia, where drought conditions have worsened following three consecutive below-average rainy seasons, the price of potable water has increased by 170 per cent in some regions.

As per the UN Food and Agriculture Organization, as of December 17, 2021, some

COMMITMENT TO END RISING WATER CRISIS

African leaders announce presidential compact on water and sanitation

IN MARCH 2023, the world met for the first time since 1977 to discuss the burgeoning water crisis across the world. While commitmets on action at the UN Water Conference, held in New York, were lagely a reiteration of pledges and ongoing work in countries, the African heads of state announced five new presidential compacts or commitments to accelerate access to water and sanitation services, which includes increasing budget allocations, reducing open defecation and delivering climate-resilient services.

The five compacts were announced by Presidents Sahle-Work Zewde of Ethiopia, Nana Addo Dankwa Akufo-Addo of Ghana, George Manneh Weah of Liberia, Yoweri Kaguta Museveni of Uganda and Emmerson Dambudzo Mnangagwa of Zimbabwe on the penultimate day of the conference, March 23, at a meeting held by the meet's co-host, the Netherlands.

Ethiopia committed to revise its loan policy and directives to accommodate loan access for water and sanitation for businesses and consumers. It also pledged to strengthen accountability among water and sanitation stakeholders—policymakers, service providers and the community—and development partners by establishing a strong accountability framework which aligns with the country's ONEWASH National Programme for universal access to water. Ghana, on the other hand, pledged to establish a national sanitation authority, reduce inequalities in water and sanitation services, particularly in poor and rural communities, and to make its cities some of the cleanest in Africa. Liberia will increase access to basic sanitation by ending open defecation, and will create a unifying monitoring mechanism at all governance levels (national, county, district, and community) to improve institutional coordination.

Uganda committed to increase public financing for water, sanitation and hygiene, while Zimbabwe pledged to create a State of Emergency on Water and Sanitation which will trigger prioritisation of this issue in the country's budget and coordination efforts.

Catarina de Albuquerque, chief executive of UN-hosted Sanitation and Water for All global partnership (SWA), one of the conveners of the water conference, said on the compacts: "We are so pleased and encouraged to see these government leaders stepping up, committing, prioritising water and sanitation at the highest levels and taking action and accountability for the human rights to water and sanitation."

She added that "the only way to make sustainable change is through the political prioritisation at the highest level that we see here today. SWA commits to mobilise our more than 350 partners to support and learn from these presidential compacts."

Patrick Moriarty, chief executive of IRC WASH, a think tank based in the Netherlands and another convener, saw the move as an inspiring example of political leadership.

"As an organisation, we have long championed the transformation of national systems to deliver the human right to safe water and sanitation for everyone, everywhere, and forever. Yet we also know that a truly transformative agenda for national systems strengthening can only follow visionary national leadership—from the highest political level," he said.

Moriarty added that "what we have seen today in this room is an inspiring example of such visionary political leadership and we commit to follow and support it in whatever ways we can."

3.2 million people in 66 of the country's 74 districts were affected by drought, of which 169,000 stood displaced in search of water, food and pasture. In Nigeria, where 60 per cent of the population lacked access to safe drinking water, the cost of water had increased more than three times in less than a year. Till January 2021, a bag of 20 satchets of water cost only 80 Nigerian naira ($0.17). By October, it was 250 naira ($0.54).

Sub-Saharan Africa was the world's most water-stressed region between 2020 and 2021, revealed a survey published in the *Lancet Planetary Health* journal in November 2022. Nearly 36 per cent of the people surveyed in the region were water insecure, according to the report. Sub-Saharan Africa was followed by North Africa (four countries), Asia (three countries) and Latin America (three countries). Overall, some 14.2 per cent of the respondents were water stressed; while countries in sub-Saharan Africa, such as Cameroon (63.9 per cent) and Ethiopia (45 per cent), experienced the highest rates of water insecurity, those in Asia, like China (3.6 per cent), experienced the least.

Some 436 million adults of the 3 billion people surveyed across 31 low-and middle-income countries across four regions in sub-Saharan Africa were water insecure in 2020-21, showed the findings, adding that 21 countries in the region sub-Saharan Africa accommodated the most water-stressed population in 2021.

The study, led by Sera Young, an anthropologist with the Institute for Policy Research, revealed the first snapshot of global experiences with water insecurity. The researchers were also able to pinpoint which socio-demographic groups experienced the highest rates of water insecurity. They used the Individual Water Insecurity Experiences (IWISE) scale, which they developed to measure individual experiences with access, use, and stability (reliability) of water, to grade the degrees of water insecurity. They asked questions such as how often participants worried about not having enough water, how often they were unable to wash their hands, or how often they changed what they ate because of water shortage. They found that people with lower levels of income and those residing on the outskirts of cities were more prone to water insecurity. For example, those living in city suburbs or outskirts of Burkina Faso had lower IWISE scores than city residents. Those living in rural areas in Senegal, Congo (Brazzaville), Gabon and Ethiopia shared the same experience. The novel coronavirus (COVID-19), too, triggered water insecurity across countries and regions. Some 31.6 per cent of respondents reported that their lives were "somewhat affected" by the pandemic, while another 47.9 per cent said that it had "significantly affected" their lives.

According to WMO, 5 per cent of Africa's GDP (gross domestic product) is lost every year due to water scarcity. "The MENA [Middle East and North Africa] region faces the greatest expected economic losses from climate-related water scarcity—estimated at between 6 per cent and 14 per cent by 2050," stated Ferid Belhaj, World Bank Vice President for the Middle East and North Africa, in a press release on August 23, 2021. But more than that, it has pushed Africa into a vicious circle of poverty, water and disease. The African Development Bank's "Africa Water Vision for 2025", which guides countries in the continent in shaping water policies and programmes, says inadequate access to water and sanitation causes diseases which, in turn, result in economic loss and extreme poverty. Extreme poverty also disables people to spend on access to water and sanitation. As the document puts: "half the work of a sick peasantry goes to feed the worms that make them sick."

According to the World Meteorological Organization, 5% of Africa's GDP is lost every year due to water scarcity. The continent has been pushed into a vicious cycle of poverty, water and disease

In a report "Triple Threat", released in March 2023, UNICEF said that nearly two of five deaths due to lack of sufficient access to water, sanitation and hygiene (WASH) are from 10 countries in sub-Saharan Africa. Some 190 million children residing in the 10 African countries face the triple threat of a combination of water-related risks, water-borne illnesses among children under five and climate-related hazards.

The threats are most acute in Benin, Burkina Faso, Cameroon, Chad, Ivory Coast, Guinea, Mali, Niger, Nigeria and Somalia, making West and Central Africa one of the world's most water-insecure and climate-impacted regions. The 10 African countries are classified as either "fragile" or "extremely fragile" by the Organisation for Economic Co-operation and Development and according to the UNICEF report they have less than 50 per cent access to basic drinking water or sanitation services.

The lack of safe drinking water, sanitation and hygiene is destructive to all aspects of a child's life. It puts fundamental needs—good nutrition, health, education and safety—at stake. African countries carry the heaviest burden of child deaths from diseases caused by inadequate WASH services, the report said. Globally, a total of 394,802 children under five years died of inadequate WASH services and 254,976 of those were in sub-Saharan Africa alone.

PHOTOGRAPH COURTESY: UNICEF

The stresses from conflict and climate change will make it even more challenging for these countries to accelerate progress towards the targets of the UN-mandated Sustainable Development Goals (SDGs) and threaten the gains made to date. Many of these 10 countries, particularly those in the Sahel region, are also facing armed conflict. The region is one of the most vulnerable parts of Africa, facing a combination of climate change, conflict, poverty and political instability. Around 5.8 million people are water-insecure in the Sahel region.

Globally, 600 million children lack safely managed drinking water, 1.1 billion do not have access to safely managed sanitation and 689 million lack basic hygiene services, the document highlighted. Developing countries need three times the current investment—at least $114 billion per year—in the WASH sector to meet SDG 6 (access to clean water and sanitation) and other WASH-related targets by 2030. ■

PHOTOGRAPH COURTESY: WHO

ONE CRISIS, TOO MANY

Africa is caught in a vortex of poverty, water and disease

THE NOVEL coronavirus pandemic has disrupted the hard-won years of progress against another pandemic—cholera, an acute diarrhoeal illness caused by *Vibrio cholerae*. The bacteria are shed through faeces and infect through contaminated water and food. Since 1817, the infection has caused seven pandemic waves, emerging from endemic areas in Asia but involving much of the world. The seventh and current cholera pandemic, which began in 1961, has lasted longer, spread further, and infected more people than any of its predecessors, and remains entrenched in sub-Saharan Africa where it causes intermittent outbreaks in communities already burdened with conflict, lack of infrastructure, poor health systems and malnutrition. The illness is easily preventable by ensuring access to safe drinking water and sanitation and is curable through simple treatments like oral medicine, or in severe cases, intravenous rehydration. But as per the World Health Organization, 83 per

cent of deaths in sub-Saharan Africa between 2000 and 2015 were due to cholera.

Though cases were on the wane since 2017, several countries including Nigeria, Ethiopia, Sudan, Niger, Somalia, Cameroon, Mozambique have reported outbreaks of cholera since the onset of coronavirus (COVID-19). In Nigeria, which faces one of the largest outbreaks, cholera spread to 32 of 36 states, affecting 90,000 people and causing more than 3,000 deaths by the end of 2021. In Zambia, seven townships in capital city Lusaka reported faecal contamination in water in October 2021, following which the country's Disease Intelligence Agency, water utility companies and local authorities heightened active surveillance-reporting of diarrhoea cases every morning, just like for COVID-19. To contain the spread, authorities in the country supplied tanker water in high-risk areas, while those in Lusaka secured bottles of liquid chlorine to disinfect the water.

Some 600,000 people in Cabo Delgado in Mozambique's Northern Province have been facing shortage of safe water, sanitation and health following a massive migration due to frequent cyclones and armed attacks. A WHO report in March 2021 states cholera cases had surpassed the 2020 levels despite reduction in testing capacity, owing to destruction of health facilities.

Some analysts blame COVID-19 for the cholera outbreaks. As priority shifted towards COVID-19 containment, contact-tracing, diagnosis and treatment of cholera patients in high-risk areas lapsed, they say. But Bioye Ogunjobi, an official with the UN Children's Fund (UNICEF) in Nigeria blames the governments' lackadaisical attitude towards ensuring access to safe water and sanitation. "The countries have not understood the concept of water quality. It does not involve chlorinating water at one point. Combating water-borne diseases rather requires ensuring that water is safe in the entire value chain—from the source till consumption," says Ogunjobi.

The rural poor are more prone to contaminated water. They usually depend on shallow borewells that have been found to be bacteriologically contaminated. This leads to outbreaks of diseases like cholera, dysentery and typhoid

But this is a difficult proposition for most living in rural and peri-urban areas or informal settlements of Africa. Williams Ngwakwe, who coordinates a non-profit Golden Change that works on water and sanitation projects in northern Nigeria, says a community called Chida in Kwali area council of the country's Federal Capital Territory (FCT) grows a lot of cassava, but rarely cleans it with water before eating it. Such is the water shortage that they just peel it, grind it and consume. Hand-washing before meals is also poorly practised. One can imagine what girls of menstruating ages go through in such places as well as the kind of disease outbreaks that result due to the lack of personal and environmental hygiene, Ngwakwe adds.

The Joint Monitoring Programme for Water Supply and Sanitation, managed by the World Health Organization (WHO) and the UN Children's Fund (UNICEF) for global monitoring of progress on Sustainable Development Goal (SDG) 6, in its latest report states that the rural poor are more prone to contaminated water. They usually depend on shallow borewells that have been found to be bacteriologically contaminated due to lack of proper sanitation facilities. This lack of access leads to outbreaks of diseases like cholera, dysentery and typhoid. Poor sanitation facilities also lead to stagnated waters, which aid in breeding of mosquitoes and malaria outbreaks in sub-Saharan Africa.

A 2020 study by Delhi-based think tank Centre for Science and Environment (CSE) on groundwater resources of Uganda also finds that inadequate sanitation facilities are a major cause of deterioration in the quality of the country's water bodies. Ndumiso Cyprian Magagula, an environmental inspector for waste management at the Kingdom of Eswatini's environment authority, admits that faulty sanitation systems contaminate the surface and groundwater bodies. "A system should be developed which ensures that the potable water shall be provided only to those households which have properly designed containment systems and ensure timely emptying of systems," says Magagula.

PHOTOGRAPH COURTESY: WHO

NO SPACE FOR SANITATION

Although Africa is the least urbanised continent, the sub-Saharan region, which has 46 countries and several developing cities, has seen rapid urbanisation. It has consequently spurred challenges in terms of basic services and sanitation. Magagula points out that in commercial hubs of Eswatini which receive a large number of migrant workers, people build cheap housing without any sanitary services. Over the years, these cramped spaces have left little space to provide facilities to manage faecal sludge. Solid waste, household waste water and effluent from industries are dumped and end up in water bodies.

The part of population that depends on borewells also face water quality issues due to faulty sewage and onsite systems. Magagula says the only possible solution to this is some people are relocated and space is made to develop proper facilities and management systems.

For now, the Eswatini government is training the police to monitor any violation of water norms and to educate communities.

In Nigeria, says Ngwakwe, the government has introduced a national action plan to stop defecation in the open. To begin with, the clean Nigeria campaign was launched in the northwestern part of the country, where the aim was to declare 100 local government areas open-defecation-free (ODF) by the end of 2021. However, scarcity of water in addition to the activities of bandits in the region slowed the campaign work and less than 30 areas could be declared ODF. "Now we hear that some people in those communities are moving to internally displaced persons' camps. So we were sure that people would defecate outside again as they may not even have access to the basic amenities, including water and sanitation," says Magagula.

UNFIT GROUNDWATER

While a majority of the economy in sub-Saharan Africa is dependent on groundwater, little attention is paid to its quality. Due to geological formations, several African countries have higher concentrations of fluorides, arsenic and chlorides. These also make groundwater

unfit for drinking without treatment. CSE's 2020 study has found high concentration of iron, magnesium and chlorides due to natural mineralisation in groundwater of Uganda. While iron results in unpleasant odour and taste, manganese damages the plumbing fixtures and laundries. Fluoride levels were also higher than the drinking water guidelines by WHO due to volcanic deposits. This results in various diseases and conditions such as fluorosis, which causes discolouration in teeth.

In Tanzania, the CSE study has identified that the groundwater was polluted with nitrates and sulphates. Mining of these resources and hazardous dumping of waste in the open results in the waste ending up in waterbodies, increasing their salt and mineral contents and affecting their pH value. However, this situation is hardly addressed, barring a few research studies. Groundwater contamination due to nitrates and fluorides should be catered to on a war footing. There should be a community-level water supply system, which treats the groundwater before it is supplies to households or similar mechanisms, although these can be a costly affair for the rural households.

Puneet Kumar Srivastava, Urban WASH Advisor with WaterAid-UK, says there have been examples in Africa where community-managed systems have worked sustainably and with less funding. Such knowledge should be revived with proper planning. WHO and UNICEF's Joint Monitoring Programme states that "achieving universal coverage by 2030 will require a quadrupling of current rates of progress in safely managed drinking water services, safely managed sanitation services, and basic hygiene services". Low-income countries will find it extremely challenging to achieve SDG 6.

WHO's guidelines for prevention of COVID-19 focus on promoting hand hygiene and strengthening infection prevention and control. The reality of the pandemic response, however, is that many countries in Africa are water-resource constrained, in terms of adequacy and distribution. Africa has a population of about 1.34 billion people and one in three people in the continent live without clean water close to their home. Despite best efforts, the pace of investments, infrastructure, prioritisation of water access remains inadequate. Furthermore, the impact of climate change, severe droughts and hurricanes, flooding, disruptions in economic activity, pollution of fresh water systems, and severe droughts and hurricanes makes rebuilding the economy and infrastructure difficult for many African countries.

Guidelines for prevention of COVID-19 focus on hand hygiene and strengthening infection prevention and control. However, many countries in Africa are water-resource constrained, in terms of adequacy and distribution

Inadequate access to water, sanitation, and hygiene has a significant impact on the lives of girls and women, who account for roughly half of Africa's population. This may be narrowly seen as a problem for women but it is in effect a problem of sustainable development, where half the population of Africa is already disadvantaged by the inadequate access to water, sanitation and hygiene (WASH). This impacts their access to education, opportunity to give birth safely, or affects their role as caregivers and service providers and impacts their overall livelihoods options and their potential to contribute to the economies of their countries. To address this systemic inequity in access, there is a need for governments to commit to a gendered approach to development planning with access to WASH at its centre. Governments should go further and make access to WASH a political priority and ringfence funding for WASH across all development sectors to emphasise the importance of attaining SDG 6 and its interlinkages with the other SDGs. Only then can we begin to take transformative progress. ■

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PARCHED CONTINENT

While climate change exacerbates water crisis situation in Africa, government inefficiency makes things worse

WITH 17 RIVERS, over 160 lakes and vast wetlands, Africa is endowed with abundant water resources. While the Nile is largely regarded as the world's longest river (some estimates also peg the Amazon as the longest), Lake Victoria is the second largest in the world. Yet, Africa is the second driest continent after Australia. Extreme droughts that regularly plague the Sahel and eastern Africa are well known. Now climate change is exacerbating the paradox, hitting the most vulnerable the hardest.

A review article published in *Frontiers in Sustainable Food Systems* on July 1, 2021, notes that since 2005, the rate of occurrence of drought in eastern Africa has increased from one in every six years to one every three years. Between 2008 and 2010, over 13 million people in eastern Africa have been affected by droughts. From 2010 to 2011, the Horn of Africa, which includes Djibouti, Eritrea, Ethiopia, and Somalia, experienced extreme droughts with food insecurity

affecting about 20 million people. Somalia alone recorded 250,000 deaths during the period.

Now, following three consecutive failed rainy seasons (by November 2022), more than 20 million people in eastern Africa face some of the worst food security risks in 35 years. The region receives two rainy seasons in a year—long rains from March through May and short rains from October to December. Since 2020, there has been a back-to-back failure of these rains. The Shabelle-Juba river basins, known as the breadbasket of Somalia, have seen their lowest rainfall totals since 1981. The Famine Early Warning Systems Network (FEWS NET), a programme supported by the US Agency for International Development, in its December 2021 report warns of a poor March-May 2022 season, which "would result in an unprecedented (since 1981) sequence of four below-normal rainfall seasons...Even if March-April-May rains are normal, the region will experience lingering long-term rainfall deficits."

Many areas in the Horn of Africa are expected to face "crisis" and "emergency" levels of food insecurity. In their report, FEWS NET analysts write: "A long sequence like this is very rare, with the last possibly being nearly 40 years ago during 1983-84."

CHANGING RAINS

"The hydrological cycle is generally expected to be more intense in a warmer world with a propensity for more intense rainfall as well as drought situations. Global monsoons are expected to intensify because of global warming, but decreases could also result from increased concentrations of atmospheric aerosols," explains Rupa Kumar Kolli, executive director of the International CLIVAR (climate variability and predictability) Monsoon Project Office, hosted by the Indian Institute of Tropical Meteorology, Pune.

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Climate change impacts on the monsoon, in terms of the onset, intra-seasonal variability such as active-break cycles, number of rainy days, extreme rainstorms, as well as the seasonal total, will have a direct impact on the water resources because most river basins in Africa are directly fed by the monsoon rains, Kolli adds.

Chris Funk, affiliated research professor, department of geography, and research director, Climate Hazards Group, University of California, Santa Barbara, US, says the weather cycle responsible for the debilitating drought and hunger in eastern Africa is a climate-change enhanced La Niña. The La Niña phase of the El Niño Southern Oscillation is driven by the cooling of ocean temperatures in the eastern Pacific sea, causing dry spells in eastern Africa.

Human-induced warming in the western Pacific Ocean is making things worse. Global emissions have resulted in the rapid warming of the west Pacific, resulting in more rain around Indonesia and concerning but predictable rainfall deficits in arid, food-insecure eastern Kenya, Somalia and Ethiopia, Funk writes in *The Conversation* in October 2021. Mouhamadou Bamba Sylla, AIMS (African Institute for Mathematical Sciences)-Canada Research Chair at Climate Change Science at AIMS Rwanda, says although African governments are aware of climate change, little has been done to include climate change information in their long-term planning or adaptation strategies. For example, a lot of investment from the African Development Bank as well as other institutions has been devoted to improve observation networks to help countries have more accurate weather forecasts and seasonal predictions. However little to no funds have been dedicated for research on development of more accurate climate change information. It is the time African governments and their finance institutions' partners tackle this issue, to at least understand what kind of future to adapt to, Sylla adds.

STRATEGY TO MANAGE WATER QUALITY OF LAKE VICTORIA IN TANZANIA

Focus should be on reducing pollution load from dumping of waste, effluents

ISTOCK PHOTO

ONE OF the largest lakes in the world, Lake Victoria, has been suffering from a variety of unsustainable human activities over the last five decades. Delhi-based non-profit Centre for Science and Environment (CSE) and National Environment Management Council (NEMC), Tanzania have jointly released a report on managing its water quality. The report, "Lake Victoria: Roadmap for Management of Water Quality in Mwanza City-Tanzania", was released on January 25, 2023 by the Mary N Maganga, Permanent Secretary, Vice President's Office, Tanzania.

The report is the final outcome of an earlier discussion paper, "Development of an Environmental Management Strategy for Lake Victoria", that was released in July 2022. Lake Victoria and its flora and fauna support the livelihoods of about 45 million people. The ecologically unique water body is shared by three countries: Tanzania (51 per cent), Uganda (44 per cent) and Kenya (5 per cent).

The discussion paper identifies Mwanza city as a hotspot, contributing substantial pollution load in the form of industrial effluents, domestic sewage and dumping of solid waste. It also recognised two rivers—the Mirongo and the Nyashishi—as the major water bodies carrying domestic and industrial pollution loads, respectively. A team from CSE and NEMC conducted a sampling exercise in November 2022 to gauge the pollution in these rivers. The results showed substantial pollutant load in the rivers, which may be getting discharged in the lake.

The water from the Nyashishi is extensively used for agricultural purposes before it meets the lake. "The focus on the Nyashishi should now be doubled because any pollutant in the river, apart from affecting the water quality of Lake Victoria, may also adversely impact crops and human health," said Nivit Kumar Yadav, programme director, industrial pollution, CSE. Only 3 per cent of households are connected to sewer lines managed by the Mwanza Urban Water Supply and Sanitation Authority (MWAUWASA), while 93 per cent—especially those living on the hills—are dependent on onsite sanitation (pit latrine and septic tanks), the report highlights.

The city's waste management practices have 70-80 per cent waste collection efficiency and there is no segregation of the garbage. MWAUWASA has initiated the process of connecting these households to the main sewer lines through a simplified sewerage system, but this could be a challenge considering the area's landscape, CSE has found. CSE and nemc are also working towards strengthening the environmental impact assessment (EIA) regime in Tanzania—a 'Terms of Reference' (TOR) for mining and industrial development projects was released during the meeting. "The purpose of these TORs is to enable the project proponent, with environmental experts' support, to plan and design an eia properly. A TOR is designed to provide a format and structure for the EIA report, especially on the data required, to ascertain the impacts of the project on people and the environment," says Samuel G Mafwenga, director-general of NEMG.

In all probability, the water stress will intensify tensions among countries in Africa and lead to conflicts and social unrest. While the governments can avert the crisis by managing and safeguarding their water resources, they have had conflicts and failed negotiations over these.

The problem stems from the fact that the continent has some 60 transboundary rivers. Tensions arise among the countries whenever resources are discovered or become scarce in these shared waterbodies. The Nile, for instance, is one of the most critical transboundary waterbodies in Africa, serving 11 countries—and it is also a highly disputed one.

"Historically, wars have been fought over the Nile, particularly between Egypt and Ethiopia. In the 20th century, the conflicts have not turned into wars but there have been many instances of disagreements between Ethiopia and Egypt," says Firehiwot Sintayehu, assistant professor in the department of political science and international relations at Addis Ababa University, Ethiopia.

These conflicts have their roots in colonial agreements over the water resource. Since the inception of Grand Ethiopian Renaissance Dam (GERD) in 2011, it has fuelled controversies, especially among the three Nile riparian countries: Ethiopia, Sudan and Egypt. "The interest of making use of the Nile waters for Ethiopia continues despite the change of regimes in different instances. Ethiopia is insisting that it should be able to make use of the Nile waters for the country's economic growth while Sudan and Egypt are insisting to maintain their 'historical rights' over the Nile waters which basically denies upstream countries to utilise the Nile waters," says Sintayehu. "If the riparian countries were able to cooperate, they would have been able to share ultimate benefits from the Nile. None of the countries are suitable for all economic activities that one can obtain from the river. Rather each country has its own comparative advantage. For instance, the water of the Nile would be saved from evaporation by having dams in the upstream countries. Sudan is also said to be the best place for irrigated agriculture. If the riparian countries came into such a common understanding, they would have been able to cooperate rather than going into a never ending conflict," said Sintayehu.

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The other such protracted conflict is over Lake Victoria. Since 1989, the lake's basin has been one of the most conflict-affected regions in the world. All the countries that share the lake, especially Kenya, Uganda and Tanzania, fight over it—for its fish and water. Lake Victoria basin countries account for 20 per cent of the continent's population but 40 per cent of the battle deaths that occurred continent-wide, states a study paper published in *Ecology and Society* in 2019.

These conflicts are increasing as the water levels in the lake keep falling and its resources are disappearing. New strains on the water resources have added to the tension. Samuel G Mafwenga, director-general, National Environment Management Council, Tanzania, admits that Lake Victoria has undergone severe ecological changes in the past four decades, which have led to near extinction of some of the fish species that are endemic only to the lake. Water quality has also been affected by hyacinth infestation, which causes eutrophication, and release of untreated sewage and industrial effluents, storm water and maritime transport wastes.

The extinction of several hundred species of *haplochromine cichlid* fish in the lake has been blamed on the introduction of the predaceous fish the Nile perch. The change in water quality, especially turbidity, has also affected activities of different organisms in the lake thus contributing to the loss of biodiversity. On the Tanzanian side, different kinds of industries have contributed to the pollution load in the lake. These include fish factories, coffee producers, sugar companies,

ACROSS AFRICA, WATER CONFLICT THREATENS SECURITY, HEALTH AND THE ENVIRONMENT

Once conflicts escalate, they are hard to resolve and can have a negative impact on water security, creating vicious cycles of conflict

ROBIN SCHER

WATER IS a finite resource on our planet. We can only rely on what we have, which translates to about 2.5 per cent of drinkable fresh water. Of that amount, only 0.4 per cent currently exists in lakes, rivers, and moisture in the atmosphere. The strain of this limited supply grows by the day and as this continues, the detrimental impact will continue to be felt in places least equipped to find alternative solutions—in particular, the African continent.

The global population is estimated to reach around 9.6 billion people by 2050. This is triple the number of humans on the planet just a few decades ago, having to exist with the same amount of water, not taking into account the nonhuman animals and plants that also rely on water to survive.

More than a third of the planet's population living without access to clean, safe water live in sub-Saharan Africa. And nearly two-thirds—some four billion people—live in water-scarce areas. With this number set to steadily rise, the United Nations predicts that around 700 million people across the world might be "displaced by intense water scarcity" by 2030.

SCARCITY-LED CONFLICT AND CRISIS

Each year, the world is seeing extreme water-related events including heatwaves and droughts. In 2021 on the African continent alone, Madagascar, Kenya, and Somalia experienced severe water shortages. And with scarcity, conflict tends to follow.

A number of African conflicts are being fueled by competition for dwindling natural resources. At a state level, Egypt, Ethiopia, and Sudan have been engaged in a continuing dispute over fresh water in the Grand Ethiopian Renaissance Dam. Similar issues are playing out across every level of society.

Cameroon, for instance, experienced a violent dispute over water between fishermen and herders in a town near the border of Chad in December 2021. The disagreement over rights to water found in a shrinking Lake Chad led to the death of 22 people and a further 100,000 people displaced from their homes as the two groups fought.

"Once conflicts escalate, they are hard to resolve and can have a negative impact on water security, creating vicious cycles of conflict," said Susanne Schmeier, senior lecturer in water law and diplomacy at IHE Delft.

This negative feedback loop fueled by conflict is further compounded by the effect on water quality, agriculture, and forced migration. "With very rare exceptions, no one dies of literal thirst," said Peter Gleick, head of the Oakland-based Pacific Institute. "But more and more people are dying from contaminated water or conflicts over access to water."

This insight speaks to the complex interplay between water shortage and conflict. According to research from the Pacific Institute, the impact of water on agriculture plays an even greater role in contributing to conflict — a view backed up by the fact that agriculture accounts for 70 per cent of fresh water use in Africa.

Another conflict-causing factor is the social impact of water shortages. With up to a quarter of the world's population facing serious water scarcity at least one month of the year, people are being forced to migrate. In 2017, at least 20 million people from Africa and the Middle East left their homes due to food shortages and conflict caused by serious drought.

FOOD INSECURITY DUE TO IMPACT ON WILDLIFE AND AGRICULTURE

Food insecurity caused by water shortages is being compounded by the loss of wildlife. With a drop in their rainy seasons, Kenya's sheep, camels, and cattle have been in decline. This has led to a threat of 2.5 million people potentially going without food due to drought, according to the United Nations.

The impact of drought is taking a severe toll on agriculture, particularly in counties where this forms the mainstay of their economy. In South Africa, for instance, agriculture is key to the functioning of the country when it comes to job creation, food security, rural development, and foreign exchange.

Water shortages in the country impact both commercial and subsistence farmers. But it is the subsistence farmers who are hardest hit by the droughts, according to a 2021 paper published by a group of international scientists in the

WAR FOR WATER

Almost all major river basins have become the epicentre for conflicts in Africa

■ Countries that have experienced unrest over water

NILE RIVER
Egypt, Sudan and Ethiopia

Dispute started in 2011

The Nile water dispute stems from an **under-construction dam by Ethiopia**, which **Egypt** (that lies downstream) **fears will impact its water flow.** Once completed, the Grand Renaissance Dam hydropower project will be the **largest in Africa**

LAKE CHAD BASIN
Nigeria, Niger;Chad; Cameroon

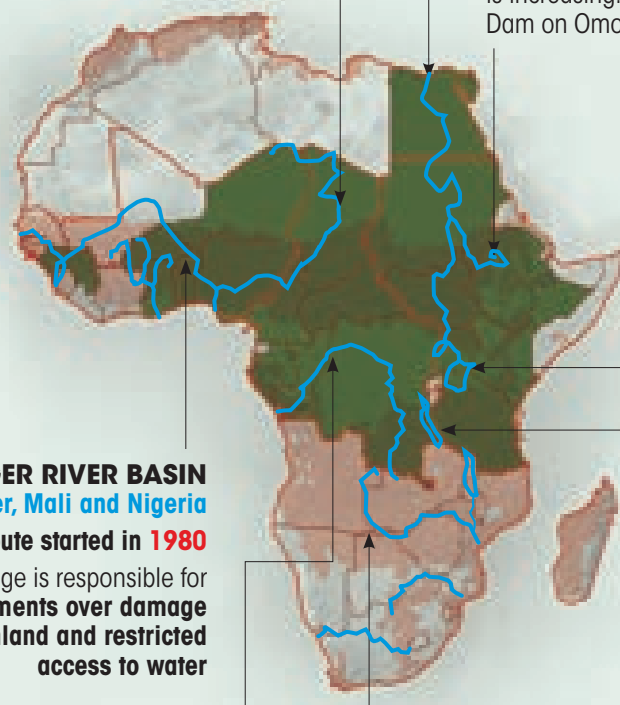
Dispute started in 1980

The water body has **diminished by 90% since the 1960s due to overuse and climate change effects.** Conflict between herders and farmers have become common as livelihoods are lost. Families dependent on the lake are migrating to other areas in search of water.

LAKE TURKANA
Kenya and Ethiopia

Dispute started in 2016

Lake Turkana receives **90% of its water from Omo river**. **Rising temperatures** and **reduced rainfall** have contributed to the lake's retreat into Kenya. To survive, the Ethiopians tribes began following the water. As a result, inter-tribal conflict is increasing. The construction of the Gilgel Gibe III Dam on Omo river has made matters worse.



LAKE VICTORIA
Kenya, Uganda, Tanzania

Dispute started in 2009

Competition over the lake's **dwindling resources** has been fueling conflict between the three countries.

LAKE EDWARD
Uganda and DRC

Dispute started in 2018

Tensions have mounted between the two countries over who has the **right to the lake's natural resources**.

NIGER RIVER BASIN
Niger, Mali and Nigeria

Dispute started in 1980

Climate change is responsible for **disagreements over damage to farmland and restricted access to water**

CONGO BASIN
Cameroon, Central African Republic, Democratic Republic of the Congo, Equatorial Guinea and Gabon

Dispute started in 1960

The basin witnesses multifaceted crisis including f**orced displacement,** violent conflicts, and political instability and climate change impacts

LAKE NYASA
Tanzania and Malawi

Dispute started in 2011

The **discovery of oil and gas** in 2011 brought an Anglo-German treaty signed in 1890 back to the fore. The treaty allows Malawi—which, back then, was a British protectorate under the name of Nyasaland—**exclusive rights to use of the lake. However, Tanzania claims the lake should be a shared** resource in accordance with international law.

journal Science of the Total Environment.

While commercial farmers are able to offset a lack of rain through alternative water supplies, as well as storage and irrigation technologies, subsistence farmers who are reliant on rain, the scientists write, "are particularly susceptible to drought as they highly depend on climate-sensitive resources." They also point out that the impact is worsened by the fact that this form of farming is tied to farmers' own food security.

ADAPTATION

There is no way to avoid the impacts of water scarcity and drought. The best thing to do is manage and mitigate risk where possible. A tool proposed by the group Water, Peace and Security is an early warning monitor capable of tracking information on rainfall, crop yields, and political, economic, and social factors. According to the group, this tool would "predict water-related conflicts up to a year in advance, which allows for mediation and government intervention."

Another common de-risking approach to conflict is water-sharing agreements. Since the end of World War II, 200 of these agreements have been signed. Despite this, the UN has consistently failed to introduce a Water Convention that would see over 43 countries sharing transboundary rivers and lakes.

A good example where a water-sharing agreement helped avoid conflict can be found in Southern Africa. In 2000, with tensions rising over shared resources, an agreement was reached between Lesotho, South Africa, Botswana, and Namibia that helped avoid further issues.

Reducing water loss remains the most recommended method countries should adopt to avoid future catastrophes. Agriculture and mining, in particular, are two industries that could do more to limit their water wastage. Another policy, suggested by Iceland, is to increase the price of water in relation to its supply, as a way to help curb water wastage.

Desalination is also a popular method used to free up more water, using seawater to increase supply. Saudi Arabia, for instance, uses desalination to supply the country with at least 50 percent of its water supply. Water recycling, known as "gray" water is another low-cost alternative used by farmers to offset the impact of drought. As water scarcity continues to become more commonplace, so too will these mitigation and adaptation strategies. The question is, will they be enough?

(Robin Scher is a writer based in South Africa. He is a graduate of the Cultural Reporting and Criticism program at New York University. This article was produced by Earth, Food, Life, a project of the Independent Media Institute)

textile mills, soft drinks manufacturers and breweries. Almost 20 per cent of water in Lake Victoria comes from rivers and streams in Tanzania, contributed by rivers such as the Kagera, Simiyu, Grumeti and the Mara. Upstream of some these rivers there are small-scale gold mining activities whereby mercury and cyanide are used for recovering the precious metal. The Mara is one of the major sources of pollution, especially of heavy metals from gold processing.

Lake Victoria has also suffered siltation due to high sediment loading caused by unchecked erosion in upper catchments and atmospheric deposition. Human activities like sand harvesting near the lake shorelines and destruction of forest contribute to more deposition of debris during runoff.

A report by the World Bank in October 2021 as part of the "Groundswell Africa" series says that without concrete climate and development action, the five countries of the Lake Victoria basin could see between 16.6 and 38.5 million people moving within their countries in response to water scarcity, declines in crop productivity and ecosystem productivity and sea level rise, augmented by storm surge. Tanzania and Uganda are projected to have the highest numbers of internal climate migrants by 2050, reaching 16.6 million and 12 million, it warns.

Investing in nature and managing these resources is even more important as climate change makes rainfall more erratic and increases the risk of floods and droughts. Evidence shows that without better sharing, management and investment, millions of the region's residents risk becoming climate refugees.

FUELLING CONFLICTS

In all probability, water stress will intensify tensions among countries in Africa and lead to conflicts and social unrest. While the governments can avert the crisis by managing and safeguarding their water resources, they have had conflicts and failed negotiations over these.

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Tensions arise among the countries whenever resources are discovered or become scarce in these shared waterbodies. The Nile, for instance, is one of the most critical transboundary waterbodies in Africa, serving 11 countries—and it is also a highly disputed one.

"Historically wars have been fought over the Nile, particularly between Egypt and Ethiopia. In the 20th century, the conflicts have not turned into wars but there have been many instances of disagreements between Ethiopia and Egypt," says Firehiwot Sintayehu, assistant professor in the department of political science and international relations at Addis Ababa University, Ethiopia.

These conflicts have their roots in colonial agreements over the water resource. Since the inception of Grand Ethiopian Renaissance Dam (GERD) in 2011, it has fuelled controversies, especially among the three Nile riparian countries: Ethiopia, Sudan and Egypt. "The interest of making use of the Nile waters for Ethiopia continues despite the change of regimes in different instances. Ethiopia is insisting that it should be able to make use of the Nile waters for the country's economic growth while Sudan and Egypt are insisting to maintain their 'historical rights' over the Nile waters which basically denies upstream countries to utilise the Nile waters," says Sintayehu. "If the riparian countries were able to cooperate, they would have been able to share ultimate benefits from the Nile. None of the countries are suitable for all economic activities that one can obtain from the river. Rather each country has its own comparative advantage. For instance, the water of the Nile would be saved from evaporation by having dams in the upstream countries. Sudan is also said to be the best place for irrigated agriculture.

If the riparian countries came into such a common understanding, they would have been able to cooperate rather than going into a never ending conflict,"Sintayehu says The other such

A report by the World Bank in October 2021 as part of the Groundswell Africa series says that without concrete climate and development action, the five Lake Victoria basin countries could see between 16.6 and 38.5 million people moving within their countries in response to water scarcity, declines in crop productivity and ecosystem productivity

protracted conflict is over lake victoria. Since 1989, the lake's basin has been one of the most conflict affected regions in the world. All the countries that share the lake, especially Kenya, Uganda and Tanzania, fight over it—for its fish and water. Lake Victoria basin countries account for 20 per cent of the continent's population but 40 per cent of the battle deaths that occurred continent-wide, states a study paper published in Ecology and Society in 2019.

These conflicts are increasing as the water levels in the lake keep falling and its resources are disappearing. New strains on the water resources have added to the tension. Samuel G Mafwenga, director-general, National Environment Management Council, Tanzania, admits that Lake Victoria has undergone severe ecological changes in the past four decades, which have led to near extinction of some of the fish species that are endemic only to the lake. Water quality has also been affected by hyacinth infestation, which causes eutrophication, and release of untreated sewage and industrial effluents, storm water and maritime transport wastes.

The extinction of several hundred species of haplochromine cichlid fish in the lake has been blamed on the introduction of the predaceous fish the Nile perch. The change in water quality especially turbidity, has also affected activities of different organisms in the lake thus contributing to the loss of biodiversity. On Tanzanian side, different kinds of industries have contributed to the pollution load in the lake. These include fish factories, coffee producers, sugar companies, textile mills, soft drinks manufacturers and breweries. Almost 20 per cent of water in Lake Victoria comes from rivers and streams in Tanzania, contributed by rivers such as the Kagera, Simiyu, Grumeti and the Mara. Upstream of some these rivers there are small-scale gold mining activities whereby mercury and cyanide are used for recovering the precious metal. The Mara is

ISTOCK PHOTO

one of the major sources of pollution, especially of heavy metals from gold processing. Lake Victoria has also suffered siltation due to high sediment loading caused by unchecked erosion in upper catchments and atmospheric deposition. Human activities like sand harvesting near the lake shorelines and destruction of forest contribute to more deposition of debris during runoff.

A report by the World Bank in October 2021 as part of the Groundswell Africa series says that without concrete climate and development action, the five Lake Victoria basin countries could see between 16.6 and 38.5 million people moving within their countries in response to water scarcity, declines in crop productivity and ecosystem productivity and sea level rise, augmented by storm surge. Tanzania and Uganda are projected to have the highest numbers of internal climate migrants by 2050, reaching 16.6 million and 12 million, it warns.

Investing in nature and managing these resources is even more important as climate change makes rainfall more erratic and increases the risk of floods and droughts. Evidence shows without better sharing, management and investment, millions of the region's residents risk becoming climate refugees. ■

STOCK PHOTO

8 WASTE

HIGHPOINTS

Waste generation in Sub-Saharan Africa will increase **300%** by the year 2050

Of the 50 largest landfills in the world, **19** are located in Sub-Saharan Africa

Across Sub-Saharan Africa only **55%** of waste is collected

Of the collected waste, only **19%** is managed in controlled facilities

PHOTOGRAPH: ISTOCK PHOTO

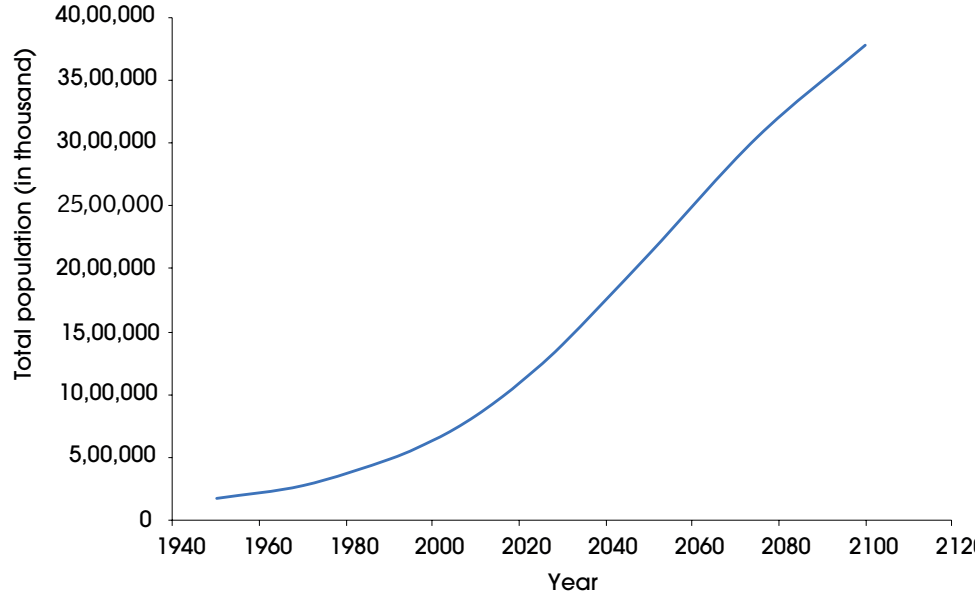
WASTE DUMP YARD

In near future Africa will have the world's highest waste generation

ALTHOUGH WASTE generation is currently lower in Africa than in the developed world, sub-Saharan Africa is forecast to become the dominant region globally in terms of total waste generation if current generation trends persist, said the Delhi-based non-profit Centre for Science and Environment (CSE) in its scoping report "Managing Solid Waste in Africa, 2022". Technically, solid waste includes refuse from households, non-hazardous solid waste from institutions, industries and commercial establishments, market waste, yard waste and street sweepings. In many low- and middle-income countries, it excludes medical waste (healthcare waste), hazardous industrial waste and sewage, e-waste, radioactive waste. Management of solid waste encompasses the functions of its collection, transfer, treatment, recycling, resource recovery and disposal.

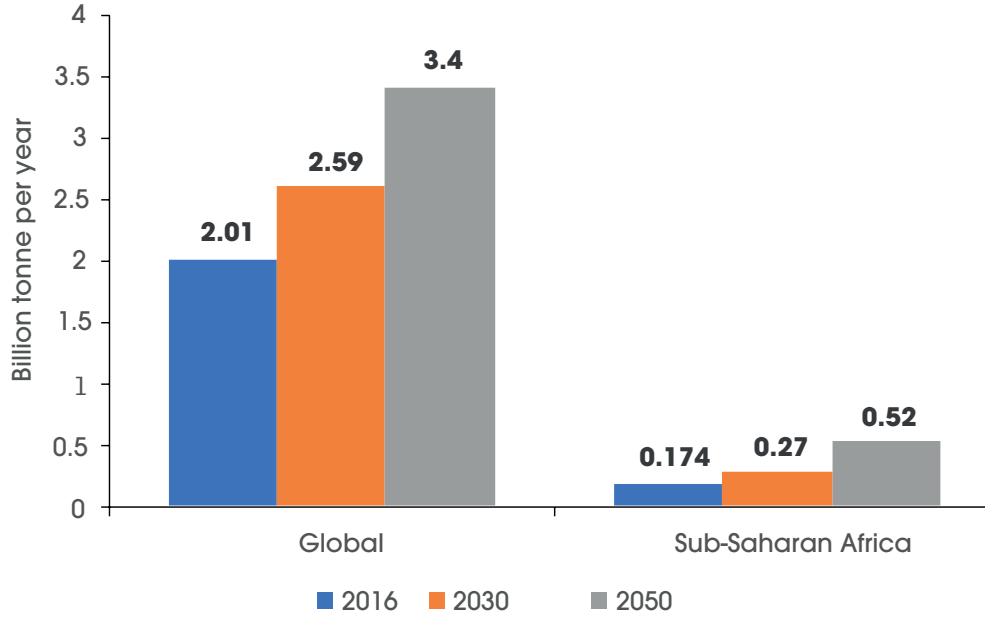
Africa, where 609 million people or 44 per cent of the population lives in urban areas, is the least urbanised, but most rapidly urbanising region in the world. From 2035 onwards Africa's urban population will exceed its rural population and the share is expected to reach

POPULATION TRENDS IN SUB-SAHARAN AFRICA



Source: United Nations, Department of Economic and Social Affairs, Population Division, World Population Prospects 2019, Volume II: Demographic Profiles

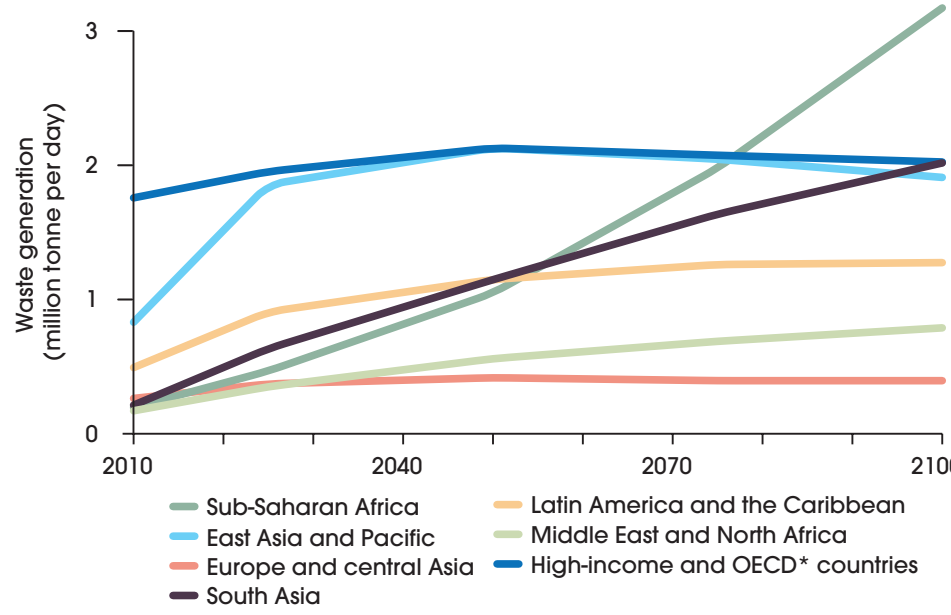
PROJECTION OF PER CAPITA WASTE GENERATION IN SUB-SAHARAN AFRICA AND THE GLOBAL AVERAGE



Source: World Bank, 2018, What a waste 2.0

close to 60 per cent by 2050 according to the "World Cities Report, 2022". Urbanisation directly contributes to waste generation, and solid waste management which is already a mammoth task in Africa and especially in the Sub-Saharan Africa (SSA), is going to be more complicated. This is because within Africa, SSA region will be predominantly urban by 2050 with six in 10 persons living in urban areas. Currently housing 1.03 billion people, the region's population is projected to reach 2.7 billion by 2060. In line with this surge, waste generation

PROJECTED WASTE GENERATION BY REGION



Source: Hoornweg, D., Bhada-Tata, P. and Kennedy, C., 2013. Environment: Waste production must peak this century. Nature, London, UK

in this region is also expected to register an over four-fold rise by 2050, according to some reports. While a large proportion of this population is concentrated in rural areas, there is a trend of workforce migration from the rural to the urban, which is fuelling the spread of cities. Urban areas currently contain 472 million people: this is expected to double over the next 25 years. The global contribution of African urban inhabitants is projected to grow from 11.3 per cent in 2010 to 20.2 per cent by 2050.

MEASURING THE CONTINENT'S WASTE GENERATION

In 2016, Sub-Saharan Africa (SSA) generated 174 million tonne (MT) of waste: the per capita generation was 0.46 kg per day. Although solid waste generation is currently lower in Africa than in the developed world — the SSA region has the lowest per capita generation rate globally — the region is expected to become a dominant region globally in terms of total waste generation if current trends persist. The countries in Sub-Saharan Africa are also expected to witness a major economic transition over the coming century as their populations explode, their rural-to-urban migration increases, and their consumption patterns change. All this will contribute to an exponential rise in waste generation, and put a huge strain on natural resources and the already stretched public and private sector services and infrastructure for managing solid waste.

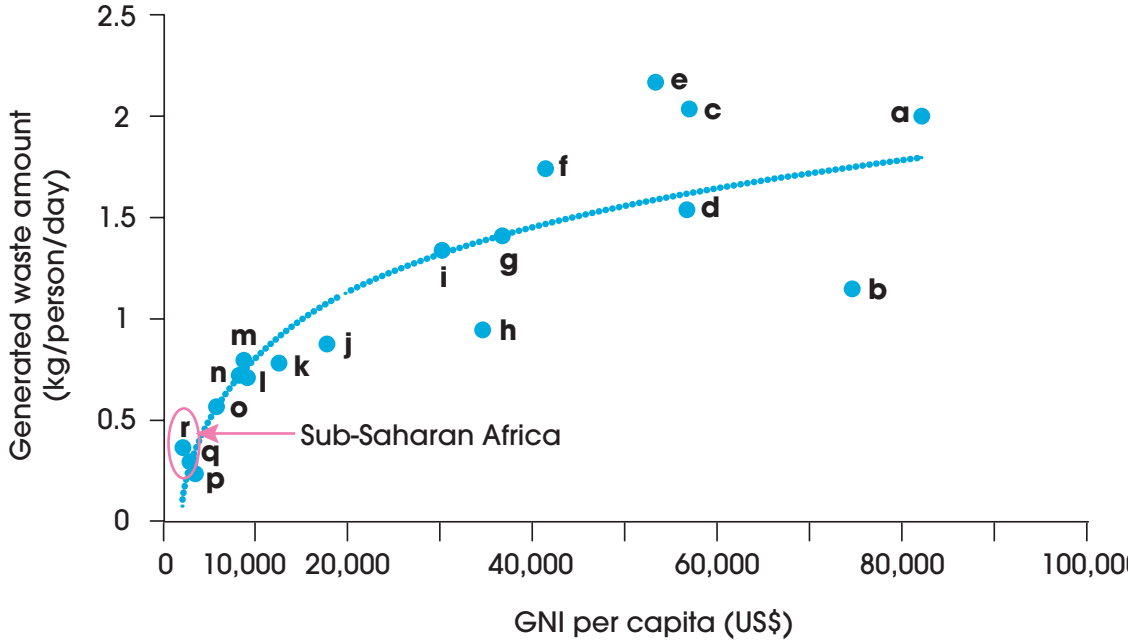
According to a study published in *Nature* magazine, waste generation will continue to rise in the fast-growing cities of SSA. In fact, the urbanisation trajectory of Africa will be a key determinant in the intensity of the "global waste peak". Using business-as-usual projections, the study predicted that by 2100, solid waste generation rates in this region will exceed 11 MT a day — several times more than today's rate (0.5 MT a day). With lower populations, denser and more resource-efficient cities, and less consumption (along with higher affluence), the peak could come forward to 2075 and reduce in intensity by more than 25 per cent. This could cut down the region's waste generation by around 2.6 MT per day.

Financial constraints, institutional weaknesses and public apathy towards Municipal Solid Waste (MSW) has meant that Sub-Saharan Africa (SSA) accounted for 65 per cent (or 81 million tonnes) of the 125 million tonnes per annum of MSW generated in Africa in 2012.

WASTE GENERATION AND ECONOMIC AFFLUENCE

Data indicates that generation of solid waste has a clear relation to the degree of economic development in a country. The jump in waste generation is sharp during initial stages of economic development, particularly until the per capita GNI reaches US $10,000 (see Graph). The Africa Solid Waste Management Data Book (2019) reports that the rise in waste generation has plateaued or even declined slightly in some developed nations as their economies have matured. In the case of Sub-Saharan Africa, which is beginning to see an economic uptick but has a per capita GDP of only US $1,600 (2017), the rise is significant. It is expected that waste generation will continue to rise in line with economic growth in this region.

How they go together



Note: (a) Switzerland, (b) Norway, (c) USA, (d) Australia, (e) Denmark, (f) Germany, (g) France, (h) Japan, (i) Italy, (j) Czech Republic, (k) Poland (l) Malaysia, (m) Mexico, (n) Brazil, (o) Thailand, (p) Indonesia, (q) Philippines, (r) Vietnam
Source: Africa Solid Waste Management Data Book 2019, African Clean Cities Platform (ACCP) Secretariat

The annual volume of waste generated in sub-Saharan Africa (SSA) increased from 81 million tonnes to 174 million tonnes per year between 2012 and 2016 and is projected to reach 269 million tonnes in 2030 according to a most recent review of "Municipal Solid Waste Collection and Coverage Rates in Sub-Saharan African Countries" published in April 2023. The total waste generation is expected to nearly triple in the SSA region between 2016 and 2050.It is projected to increase from—174 million tonnes in 2016 to 516 million tonnes in 2050. This has been projected by the UN in its report Africa Waste Management Outlook, 2018 too.

So, the growth rate of waste generation in Africa is expected to be so significant that any decrease in waste generation projected in other regions of the world will be eclipsed by Africa. Africa will lead the world due to its unmanageable growing waste. Waste management is a social, economic, and environmental problem facing all African countries. It is also part of the 2030 Agenda for sustainable development and Agenda 2063of the African continent too. ■

WOES OF LAKE VICTORIA

Critical for Mwanza to invest in source separation of waste, developing infrastructure for ensuring 100% collection coverage and efficient treatment

MWANZA, TANZANIA'S second most populous city after Dar-es-Salaam, is experiencing fast population growth. The city is seeing both natural increase and migration from other parts of the country. As a result, solid waste generation is also increasing rapidly, adding to pollution in Lake Victoria. The city has a land area of 256.45 square kilometres, of which nearly 72 per cent is terrestrial land and 28 per cent is covered by water, primarily in Lake Victoria. It is also located on the southern shores of the lake. Most of the land area is urbanised, while the remaining areas consist of forested land, valleys, cultivated plains, grassy and undulating rocky hill areas, indicating its rich ecosystem.

The city council is providing waste collection services for 17 out of the total 18 wards, as well as collection from the 38 authorised collection points. The collection coverage is 75 per cent, claimed Mwanza city council officials. Over 350 tonnes of non-hazardous waste is generated from residential and commercial areas, with per capita waste generation ranging from 0.6-1 kilogramme per day.

The practice of source separation of waste and formal sorting within Mwanza city council does not exist. However, their bye-law mandates the separation of waste into three fractions: Wet organic, plastics and paper. Like other African and Asian countries, recycling of dry waste is mostly done by the informal sector consisting of waste pickers and scrap dealers. Materials like paper, PET bottles, metals, gunny bags, etc, are sorted by the waste pickers and sold at the junk shops. It is interesting to note that glass bottles don't hold much value in Mwanza due to the country's limited number of glass recycling facilities. This needs to be addressed at the policy level to enable an environment for promoting glass recycling industries.

Collection and transportation services in Mwanza council are provided by six Community-Based Organisations (CBOs), which are currently serving 11 wards. Two private companies provide services in the central business district (CBD) area, mostly comprising commercial and institutional establishments located in six wards. Notably, just one ward — Lwamhima — is currently not provided with any waste collection service due to the unwillingness of the residents to pay the waste collection fees.

The city's only dumpsite receives waste from Mwanza city and Ilemela Municipal Council. About 150-200 tonnes are being received at the dumpsite every day. However, most of the waste remains uncollected or not received at the dumpsite. The city and municipal councils and community-based organisations operate collection points.

The predominant method of waste disposal is through landfilling. The Buhongwa landfill, which is about 18 km from the city centre, covers an area of 33.81 hectares.

It is a scientifically constructed landfill site with a barrier layer, leachate and gas collection and treatment mechanisms. There is an operational weighing bridge to record the incoming waste at the site. It is important to note that the landfill site is not operated scientifically. Waste is currently dumped haphazardly, with no leachate collection system, due to which the leachate flows into a natural wetland through which the Nyashishi River flows before meeting Lake Victoria. Overall, the entire facility was poorly managed due to a lack of staffing, equipment and technical capacity on the part of the city government staff responsible for managing the facility.

A MAJOR POLLUTION SOURCE FOR LAKE VICTORIA

A recently published report by New Delhi-based non-profit Centre for Science and Environment identified Mwanza city as a hotspot, contributing a substantial pollution load in the form of industrial effluents, domestic sewage and dumping of solid waste. It also recognised two rivers — the Mirongo and the Nyashishi — as the major water bodies carrying domestic and industrial pollution loads, respectively. A 2015 study in Mwanza reported the presence of plastics in the gastrointestinal tracts of locally fished Nile perch (Lates niloticus) and Nile tilapia (*Oreochromis niloticus*).

An analysis confirmed plastics in 20 per cent of the total fish sampled from each species. A variety of polymer types were identified, with likely sources being urban waste and consumer use. Mwanza needs to take several steps to minimise the influx of pollution in Lake Victoria from mismanaged solid waste. It is critical for the city to invest in implementing source separation of waste and developing infrastructure for ensuring 100 per cent collection coverage and efficient treatment.

The city needs to prepare a roadmap to gradually increase its recovery and treatment efficiency to divert the fractions that should not reach the sanitary landfill and drains. Besides, there is enormous revenue potential if the waste is treated with appropriate technologies, which can partially or fully meet the city's operational cost to provide waste management services to the citizens. This would be possible only if various fractions of waste, especially bio-degradable and non-biodegradable waste, were not mixed and segregated at the source mandatorily. Collection service needs to be strengthened and provided to the entire city so that waste is not littered along the streets and drains and should not eventually find its way to Lake Victoria.

PHOTOGRAPH: SWATI SAMBYAL / CSE

A CONTINENTAL WASTE

Waste collection in Africa is one of the lowest in the world and just one-tenth of it is recycled

IDEALLY ALL the waste generated must be collected and treated accordingly. But, across Sub-Saharan Africa (SSA) only 55 per cent of waste is collected, according to the UN Statistics Division, 2022. The SSA region has 19 of the world's 50 biggest dumpsites. Most of these dumpsites and landfills are non-engineered. Researchers from the Liverpool John Moores University, UK and the University of Lagos, Nigeria studied 31 landfill sites in 13 countries in the SSA region — they found that 90 per cent of these were classified as disposal sites with no or very limited controls. The landfills were actually dumpsites having no leachate collection and treatment systems, composite liner, or gas collection systems. While the growing piles of debris and waste are a cause for concern, what is more worrying is the unscientific management of this waste, a major proportion of which is dumped in the open. A 2017 report

by Delhi-based non-profit Centre for Science and Environment (CSE) — Integrated Waste Management Policy and Legislation for African Nations — has pointed out the key hurdles in instituting sustainable solid waste management systems in this region. These include meagre source separation, an absence of waste data inventory including classification and characterisation of waste streams, and limited institutional capacity to scientifically manage different material streams to secure maximum recovery, processing and recycling. The findings of this report have been further validated by two scoping studies done by CSE to gauge the solid waste ecosystem in Eswatini and Tanzania. According to the World Bank's 2018 report "What a Waste 2.0", the Sub-Saharan African countries accounted for 9 per cent of the global waste production in 2016 — together, they generated nearly 180 tonnes of waste. Out of this, 60 per cent was disposed of in open dumpsites.

Waste collection is typically done in a dual system, in which the waste is first collected door-to-door and later from a centralised point where the collected waste is aggregated. The collection rate is reported to be higher in urban areas compared to rural areas. The rate varies between countries, cities, and even within cities. For example, the collection rate for Lagos city in Nigeria is above 90 per cent, while for Jimma in Ethiopia and Wa in Ghana, it could be below 55 per cent.

The waste generated in SSA has a high proportion of biodegradable organic material, accounting for about 57 per cent of the total waste generated. The presence of high fraction of biodegradable organics is attributed to poor food preservation and preparation methods in these countries. Organic waste generated is more heterogeneous in urban areas compared to the rural areas. Also, the quantities of waste are typically more in urban areas. The proportion

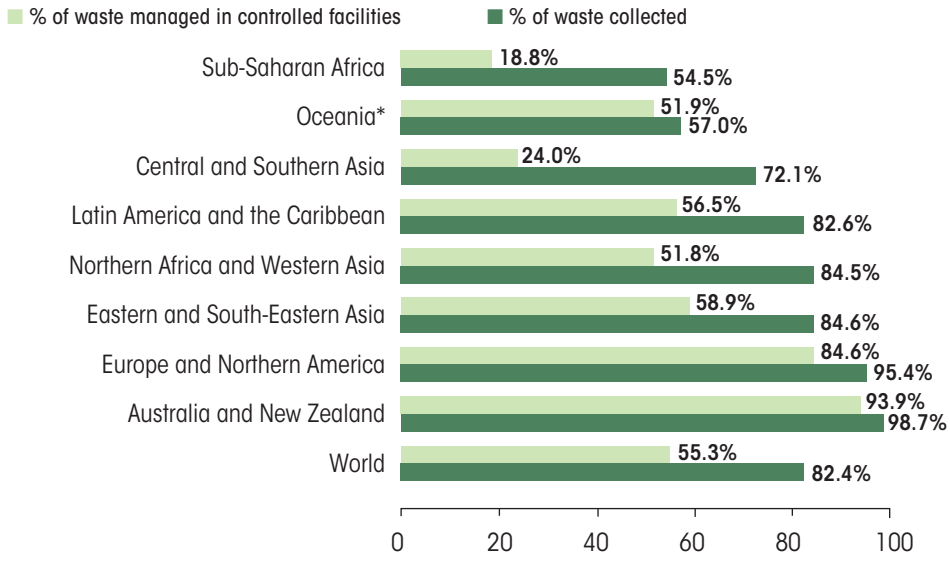
The Sub-Saharan African countries accounted for 9 per cent of the global waste production in 2016 — together, they generated nearly 180 tonnes of waste. Out of this, 60 per cent was disposed of in open dumpsites

of recyclables such as plastics, paper, metals and glass are comparatively lower in SSA countries than in high-income nations. The proportion of plastic waste varies from 10 to 20 per cent for most of SSA countries depending upon their economic level. The average percentage of plastic waste is 13 per cent, as reported by the United Nations Environment Programme in 2018. The key drivers which affect plastic waste generation are income levels, economic growth, population growth, changes in consumption patterns and migration. Currently, the region generates an estimated 17 MT of plastic waste every year, which is not recycled efficiently. Typical consumption patterns in the region are changing and moving towards consumption of more packaged products and electronic items, which will further increase the proportion of plastic and e-waste (which typically comprises of non-ferrous metals such as aluminum, copper and even gold which could be potentially recycled). It has been reported that if these valuable metals are recycled, they could earn the region an income exceeding Euro 55 billion. Rwanda and Uganda are two of the countries which have formed policies and guidelines for the management of e-waste. In most of the other countries in the region, e-waste is disposed of along with the other components of municipal solid waste.

A lack of collection and transport equipment is one of the major challenges and reason behind the low collection rate. An estimated 238 million of the region's urban population lives in slums or informal settlements, where collection vehicles and workers cannot reach easily. Since the SSA countries' waste typically contains high proportions of biodegradable organics which are higher in water content, the types of waste compactor vehicles typically used in developed nations are unable to function effectively in these countries — they offer little advantage in terms of increasing the waste density.

The absence of proper maintenance of these vehicles is also a major challenge. Most of the times, these vehicles become non-operational because of maintenance difficulties which

MUNICIPLE SOLID WASTE COLLECTION AND MANAGEMENT IN CONTROLLED FACILITIES, 2022



* Excluding Australia and New Zealand

include lack of technical capacity, complicated mechanisms and equipment, lack of the time for carrying out repairs or maintenance, and a lack of budget needed to import parts. Experiences in Abuja (Nigeria) show that advanced compactor trucks provide little advantage for African conditions owing to the high proportion of organic matter in the municipal solid waste (MSW), as well as servicing requirement. Primary waste collection is often performed by a wheelbarrow or a donkey cart in many African cities. Although these methods allow for efficient waste collection, they are not capable of long-distance transport or for moving waste in bulk. In some cases, therefore, systems have been adopted in which transfer points have been set up — the primary collection is performed by wheelbarrow or donkey carts, and the waste is later collected by a motorised vehicle (secondary collection or transport). The uncollected waste is often managed independently by households, or openly dumped or burned.

According to UN estimates, only 19 per cent of the waste collected is managed in controlled facilities. Globally, an average of 82 per cent of municipal solid waste globally was being collected and 55 per cent was being managed in controlled facilities according to the UN Statistics Division, 2022. So, the performance of SSA region is worst on these two parameters amongst the eight Sustainable Development Goals (SDGS) regions of the world even when most of the budget for solid waste management in developing countries including the SSA nations goes to waste collection, stated the UN Habitat.

SLIPPAGE WOES

An analysis of the city-wise collection rate of MSW in the Africa continent shows that in 24 out of 46 African cities across 34 African nations, the collection rate was less than the regional average of 55 per cent. This is as per the collection rate provided by World Bank in 2018. But the two cities in Zimbabwe in the Sub-Saharan region—Harare and Gweru—had collection rate 100 per cent. Four years later, waste management especially "collection" in these cities has not been up-to-the-mark and has been criticized too.

In Harare, just 26 per cent of the 760 tonnes of municipal waste generated daily, gets collected as per the most recent data for 2021provided under the UN Water-Wise cities initiative. In March 2023, the local councils failed to collect refuse in various suburbs resulting in fears of health crisis. Gogo Chimombe a resident of Glen View, Harare was quoted in local media, "We are not safe because the Harare we used to know is no longer exists. We used to

GENERATION AND COLLECTION OF WASTE

City in Africa	Year	Total MSW generated	Total MSW collected	Collection rate (%)
Addis Ababa (Ethiopia)	2021	2086 t/d*	2048 t/d	98.18
Victoria (Seychelles)	2019	199 t/d	195 t/d	97.99
Dakar (Senegal)	2022	1426 t/d	1358 t/d	95.23
Sousse (Tunisia)	2021	295 t/d	266 t/d	88.96
Bahir Dar (Ethiopia)	2021	159 t/d	136 t/d	85.53
Alexandria (Egypt)	2022	5134 t/d	4300 t/d	83.76
Nairobi(Kenya)	2019	3085 t/d	2013 t/d	65.25
Cape Coast (Ghana)	2021	166 t/d	104 t/d	62.65
Sekondi-Takoradi (Ghana)	2022	165 t/d	100 t/d	60.61
Mombasa (Kenya)	2020	708 t/d	399 t/d	56.36
Kiambu (Kenya)	2020	1290 t/d	667 t/d	51.71
Lagos (Nigeria)	2021	11349 t/d	5445 t/d	47.98
Homa Bay (Kenya)	2023	76 t/d	32 t/d	42.11
Dar es Salaam (Tanzania)	2021	5733 t/d	2042 t/d	35.62
Taita Taveta (Kenya)	2022	195 t/d	59 t/d	30.26
Harare (Zimbabwe)	2021	798 t/d	204 t/d	25.56
Mosanze (Rwanda)	2023	142 t/d	26 t/d	18.31
Bukavu (Democratic Republic of the Congo)	2021	898 t/d	63 t/d	7.02

Source: UN Waste-Wise Initiative, as of July 21, 2023 https://unh.rwm.global/Map; *tonnes/day

see the refuse trucks twice every week. It's now history, Glen View and Budiriro were the most affected during the outbreak of cholera sometime in 2018, and the same plague might revisit us anytime soon." In May 2023, the Environment Management Agency was forced to scale-up law enforcement on waste collection and management. In June 2023, Gweru was reportedly under fire over poor waste management as per media reports. Dar es Salaam too has slipped to 36 per cent collection rate in 2021 from 49 per cent in 2018.

Addis Ababa collects over 98 per cent of its MSW as per the UN as of the year 2021. So less than 2 per cent remains uncollected in the city of Ethiopia. The data gaps on MSW make it difficult to monitor the progress; however, the Waste-wise initiative launched in 2018 by the UN Habitat is a step in the right direction.

In 2018, Lagos along with eight other cities - Mbare, Lilongwe, Blantyre, Nyagatare, Sikasso, Porto Novo, Monroviam and Nouakchott - had a collection rate of up to 30 per cent only. Lagos, the most populated city in Africa (15.4 million), had the lowest collection rate of 10 per cent only in 2018. In the same year, the people of Lagos feared an epidemic outbreak owing to mounting heaps of uncollected MSW across the city. The waste collection rate in Lagos had increased to around 48 per cent in 2021; but since then, it has been coming down, as data from the UN data under Water-Wise cities initiative shows. From the over11, 349 t/d of MSW generated, less than half (48 per cent) gets collected and this is less than the average of "55% collection rate" for the region. So, despite progress, the state of municipal waste management remains far from satisfactory even now.

In June 2022, a paper published in *Open Journals of Environmental Research* (OJER), too has reiterated the poor state of waste management in Lagos. "As the volume of waste continues to increase in Lagos State, there is a need to adopt an efficient sustainable policy framework such as the Waste Framework Directive 2008/98/EC (WFD) - also known as the Waste Hierarchy Guideline – that will help resolve part of the plastic waste problems in Lagos State," said Allen-Taylor, K. O, the lead researcher and author of the paper from Department of Waste and Resource Management, Technische Universität Braunschweig, Germany. But, the Lagos state government hopes to achieve a better management of waste and attain a waste

JUST TRANSITION WITH WASTE-PICKERS

KENYA AND South Africa announced an initiative in December 2022 to end plastic pollution in a way that is as fair and inclusive as possible to everyone concerned. The Just Transition initiative, launched in the aftermath of negotiations on a global treaty to end plastic pollution, aims to create decent work opportunities for waste-pickers and other workers in the plastic value chain.

The first Session of the Intergovernmental Negotiating Committee (INC) to phase out plastic was held in Uruguay from November 28 to December 2, 2022. The Just Transition initiative "seeks to foster the element of a just transition within the letter and spirit of the proposed legally binding instrument," announced Ayub Macharia, representative of the Kenyan delegation at the INC session. In Macharia's words, the legally binding instrument ensured the spirit of leaving no one behind. The Just Transition initiative was welcomed by waste pickers present at the INC. Maddie Koena, the South African member of the delegation of the International Alliance of Waste Pickers (IAW), asserted the need for the concerned countries to design the plastic treaty with livelihoods and human rights in mind. IAW is a networking process that connects and supports thousands of waste picker organisations in over 28 countries.

It's been good this week to see such widespread recognition of the vital role we waste pickers play. Now countries need to design the treaty with our livelihoods and human rights in mind, said Koena. "I'm very pleased to see my country, South Africa, leading the way on this, alongside Kenya, by launching the Just Transition Initiative as a joint initiative with the International Alliance of Waste pickers (IAW) and other stakeholders," added Koena.

Following the announcement of the initiative, Barbra Weber, a waste picker from USA, said, "A Just Transition, not only for those who collect and process plastics but also for those who live and work amidst the pollution from plastics production and management." This requires direct funding for our communities, appropriate technology transfer and decent and safe work in reuse, repair and mechanical recycling, she said. Barbra said, "We reject false solutions like incineration and pyrolysis and demand that the petrochemical companies immediately phase toxic chemicals out of plastics production and recycling, eliminate non-recyclable plastics and ensure that all materials have value." "Our interpretation of a Just Transition is clear: Guaranteeing that waste pickers can remain and advance in value chains, improving our working conditions and ongoing investment in our work," said Soledad Mella Vidal, a waste picker from Chile.

A submission on modalities informed by the Just Transition Initiative will be developed in consultation with the IAW and will be finalised in the next few months before the next INC in 2023, said Mamogala Musekene, South African government representative and chair of the Group of Friends of Waste-pickers.

free city as it has adopted a circular economy approach.

Under business as usual, the continent's average MSW collection rate is expected to rise by only 69 per cent by 2025. This means that the cities will continue to dump 31 per cent of their uncollected waste in open spaces on land. The uncollected waste will also clog the storm water drains and pollute the rivers too.

While the volume of uncollected waste is challenging the nature of waste adds to the challenge. Waste generated in Africa with large proportion of organic waste (60 per cent) which has high moisture content. This has a direct bearing on the management of the waste, the potential environmental impacts of the waste when disposed of to landfills. According to the UN-Habitat, more than 90 per cent of the waste produced in Africa is disposed of in uncontrolled landfills, often accompanied by open burning.

Some 19 of the 50 largest landfills in the world are located in Africa, all in sub-Saharan Africa. Waste production will continue to rise in the future, with unsustainable treatments—especially landfilling—continuing to dominate according to the paper "The world's growing municipal solid waste: trends and impacts" published in *Environmental Research Letters* on June 23, 2020. Uncontrolled and uncollected waste has severe public and environmental health costs, estimated to be five to 10 times more economically damaging than the costs of bringing global waste management to healthy levels as per the "Global Waste Management Outlook 2015".

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LOSS OF WEALTH

Close to 80-90 per cent of the MSW generated in Africa is recyclable, but 10 years later less than 10 per cent of the urban solid waste is being recycled in the continent. In 2013, African Union had a target to recycle 50 per cent of the waste generated by African cities in 2023. The ambitious target was included in the 10-year implementation plan (2014-2023) for Agenda 2063 of the African Union.

The region is missing the opportunity of utilising waste to create wealth. Though recycling is a billion-dollar industry, many governments across Africa have not yet tapped into its potential, said the Recycling Association of Africa (RAA) in March 2023. Across the continent, only South Africa has made significant strides in recycling, noted RAA. Lack of proper legal frameworks to support and encourage the growth of the recycling industry in most of the African nations has made it difficult for the industry to operate efficiently and effectively. This also creates a disincentive for investment in the sector.

Such trends will negatively impact the 2030 Agenda for Sustainable Development and Agenda 2063 of the Africa continent. The region is very likely to miss important targets under SDG goals 11 and 12 relevant to municipal waste management. Under SDG 11 (Target 11.6), the world has a target to reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management. Indicator 11.6.1 refers to "proportion of municipal solid waste collected and managed in controlled facilities out of total municipal waste generated, by cities". Under SDG 12 (target 12.5), the world had a target to substantially reduce waste generation by 2030 through prevention, reduction, recycling and reuse. Solid waste management is also linked to other SDGs. For example, Solid waste management technologies can drive renewable energy from organic waste, which include—SDGs on affordable basic services in cities. Adequate SWM practices

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can prevent emissions of large amounts of greenhouse gases, thus linked to the SDG 13 on climate action. Eliminating uncontrolled dumping of waste will prevent waste, especially plastics from entering into the ocean, thus contributing to SDGs 14, which includes reducing marine pollution. Africa has 30,500 km of coastline, with 70 per cent of Africa's 54 countries containing coastlines, as per the "Africa Marine Litter Outlook", released in June 2022. So, there is an obvious need to balance future population growth and urbanisation with more stringent waste reduction efforts.

Solid waste management is a development issue that cuts across socio-economic activities and needs to be a political priority for Africa, said the UN earlier. In 2022, there have been two significant noticeable developments which show that the continent is determined to address the "waste management" and is amongst the top "political and urban priority". The first was the decision of the 18th session of the African Ministerial Conference on Environment (AMCEN) to move towards the "phasing out open burning of waste in Africa". In 2022, waste management for the first time received a spotlight at Conference of Parties (COP27) to the United Nations Framework Convention on Climate Change. The Global Waste Initiative 50 by 2050 was led by Egypt, the host of COP27. This initiative aims to raise the recycling rate of African waste to 50 per cent by 2050 from the current 10 per cent. ■