

GEO-6

GLOBAL ENVIRONMENT OUTLOOK

FOR YOUTH

AFRICA



environment
programme

A WEALTH OF GREEN OPPORTUNITIES



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Preface by United Nations Environment Programme Director and Regional Representative for Africa



One third of Africa's 420 million youth aged 15 to 35 are unemployed. Consequently, youth in Africa are twice as likely to be unemployed as adults.

The Global Environment Outlook (GEO) for Youth, Africa: A Wealth of Opportunities, articulates solutions provided by Africa's youth to tackle unemployment through the green economy. All the seven chapters of the book were authored by nearly one hundred young people from all of Africa's six sub-regions. They have laid out their concerns about both the state of Africa's environment and their career prospects. But more importantly, they have provided insights on steps that can be taken to conserve the environment and create jobs.

Although centred on youth voices, this publication is anchored substantively in the United Nations Environment Programme's *Sixth Global Environment Outlook (GEO-6) Regional Assessment for Africa*. This assessment had a very clear message that, 'Africa has an opportunity to use its large young population to drive its growth.' Amongst the report's key findings was the fact that Africa's rich natural capital was critical in enhancing the livelihoods of Africans. Sustainable management of this natural capital will ensure a multiplicity of sustainable livelihoods for our young people. Driven by this realization, the UNEP Africa Office has put in place a strategy for engaging African youth in rolling out sustainability across the continent.

We acknowledge that a changing climate has negatively impacted employment prospects across the continent, thus adversely impacting millions of African youth. Consequently, there have been fewer jobs for a growing number of youths. This scenario cannot be left unchecked. This publication explores the wealth of livelihood opportunities that can be found not just in tackling climate change, but also in land, water, biodiversity, and environmental policies.

I call upon African youth to come together and use their demographic dominance to build a sustainable, low-carbon Africa. Young people have the potential of ensuring a critical mass in sustainable utilization of Africa's natural resources. Such is the sustainability that will unlock green jobs in Africa.

Dr Juliette Biao Koudenoukpo,
United Nations Environment Programme Director and Regional Representative for Africa

Foreword by AMCEN President



Unemployment has condemned African youth to social and economic exclusion that leaves them greatly disadvantaged as they pursue their goals in life. It is therefore incumbent on us, as leaders of Africa to bequeath to our youth a future in which they are able to create or find jobs that will allow them to fulfil their potential, to have a stimulating life and earn them a decent living. Such jobs can be found by unlocking the green economy's sustainable potency.

Africa's natural resources provide employment of eight out of ten people on the continent. Nearly six million Africans employed in a fisheries and aquaculture sector that is worth US\$24 billion. In the same vein, almost ten million people work in the wildlife sector. In addition to those directly employed in the sector, wildlife also indirectly supports more than 22 million jobs. Further to this, more than half of working age Africans are employed in the agricultural sector. Anchored in the green economy, these jobs are providing livelihoods for millions of African youth.

The green economy calls for a paradigm shift in the way that we produce and consume. If young people are the centre of such a shift, they will secure a sustainable future replete with sustainable livelihoods. The *Global Environment Outlook (GEO) for Youth, Africa: A Wealth of Green Opportunities* digs deep into that future and shows young people how they can secure their livelihoods through green jobs.

The Africa Ministerial Conference on the Environment (AMCEN) has a long-standing commitment to Africa's youth. In 2005, we commissioned and supported the first UNEP youth publication that was known as, *"Africa Environment Outlook for Youth: Our Region, Our Life."* It is thus fitting that fifteen years later, a new generation of African youth have come together again to make their voices heard. We will listen to these voices and work to put in place policies that will enhance green jobs that can make a lasting difference in the lives of our young people.

As such, the success of the green economy in Africa will partly be measured by the number of jobs that it creates for our youth. This publication has laid out a fitting blueprint for achieving that goal.

As Africa's environmental leaders, we are extending a hand of partnership to Africa's youth to join us in implementing the green jobs blueprint that they have mapped out in this publication. Let us all roll up our sleeves and create green jobs that will quench the employment thirst of Africa's increasingly youthful workforce.

A handwritten signature in blue ink, appearing to read 'Lee White', with a stylized flourish at the end.

**HE Lee White,
Minister of Forests, Seas, and Environment in Charge of Climate Plan of Gabon
and
President of the African Ministerial Conference on the Environment (AMCEN)**





GEO-6 for Youth: Africa 1st Authors' Meeting, 13-14 March 2018, Cairo, Egypt



GEO-6 for Youth: Africa 2nd Authors' Meeting, 22-26 October 2018, Nairobi, Kenya

Executive Summary

There are more young people in Africa than anywhere else in the world. This has endowed the continent with the potential for unparalleled energy, dynamism, and innovation. Unfortunately, this priceless asset of a predominantly youthful population can easily be undermined by lingering youth unemployment across the continent. This *GEO for Youth Africa: A Wealth of Green Opportunities* publication explores the economic opportunities that can be found in Africa's vast natural resources.

The first aspiration of the African Union's Agenda 2063 is, 'a prosperous Africa based on inclusive growth and sustainable development'. Africa must therefore shift towards an inclusive green economy that will replenish the environment and deliver jobs to youth. The time is ripe for new development models that can drive growth in income and employment for youth, while significantly reducing environmental risks and ecological scarcities. Such models must be championed by young people. They want an Africa where the indignity of unemployment is consigned to the past. In this envisioned Africa, the green economy will trigger a multiplicity of new economic opportunities for youth across the continent.

Air pollution, whose greenhouse gases are a key contributor to climate change, is responsible for approximately 600,000 deaths in Africa annually. This must be decisively addressed through sustainable solutions, such as the construction of better ventilated housing and clean cook stoves, interventions that can easily create youth jobs. Climate change can undermine all conservation and restoration efforts if not met with concerted and consistent action.

The transport sector is also a major contributor to air pollution in Africa. To counter this, African Governments should fast track development of citywide non-motorized transport policies and infrastructure. Moreover, youth should be on the forefront of lobbying for and utilizing non-motorised transport like cycling. If more African youth embrace cycling, governments will end up planning for and putting in place cycling infrastructure.

The renewable energy sector is emerging in Africa, as African countries try to mitigate their GHG emissions. Energy created through solar photovoltaic cells, landfill gas and biomass plants, creates more jobs per unit of energy than energy created from fossil fuels. These jobs can easily exceed 20 million by 2030. This positive job creation effect of off-grid electricity is a result of longer and more diverse supply chains, higher labour intensity, and increased net profit margins. Jobs in renewable energy can be created directly and indirectly along the entire value chain, including in the manufacturing and distribution of equipment; the production of inputs such as tools and chemicals; or

even in services like project management, installation, operation, and maintenance. All these economic opportunities can only be fully tapped into through substantially greater adoption of renewable energy.

Land is the true wealth of Africa and is home to a dazzling diversity of natural resources and ecosystems including soils, vegetation, water, and genetic diversity. Together, these resources form the continent's main natural capital that anchors essential ecosystem services and functions. By virtue of their demographic dominance, African youth can play a pivotal role in the sustainable management of Africa's land, unlocking sustainable livelihoods. If Africa unlocks its arable land potential and begins to export substantially more food globally, considerably more jobs will be created. Climate smart agriculture presents an avenue for reinforcing the livelihoods of smallholder farmers, among them young farmers, by equipping them with more effective ways of managing natural resources and deploying technologies that will help them produce and sell more.

It is quite telling that the global food value chain already employs almost one billion people and generates up to US\$2,400 billion to the global economy. It is estimated that the world will need to increase food production by at least 50 per cent by 2050 to adequately feed the population. As such, Climate Smart Agriculture presents a golden opportunity for African youth to insert themselves into the global food production value chain in a sustainable manner.

Africa's freshwater ecosystems include 63 shared river basins whose economic opportunities are abundant. These river basins are also critical for meeting Africa's energy needs. Currently 90 per cent of Africa's hydroelectricity potential remains untapped. If this is addressed, there will be more energy access across the continent, which would lessen pressures on forests since they continue to supply the bulk of the continent's cooking fuel needs. Moreover, these river basins support inland fisheries in dozens of countries, creating, in the process, jobs for thousands of young people.

African youth are also gainfully employed in coastal areas whose tourism thrives from the marine ecosystem and Africa's small island developing states are dependent on tourism, albeit, at varying degrees. As such, the blue economy is a major provider of jobs in these countries which portends the great potential of the blue economy to provide increased decent employment for African youth. This is why the African Union has placed a high premium on the blue economy as the new economic frontier that will create employment.

The millions of African youth who live in coastal countries should be enabled to seize the economic opportunities presented by the rich marine ecosystem in their respective countries. These economic opportunities transcend the fisheries and coastal tourism sectors





into marine renewable energy technologies for wind, wave, and tidal energy; mineral production; boat building; shipping and ports activity; aquaculture; bioproducts (pharmaceutical and agrichemicals); 'blue carbon' (carbon storage in mangroves, seagrass, and saltmarsh) and desalination. All these sectors present golden opportunities for blue-economy powered youth employment.

Africa's immensely rich biodiversity is also fertile ground for sustainable livelihoods. The continent's vast land, water bodies and skies are full of all manner of plant and animal life that constitute the continent's rich biodiversity. So rich is this biodiversity that 25 per cent of the world's biodiversity can be found in Africa.

The wealth of this biodiversity extends beyond forests into rangelands that cover 65 per cent of the continent's total land area. The biodiversity of Africa's rangelands is so abundant that the world's greatest diversity of large mammals can be found in Eastern and Southern Africa's rangelands. This has boosted wildlife tourism and created thousands of jobs for young people. These economic opportunities inherent in wildlife tourism can be further enhanced through ecotourism. Further to this, Africa's aquatic ecosystems are also flowing with rich biodiversity. Across the continent, wetlands, rivers, lakes, and coastal environments are home to distinctive aquatic biodiversity. Against this backdrop of a biodiversity-rich continent, it is incumbent on African youth to increasingly anchor their livelihoods at the intersection between biodiversity and sustainable development because our shared wealth, health, and well-being is rooted in this intersection.

Ultimately, only sound and successful environmental policies can ensure and enforce long term sustainability gains. The United Nations has had a long-standing recognition that youth imagination, ideals, and energies are critical in fostering sustainable development. Stakeholder involvement is a central component of policymaking and implementation. Because sustainability is anchored in good policies, youth must be involved in policy processes from conception to implementation. As key stakeholders in society, African youth must be on the frontlines of advocating for transformative environmental policymaking as well as implementation. Young people have a wide array of knowledge and skills that are needed in curbing environmental challenges and can help fill data gaps needed for sound policymaking, as well as raise community engagement and compliance. Making them part of the policy making processes could bring in a fresh breath of ideas that will help in proper policy implementation and enforcement.

Africa's sustainability future is bright. In that future, green jobs abound so much that youth unemployment is dealt a decisive blow. But for this future to materialise, young people, policymakers, private sector players, local communities, and Africans as a whole must roll up their sleeves and work very hard at ensuring replenishment and not depletion of natural resources. The numerous pathways that lead to this future can be found in parliaments, learning institutions, work places, local markets, city streets, farms, and all across Africa. This publication showcases over 30 such pathways that have already been carved successfully by young people from all over the continent.

Chapter 1

Youth-led Green Solutions





Key Messages

Africa has the largest concentration of young people in the world. There are approximately 420 million young men and women aged between 15 and 35 years in Africa today and the number is set to double to 830 million by 2050. This transition in demography, if properly utilized, can generate a 'demographic dividend' capable of stimulating economic growth.

Africa's natural resources are responsible for 80 per cent of total employment on the continent. Youth engagement in the green economy can potentially maintain and enhance this natural capital that constitutes a vital source of livelihood for the vast majority of Africans.

Green jobs can be an antidote to youth unemployment in Africa. There is a strong correlation between a thriving green economy and decent jobs, and African youth offer significant promise in leading the green growth agenda.

Governments need to incentivize young people to join the green economy, and create platforms for innovation in sustainable development.

1.1 Introduction

Africa is a land of beauty and magnificence! It is a land endowed with a myriad of natural resources. From its deep, dense, and almost impenetrable forests; to the vast reserves of mineral deposits within its ground; the numerous ribbons of rivers and streams that cut across it; to the scores of wildlife that also call the continent their home: The continent is indeed a locus of significant natural wealth.



Rowing a boat along the White Nile River in Al-Douiem, Sudan

Rami Elsayed

For one, Africa is home to the second largest contiguous tropical forest zone; the Congo Basin Rain Forest. It covers 251 million hectares and stretches across the nations of Cameroon, the Central African Republic, the Republic of the Congo, Equatorial Guinea, and Gabon. As a result of its sheer vastness, and because it stores a quarter of the total carbon in tropical forests globally, the Congo basin forest area is so important to the planet that it has been called the 'world's second lung' (Baffoe 2018). The continent is also home to the world's largest arable landmass, or 65 per cent of the total uncultivated arable land in the world (African Development Bank [AfDB] 2018a). In terms of mineral reserves, about 30 per cent of all global mineral reserves on the planet are found in Africa (AfDB 2016a). The world's longest and second largest rivers; the Nile and the Congo, also snake through the continent with inspiring awe and pour into the Mediterranean Sea and the Atlantic Ocean, respectively. In fact, Africa possesses 10 per cent of the world's internal renewable freshwater sources (United Nations Environment Programme [UNEP] n.d. a). The dense population of wildlife in their natural habitats also show that Africa is a hotbed of biodiversity.

With such an abundance of natural resources, Africa has within its hands an auspicious opportunity to foster economic development and realize the sustainable development goals (SDGs). By using its natural resources as the bedrock, Africa can launch and catalyse broader economic progress for its more than 1 billion people, most of whom are youth below the age of 35 years.

1.2 Africa's greatest asset: Youth

Although Africa has significant natural wealth, its greatest asset is its largely youthful population (AfDB 2018b). There are approximately 420 million young men and women aged between 15 and 35 years

in the continent today and the number is set to double to 830 million by 2050 (AfDB 2018b). With the fastest-growing population in the world, the percentage of working-age Africans is expected to increase from 12.6 per cent in 2010 to 41 per cent in 2100. (United Nations Department of Economic and Social Affairs [UN DESA] 2017). This transition in demography, if properly utilized, can generate a “demographic dividend” capable of stimulating economic growth (Gribble and Bremner 2012).

This chapter and the rest of this publication provide ample evidence of sustainable youth action that capitalizes on their energy, innovation, ideas, and solutions. When channelled into green jobs, these initiatives can potentially transform local communities and the continent at large.



A group of students in Accra receiving training to become sanitation ambassadors in their communities

Divine Aghorli

A demographic dividend can be described as accelerated growth in an economy borne out of a shift in the population's age structure that results in the nation having a larger working-age population compared to a non-working-age population. Through strategic investments in human capital; in the form of employment, entrepreneurship, education, and skills development; nations can truly harness the promise of the demographic dividend to change the development trajectory.

1.2.1 Challenges facing Africa's greatest asset

African youth continue to face a multitude of challenges: unemployment, low literacy rates, inadequate access to funding, violence and conflict, inadequate medical services, poor mentorship, policy limitations, poor governance, and corruption (United Nations Economic Commission for Africa [UNECA] 2017).

Unemployment is particularly challenging. The African Development Bank reports that of Africa's nearly 420 million youth aged 15 to 35 years, 31 per cent are unemployed, 35 per cent are vulnerably-employed, 19 per cent are inactive, and only 15 per cent are in wage employment. To bring this into perspective, only 3.1 million jobs are available for the 10 to 12 million youths entering the labour force every year. Furthermore, youth in Africa are twice as likely to be unemployed as adults (AfDB 2018c). This can only serve to exacerbate poverty and inequality in the region. The ripple effects of youth unemployment in Africa are already resulting in social unrest and unsafe migration even as they threaten global peace and security (United Nations 2013).

Message to Africa's youth, from H.E. Dr. Yasmine Fouad, Minister of Environment, Arab Republic of Egypt

African youth hold the future of the African continent, and I call on them to take up their responsibility to come up with innovative and unconventional ideas, approaches, and initiatives that accelerate a transition to a green and circular economy, as effective tools for achieving sustainable development. Africa's Agenda 2063 stressed on the role youth have to play in transformative leadership in all fields and as drivers of change, and particularly in their potential to lead African development, making it imperative to implement the African Youth Charter.

I call on African youth to ensure the adoption of nature-based solutions that take climate change impacts into consideration; solutions that are inclusive, transparent, and participatory. Adopting such approaches would contribute to the diversification and revitalization of economies and the creation of decent and sustainable green jobs, thus securing the future of African generations to come. Youth have a vital role and stake in the successful implementation of the proposed policies of the African continent and should therefore be part of their design and formulation, and in the implementation of programmes and plans translating those policies into action. Youth hold the future of societies across the world, it is imperative that policies, plans, and programmes reflect their priorities, hopes, and aspirations.





Food for thought

- Unless green jobs are created and multiplied across Africa, the largely unemployed youth will continue to engage in low-cost investment ventures such as farming and artisanal mining, including unsustainable practices that are hazardous to the environment and human health.
- For the millions of people who depend on resources from nature such as fertile soils, dynamic forests, and productive fisheries for their livelihood; it will be quite challenging to eke out a living in the face of deforestation, soil erosion, desertification, loss of biodiversity, depletion of fish stocks, as well as the effects of climate change.
- E-waste (defined as what remains of mobile phones, computers, television sets, and other electronic devices) is the fastest growing waste stream in the world. It is therefore one of the top environmental challenges of the 21st century.



A lion in Kenya's Tsavo East National Park

James Washika

Africa derive their livelihoods from forests and woodlands; and in most African countries, natural capital accounts for between 30 and 50 per cent of total wealth (UNEP 2016). Africa's natural resources are therefore the basis upon which its people create their wealth.

For example, in 2016, the fisheries and aquaculture sector employed approximately 5.8 million people (Food and Agriculture Organization of the United Nations [FAO] 2018). Wildlife is also responsible for directly employing 9.3 million people, and indirectly supporting 22.8 million jobs (AfDB 2018b), while the agricultural sector employs an average of 54 per cent of the working population (Bhorat, Naidoo and Ewinyu 2017). Further to this, silviculture, which is the science and art of managing the establishment, composition, growth, health, and quality of forests and woodlands; can meet several needs and values for people, including timber, water resources, wildlife habitation, restoration, and recreation on a sustainable basis (U.S. Forest Service 2019).

1.3.2 Challenges to Africa's natural capital

Despite the role that Africa's natural resources play in driving forward economic growth, development is undermined by environmental degradation, climate change, desertification, and other environmental pressures (UNECA and UNEP 2012). It is also disheartening to learn that Africa loses an estimated US\$195 000 million of its natural capital annually through illicit financial flows, illegal mining, illegal logging, illegal trade in wildlife, unregulated fishing, and environmental degradation (UNEP 2016).

For the millions of people who depend on resources from nature such as fertile soils, dynamic forests and productive fisheries for their livelihood; it will be quite challenging to eke out a living in the face of deforestation, soil erosion, desertification, loss of biodiversity, depletion of fish stocks, as well as the effects of climate change. They will likely face the following challenges:

1.3 Nature powering youth livelihoods

1.3.1 Natural capital

Natural capital is defined as the world's stocks of natural assets, which include geology, soil, air, water, and all living things, that yield a renewable flow of goods and services and provide a range of direct and indirect benefits to businesses and society (Natural Capital Finance Alliance 2016).

Africa's natural resources account for 80 per cent of total employment on the continent (UNECA and United Nations Environment Programme [UNEP] 2012). More than 70 per cent of people living in sub-Saharan

- **Loss of livelihood:** The people in the region whose livelihood is contingent upon a thriving ecosystem and environment are likely to experience shocks and stresses from environmental degradation and resource depletion.
- **Surge in health problems:** The escalation of climate change-induced extreme weather events will result in health-related issues. Droughts which occasion water scarcity can fuel malnutrition, dehydration, and other health hazards related to poor sanitation. Floods in areas with poor waste management can spread waterborne diseases such as typhoid, diarrhoea, dysentery, and cholera. Warming temperatures can also increase the exposure of the population to vector-borne diseases (UN DESA 2010).
- **Food insecurity and water scarcity:** Climate change could cause agriculture productivity in developing countries to decrease by between 9 and 21 per cent (FAO 2009). Crop yields are hampered by soil degradation and erosion, crop damage, and declining harvests stemming from extreme weather events, such as droughts, heatwaves, severe storms, and floods—all of which are expected to occur with greater frequency and intensity. This predicament may worsen in the long term because of increased temperatures and systemic water scarcity linked to climate change (Intergovernmental Panel on Climate Change [IPCC] 2008; World Bank 2010).

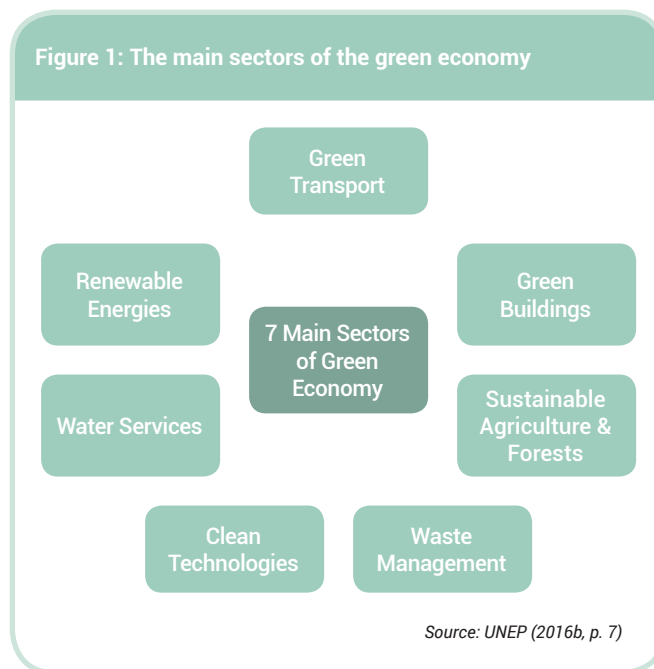
It is important to note that while the above impacts are felt across all demographic groups, youth, especially those living in indigenous communities, are most vulnerable to environmental degradation and climate change (UN DESA 2010). Young people will also be harder hit by the effects of environmental degradation and climate change since they will live longer and are expected to face these challenges for a significant portion of their lifetime (UN DESA 2010).

Thus, and in order to mitigate both unemployment and environmental degradation, there is a need for new development models that can drive youth job creation while drastically reducing environmental risks and ecological scarcities. Youth engagement in the 'green economy', for example, can potentially sustain and enhance the natural capital that constitutes a vital means of livelihood for the vast majority of Africans. This publication will explore the green economy's potential to create more, decent jobs for young people. It will discuss opportunities in skills development for green jobs; green investments, and entrepreneurship, as well as green economic initiatives that exist or could be strengthened. Particular emphasis is placed on case studies of young people who have gone against the grain to create green initiatives and innovations. Their experiences and insights are captured through contributions from nearly one hundred youth writers who contributed to this publication.

1.4 The green economy

The green economy is defined as one that results in improved human well-being, societal equity and that significantly reduces environmental risks and ecological scarcities (UNEP 2011). Green jobs can be described as jobs that reduce the consumption of energy and raw materials, limit greenhouse gas emissions, minimize waste and pollution, protect and restore ecosystems and that enable enterprises and communities to adapt to climate change (UNEP 2008).

Figure 1: The main sectors of the green economy



The green economy (Figure 1) presents an opportunity to advance both sustainability and social equity within the contours of a finite and fragile planet. An inclusive green economy is therefore a pathway towards eradicating poverty, achieving the 2030 Agenda for Sustainable Development and safeguarding the ecological thresholds which underpin human health, well-being, and development (UNEP 2016a).

1.4.1 The green economy and job creation

In addition to increasing productivity while reducing resource use, an inclusive green economy has significant potential to create new jobs in many sectors and sub-sectors of the economy, including in renewable energy and energy efficiency, agriculture and the agro-food industry, tourism, and recycling and waste management.





Group of different immigrant birds in Wadi El Rayan protected area in Egypt during winter. The birds include: Little egrets, great egrets and seagulls

Ahmed Fathy

As established in the previous section, jobs in many sectors (e.g., agriculture, mining and fossil fuel-based energy) rely directly on natural resources and by virtue of economic linkages, many other sectors also rely on them indirectly. In light of increasing scarcity of natural resources, hitting the planet's ecological limits and by exceeding the earth's capacity to absorb waste and emissions, these jobs could be threatened. However, a lush green economy could secure these existing jobs while also being responsible for the generation of new decent jobs (International Labour Organization [ILO] 2018). Switching to a green economy mindful of safeguarding the environment and mitigating climate change would also help minimize environmental disruptions to economic activities.

Such a green economy presents countless opportunities for youth action. Because it is low-carbon, a green economy can replenish ecosystems; because it is resource efficient, it can ensure sustainability of Africa's resources; and because it is socially inclusive, it can guarantee youth a share of any economic gains resulting from ecological replenishment (UNEP 2011).

1.5 Young African scientists and sustainability

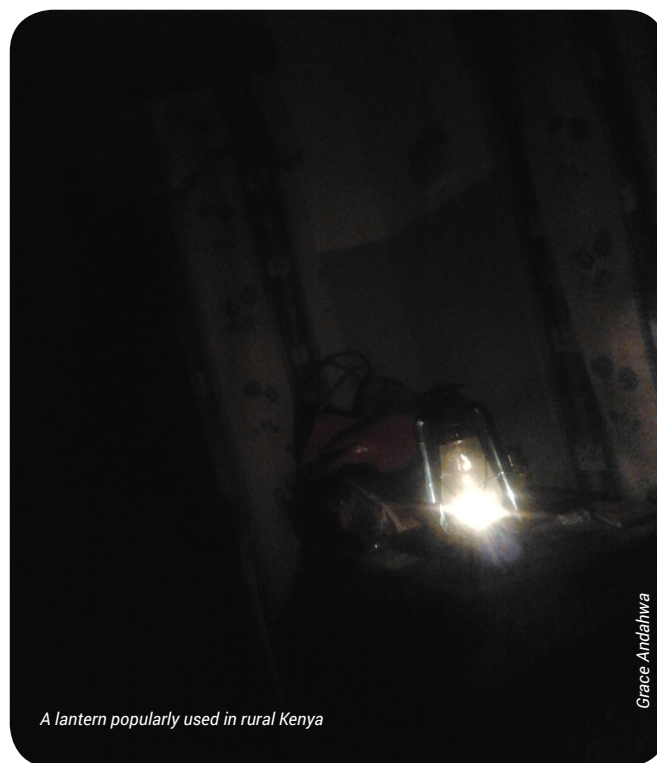
The United Nations Environment Programme's *Sixth Global Environment Outlook (GEO-6) Regional Assessment for Africa* produced scientific evidence for supporting environmental policy. This underscores the importance of science in decision-making (UNEP 2016a) that will anchor Africa's sustainable development.

Indeed, the growing concerns for Africa's sustainability challenges have promoted a development and research agenda to balance

economic growth with environmental sustainability. Scientific research plays a vital role in tackling Africa's sustainability challenges: power supply, agriculture, and health. These challenges are the most critical because of their interdependency, synergies, and trade-offs, as well as their effects on other sectors (Water-energy-food-health nexus). The following sections discuss the different sustainability challenges in Africa and the role of young researchers in tackling them.

1.5.1 Sustainable power supply

Six hundred and twenty million Africans lack access to electricity, short-circuiting their chances of achieving economic prosperity and improved quality of life (UNEP 2014). There is, therefore, a direct link between economic growth and electricity supply. This is evident in both developed and developing economies. The availability of energy has a direct impact on economic growth (World Economic Forum [WEF] 2012). In particular, South Africa and Botswana are enjoying a relatively stable power supply which is believed to be responsible for the persistent and stable growth of their respective economies.



A lantern popularly used in rural Kenya

Grace Andahwa



Rwanda's embrace of the green economy

Although Rwanda is a tiny landlocked nation in the heart of Eastern Africa, all indications reveal that it is a nation with a bullish ambition to integrate green growth and climate-resilient strategies into its national fabric. Rwanda has taken a proactive approach to streamline environmental concerns and climate change into its policies, programmes, and plans. It is hoped that these initiatives will transform Rwanda into a developed, climate-resilient, and low-carbon economy by 2050. In the meantime, some of the results have already started to show.

First, the nation has institutionalized 'Umuganda'; a community cleaning exercise where all able citizens between the ages of 18 and 65 years engage in cleaning up its cities and villages on the last Saturday of every month. This simple community exercise has entrenched the ideals of environmental conservation and proper waste management so much that waste is now an uncommon site (Rwanda Governance Board 2017). It also banned non-biodegradable single-use plastics and packaging materials. This reduced plastic waste in the nation so much so that it has earned Rwanda's capital, Kigali, the reputation of being one of the foremost sustainable cities in Africa. This feat was confirmed when UN Habitat honoured it in 2008 (Bafana 2016).

Recently, the Rwandan government's decision to eliminate e-waste saw it establish, through a public-private partnership (PPP), a multi-million e-waste recycling facility for obsolete electronic equipment. This programme is expected to save the country from environmental hazards and create thousands of green jobs.

Furthermore, Rwanda has already reached its target of increasing its forest coverage to 30 per cent by 2020, with two years to spare. This is no small feat, considering that the nation has one of the highest population density rates in Africa. Despite the large population pressure on its small land surface, more trees are planted and protected in Rwanda every year, than are cut down (The East African 2019).

To finance some of its green growth strategic plans and projects, the country has set up a Green Fund that is meant to support the best public and private projects that support its commitment to transitioning to a green economy (Rwanda Green Fund 2019). It has also consistently met the Comprehensive Africa Agriculture Development Programme (CAADP) targets of investing at least 10 per cent of its annual budget to the agricultural sector (Alliance for A Green Revolution in Africa [AGRA] 2018).

All these factors combined with structural reforms in government have contributed to Rwanda's economic rise to become the third fastest growing economy in the world in 2018 (International Monetary Fund 2019). Over the past decade, a whopping 2 million people have been lifted out of poverty (United Kingdom, Department for International Development 2018). Indeed, Rwanda proves that nations can achieve decent jobs through environmentally-sound policies. It is therefore safe to say that there is a strong correlation between a thriving green economy, reducing unemployment and decent jobs.

Sub-saharan Africa is starved for electricity; the power sector is hugely underdeveloped, whether it is energy access, installed capacity, or overall consumption (United Nations Development Programme [UNDP] and World Health Organization [WHO] 2009). The residential and industrial sectors suffer electricity shortages, which makes economies within this region struggle to sustain economic growth. Indeed, fulfilling the economic and social promise of the region largely depends on the ability of governments and investors to develop the continent's huge electricity capacity.

Simply put, Africa cannot develop in the dark. Lacking power, African agro-industries are weighed down by high costs that render them

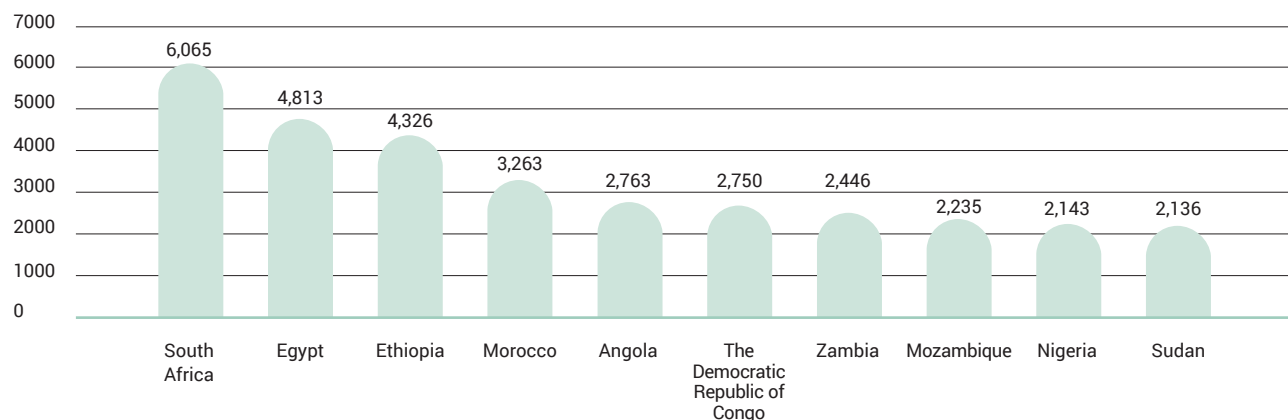
uncompetitive (AGRA 2017). Governments must create an enabling environment for young scientists and entrepreneurs to commercialize innovative solutions. Solar energy start-ups need tax incentives for a number of years to expand and sustain their operations. The challenge now lies in how to maximize the value of energy resources in Africa, and to identify the best policies and reforms needed for affordable electricity and for unleashing Africa's economic potential. In fact, the renewable energy sector itself employed approximately 10.3 million people around the world, directly and indirectly, in 2017 (REN21 2018), and Africa can stand to benefit from this kind of job creation. Although nearly one billion people in sub-Saharan Africa are projected to gain



access to electricity by the year 2040 (World Bank 2017); this number could increase drastically if these innovations are supported and fully

operational. Figure 2 shows the current top ten countries in Africa in renewable energy production.

Figure 2: Top ten African countries in electricity generation from renewable sources, 2018



Source: International Renewable Energy Agency [IRENA] (2019)

Youth Action 1: Solar photovoltaic technology, Zimbabwe

Simbarashe Mhuro is a young Zimbabwean scientist in the renewable energy space and the founder and managing director of Oxygen Africa, a renewable energy development company focused on commercial and industrial rooftop solar photovoltaic (PV) projects. Simbarashe was shortlisted by CNBC Africa and All Africa Business Leaders Awards partners for the Innovator of the Year Award. He was also named as one of Africa's 30 most promising and inspirational young entrepreneurs by Forbes Magazine (Nsehe 2018), and recognized by the Africa Youth Awards as one of 100 most influential Young Africans of the year.

1.5.2 Sustainable agricultural practices

Africa's fast growing population will result in rising food demand that will necessitate more agricultural output (FAO 2017). For this food gap to be filled, young scientists in Africa must be incentivized to invest their time towards enhancement of sustainable agriculture.

Inclusive and sustainable economic development, employment and decent work can be realized through innovation. Unemployment is a problem which can be solved through the use of science and technology (AfDB 2016). Public and private investment in research and development needs to engage young scientists, and support innovation and product development to overcome the current and future challenges and achieve sustainable development.

Public and private support is needed for youth-led green cottage industries. Appropriate infrastructure would ensure that youth engagement in green businesses is sustained. To facilitate this decentralization of climate action through cottage industries, governments need to strengthen infrastructure such as internet connectivity, access to finance, and improved transport in rural and semi-urban areas (Sarkar 2017). Incentivising youth-led green businesses through tax rebates to cushion them from competition by established industries (Linnanen 2005), as well as favourable grants and contracts to encourage them to engage in environmental conservation and climate action that also includes opportunities for employment and decent wages.

1.5.3 The way forward for young scientists

Young scientists need to be empowered and supported to contribute to development plans and policies. A transformative education (United Nations Children's Fund [UNICEF] 2015) is needed to prepare future generations to engage in and harness dynamic technologies, and to foster a culture of innovation.

Finally, to be able to realize their ideas and innovations to solve Africa's development challenges, young scientists need to learn

how to effectively communicate to funders, potential partners, and policymakers the added value of these solutions, as well as their potential for scaling up and replicability.

Youth Action 2: Turning invasive weeds into paper, Kenya

The fishermen plying their trade at Lake Victoria in the western part of Kenya are a frustrated lot. This is because the lake, which is Africa's largest freshwater body at 68,800 km² (UNEP 2010), is being choked by water hyacinth, an invasive weed that has not only hampered their fishing efforts, but also navigation and irrigation efforts along the lake (Wawire 2004).

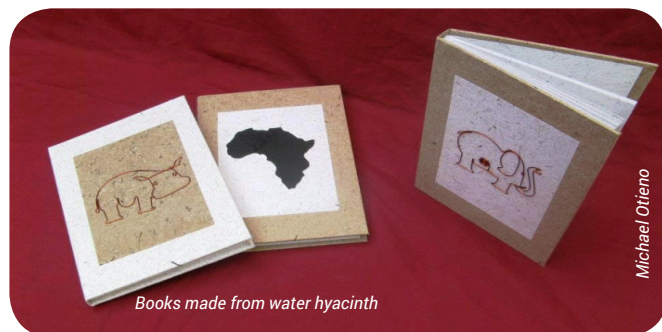
"My fishing boat has been anchored to the beach for three days now. It is too dangerous to venture into the lake as the boat might get stuck far from the shore. I just have to wait until the wind washes the hyacinth to another part of the lake," says Victor Omondi, a fisherman at Kisumu City's Dunga Beach.

To Michael Otieno, however, the hyacinth weed is an opportunity disguised as a menace. Michael is the founder and chair of Takawiri Craft Enterprises, a youth group that helps earn its livelihoods by processing the water hyacinth into paper products.

As dawn breaks over the city by the lake, Otieno cycles towards the shore to harvest raw materials for his paper-processing plant. In addition to helping solve the hyacinth problem, Otieno is also making the city cleaner. As he is harvesting the hyacinth from the lake, two members of his youth group are busy collecting waste paper from the streets of Kisumu so that they can recycle it alongside the hyacinth.

At Otieno's rental house later that day, he mixes slightly decomposed hyacinth leaves with pieces of waste paper cut into small pieces. He then dips these in water and stirs them to make thick pulp which is heated, mixed with wood glue, and left to form wet paper on top of a wooden platform. After a few hours, the paper dries and he inserts it into a calendaring machine in his backyard to flatten the paper and make it easily foldable. Otieno, who dropped out of high school due to financial difficulties, reveals that he designed and assembled the machine during a stint at a local technical training institute.

After a long day, the members of Takawiri youth group retire, ready for the next day when they will craft the paper produced into greeting cards, shopping bags, and envelopes for sale. "We get enough money to sustain every youth in the group," Otieno says.



Youth Action 3: Kenyan youth and the recycling economy

Youth entrepreneurs are creating a thriving recycling economy in Kenya. From paper and electronic waste, enterprising Kenyan youth are crafting innovative products.

In Kenya's capital, Job Ogenche, 25, and his business partner, Miriam Muthui, 23, are making money recycling waste paper in their home-based enterprise, MJ Kreatives. The two university students have converted the living room of their one-bedroom apartment in Nairobi's Kahawa Sukari estate into a jewellery factory.

"We have an understanding with a local supermarket whereby instead of handing over their trash to garbage collectors who would then dump it into open landfills, the supermarket hands their trash to us. We then use the waste paper, together with varnish and glue, to make jewellery such as necklaces and bracelets," says Muthui.

As he dips a bead made from polythene paper into varnish to give it a polished look, Ogenche explains that he understands the harmful effects of plastics to the environment and is glad to be playing a part in mitigating the effects. He says, "When we try to [get] rid of plastics by burning them, we only end up with poisonous gases capable of causing respiratory illnesses. By turning them into jewellery, we ensure the plastic does not end up harming humans and other living beings."

In Kikuyu, Kenya, the small warehouse might be mistaken from the outside for an old computer repair facility, with heaps of old computers and television sets reaching the ceiling. However, the sight of classic-style furniture made from electronic waste on the front porch will leave you in astonishment, and more importantly, in admiration of Ciiru Waweru's sheer creativity and Midas touch.

While studying Interior Design at the University of Glasgow, UK, Ciiru never imagined that she would end up repurposing what other people consider waste into decent products. She started out by founding an interior design consultancy that provided services for individuals, hotels, and multinationals. Her passion for design and manufacturing then led her into founding Funkidz Limited to manufacture children's furniture and toys.

As her business was extremely reliant on the availability of wood for furniture production, the onset of a ban on tree logging in Kenya hit her business badly. However, her creativity, and desire for sustainability, led her to experimenting with different waste products as her raw material. With her newfound green mentality, her business has grown by leaps and bounds and seen her also use second-hand clothes to reinforce furniture. However, it is her use of electronic waste to make furniture that keeps curious onlookers gazing, and satisfied eco-conscious customers flocking.

Youth Action 4: Somalia's youth efforts in landscape restoration

When the phrase 'The nation of Somalia' is mentioned, a few words automatically come to mind. Sadly, they are likely words such as drought, hunger, malnutrition, instability, and civil war. It is forgivable that this would be the case since this nation is only just recovering from the aftermath of a protracted and devastating civil war that impoverished many of its citizens and incapacitated most of its institutions.





Earning decent livelihoods from environmental consultancy

In recent years, the demand for environmental specialists has increased significantly. For instance, Sustainable Development Goal (SDG) 12 calls for sustainable production and consumption patterns; it seeks to put in place sustainable harvesting and transportation services for food products to ensure that the food wastage is mitigated, that energy use is more efficient, and that natural resources are conserved. The goal has made companies and organizations seek the services of environmental consultants. Environmental consultancy is a profession that entails among other things, ensuring that the client adheres to environmental regulations.

Environmental consultancy is a sustainable and viable means of livelihood that young environmental experts can embrace. It offers young environmental professionals an opportunity to develop their experience in an environment with adequate tools, knowledge, and resources. Environmental consultancy also exposes the young environmentalists to continuous learning as they adapt to the dynamics in the industry.

Young environmental consultants are also given the opportunity to capacity build during their initial recruitment. That is, they are taken through training to ensure that they understand the activities of the organization and able to learn and develop. The young dedicated and ethical consultants often experience significant growth in the early stages of their career. Again, in some instances, competence is based on the capability, interest, and competence and not the type of degree. Therefore, young environmentalists without a degree in such courses but competent enough have the opportunity to make the world a better place. Lastly, young people like networking and fun which are the same activities that can be found in environmental consultancy fields of operation. Consultancy careers are often characterized with events thus opportunity for the young professionals to socialize and put on their fancy attire.

The Somali Youth Agro-Marine Development Association (SOMYAMDA) has teamed up with the Somali Diaspora Network (SDN) to empower young women as champions of the environment, building the resilience of their communities by cultivating drought-resistant crops. The reason for this is simple. Even before the outbreak of the fully-fledged civil war in 1991, illegal logging of the Acacia Bussei was rampant (Saleem and Hussein 2015). The deforestation and lack of re-afforestation is so pervasive that the International Union for the Conservation of Nature (IUCN) listed it on its red list (Contu 2012). The illegal logging of this very important desert plant was fuelled by charcoal production whose proceeds were used to fund the operations of the illegal militia group, Al-Shabaab (Nellemann *et al.* eds. 2014).

In order to combat deforestation and landscape degradation, SOMYADA has engaged young women in the process of landscape restoration through planting trees in some of the areas that are most affected by illegal logging. In addition, the young women are able to farm dryland areas through the use of irrigation methods and drought-resistant crop varieties. This will give them a foothold in sustainable agribusiness as well as addressing food security. This initiative which is in its formative stages hopes to upscale and expand in the coming years.

Youth Action 5: Creating livelihoods from bamboo, Kenya

Africa is rapidly urbanizing (by 2050, more than 1,300 million Africans will call a city home) in a period of unprecedented climate stress; the region is warming up 1.5 times faster than the global average (Muggah and Hill 2018).

The threefold challenges of air pollution, access to sanitation services, and availability of clean drinking water will challenge cities. There is, therefore,

However, one youth group is changing the face of this nation. The group envisions that Somalia will become a hub of revival, renewal, and restoration, and that the country will become equitable, productive, and climate-resilient. The beauty about it is that they will create this change, one young woman at a time.



Nyangores River in Kenya's Great Rift Valley

Green Towns Initiative



no better time to act to make African cities and urban centres liveable and more sustainable. This is exactly what the youth-led Green Towns Initiative in Kenya's Bomet County is doing.

This initiative is mobilizing primary schools and youth to plant bamboo along select sections of Nyangores River, which is a tributary of the Mara River that nurtures wildlife in Maasai Mara, Kenya's famed national reserve. The goal of the Green Towns Initiative is to restore rivers and their landscapes as centres of sustainable economic activity by planting bamboo and eventually using it to produce bamboo products. The group is already producing bamboo umbrellas and is poised to diversify soon.

1.6 Communicating change: Innovative means to creating environmental awareness

Creating awareness on environmental issues in Africa will require the concerted efforts of all stakeholders. Since issues such as climate change tend to be very distant and abstract, and the science of pollution can be difficult to understand by non-experts, they need to be repackaged in relatable and personalized ways for young people to grasp. Personalization can reduce the psychological distance between oneself and abstract climate change messages. This makes it easier to engage with the issues (Spence, Poortinga and Pidgeon 2012). Non-traditional avenues such as comedy, podcasts, social media, art, music, photography, and poetry are gaining traction as effective channels for communicating environmental messages. This momentum should be accelerated, even as traditional media like radio are utilized in newer and more innovative ways that include dynamic content.

Youth Action 6: The tweeting climate advocate, Nigeria

If you asked any young stranger on the streets of Abuja whether they knew Olumide Idowu, their answer will most likely be in the negative. However, if you asked the same question inquiring whether the name 'Mr. Climate' rang a bell, then the stranger's answer would most likely be in the affirmative. Olumide's environmental and climate activism in his city has made him a household name and his name ('Mr Climate') is almost synonymous there with youth environmental activism on twitter.

A life without social media is unthinkable for Nigeria's youth. "Social media is where we [the youth] live. We live online" he notes. With this realization, he uses the platform to bridge the knowledge gap on the science, impacts, and politics of climate change.

#ClimateWednesday is his most successful awareness programme. Every Wednesday, he engages with his over 30,000 followers on the broad issues of the green economy, clean energy, and effective waste management, together with the catalysts and impact of climate change. With this platform, he has managed to build a community with specialized knowledge and has mobilized them into taking part in climate action across different Nigerian cities.

For Olumide, his online activism is geared towards supporting offline activism related to the environment and climate change: "My aim is to leverage technology to engage the public on climate change, then through that I can

build the momentum that can help mobilize action in making our community greener and more sustainable".

Youth Action 7: Dancing to a new tune of managing plastic waste, Egypt

At first glance, you might mistake Shady Rabab for any young, Egyptian, male artist. But he is no ordinary musician. After he has held his musical instrument, you will definitely dance to the harmonic tune of the flute. A flute that is made from repurposed plastic bottles.

While Shady is a passionate musician, designer, and painter; he takes most pride in being an environmental activist. The University of Luxor, Egypt, graduate offers weekly classes to a marginalized group of young children on how to make musical instruments from trash. The more than 70 children who previously worked as waste collectors then play together in the 'Garbage Conservatoire Band'.

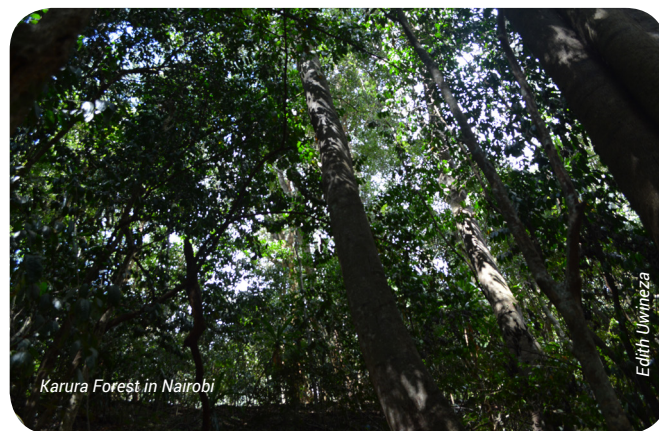
The lessons are an opportunity to teach the kids about the environment through music. And while the kids might have had first-hand experience with improper waste management, when they were making their living from the dumpsters and landfills, the combination of music and environmental education has helped improve their quality of life. Through music, they have transitioned from garbage collectors to environmental champions who are spreading awareness about prudent waste disposal mechanisms.

Shady has proved that it is possible to reuse and repurpose waste materials and turn them into a gem. It is for this reason that he was crowned the 2018 Young Champion of the Earth for Africa (UNEP n.d. b).

Youth Action 8: Comedy for a serious reason, Kenya

Humour can be a way to communicate around barriers with surprising emotional depth (Ecospeakers 2014). The Karura comedy club is a group of comedians who mix humour with environmental commentary to examine a range of environmental issues.

Their shows are mostly held in Karura Forest's environs, a forest once encroached by private developers and marred by illegal logging. Their shows have been instrumental in creating a unique movement of young people who are involved in the conservation of the forest.





Victoria Falls, Livingstone

David Ngwenyama

Earth (Mother of Life)

*I am the mother of all forms of life
From the mighty Victoria Falls in Zambia,
To the breath taking Kilimanjoro in Tanzania
Down to the Northern Lights,
All the way through the Grand Canyon
Deep into the Harbour of Rio de Janeiro in Brazil,
Through the Paracutin Valcono and
All the way to the great heights of Mount Everest,
Yes, am mother to all forms of life.
From the time of my creation,
I stand firm and faithful to my core function,
supporting life.
From the birds of the air,
To creatures in the waters and animals on land,
I give life.
I have the finest possessions that no one can ever imagine
Fresh & salty water, land, forestry,
Oh! Wait a minute...
Diamond, gold, copper uranium oil
And all those priceless materials.
Yes I am mother of all forms of life.
I am not only rich,
I am beautiful, magnificent, self-contained, and irreplaceable.
Even though I know my value,
My worth and dignity
I am not the happiest of all planets
Every night and day rivers of polluted tears roll down my cheeks
And I have lost a peace of mind to the rapid changes on my body.
In the night I cry,
During the day I sit lamenting
And regretting the decision I made billions of years ago...
to support life
Mercury, Venus, Mars, Jupiter, Saturn, Uranus, Neptune and Pluto
All rejected the offer,
They all said they needed a peace of mind
And a little longer life span.
I didn't understand all that.
Mercury was even more specific,
That he would rather be hot than give room for human habitation.*

*When they warned that humans will seek for my destruction
To fulfil their own desires
I always told them how impossible that was
Because I know that my destruction leads to human extinction
I expected them to hold me dearly
I was naïve.
Today I sit here,
Under the shed of the only tree surviving,
Thirsty yet my waters are deadly polluted,
Am hardly breathing,
The air is so heavy and dirty.
Am hungry, my wildlife is all history
With all this ailments, am almost exploding
With a pregnancy of about seven billion humans
Inside my heart I have a terrifying anger
In the back of my mind am thinking hard.
Does it ever ring in their selfish minds
That am breathing my last?
That am gonna perish with the 7 billion of them?
The right, purest minerals in their right quantities...
They were never enough,
Instead you tear down my skin with your heavy duty machinery
And gave yourselves more.
I gave you a living space,
That still was not enough,
Instead, you snatched the homes of birds and animals
And established more cities and settlements for yourselves.
Yes I did give you everything but you want more and more
I try giving warnings of my death day that is fast approaching,
All you do is ignore and carry on with your ruthless habits
That have caused pain to my every born and cell.
Dear humans,
Am not asking for anything unnatural or anything abominable
...Just a twist in your kind of thinking,
Just repentance from your environmental sins....
Just a sound reasoning in the back of your mind,
A feeling of shame on your development options
And an act of justice towards me...
CONSERVE ME!*

By Miyoba Buumba, Zambia





Youth Action 9: Young celebrity power, Kenya

Even after the shutters of the glaring cameras go silent, Kenyan Eliud Kipchoge still remains a champion. Not a champion on the track, but a wildlife conservation champion.

Arguably the world's greatest marathon runner of all time, Eliud Kipchoge is involved in a myriad of conservation efforts for wildlife in Kenya. The 2018 UN Person of the Year has been a fearless advocate for the protection of wild animals and the empowerment of communities living in close proximity to wildlife sanctuaries. He has argued that local communities bear the brunt of living with wildlife, and without an incentive to conserve, they resort to poaching, revenge killing, and conversion of wildlife habitats to more profitable land uses, exacerbating biodiversity loss.

In his position as a Wildaid ambassador, Eliud joins prominent global personalities such as Prince William, Sir Richard Branson, David Beckham, and Lupita Nyong'o in creating awareness about poaching and the massive destruction caused by this illegal trade. Media campaigns have been credited for the changes in attitudes and behaviour that have subsequently led to a significant drop in prices and usage of endangered species products such as ivory, rhino horn, and shark fins.

Together with For Rangers, Beyond the Ultimate and Save the Rhino International, Eliud has participated in runs that raise funds for the country's rhino rangers who put their lives on the line to protect Kenya's rhinos from poachers. He also graces Safaricom's Lewa Marathon to help foster conservation awareness.

At only 34 years of age, the world marathon record holder proves that young people in all fields can have a knack for wildlife conservation.

Quick Facts

- Only 3.1 million jobs are available for the 10 to 12 million youths entering the labour force every year (AfDB 2018c).
- More than 70 per cent of people living in sub-Saharan Africa derive their livelihoods from forests and woodlands (UNEP 2016a).
- Wildlife is responsible for directly employing 9.3 million people, and indirectly supporting 22.8 million jobs (AfDB 2018b).
- Africa's agricultural sector employs an average of 54 per cent of the working population (Bhorat, Naidoo and Ewinyu 2017).
- Africa is home to 65 per cent of the total uncultivated arable land in the world (AfDB 2018a).
- Africa's fisheries and aquaculture sector alone is estimated at US\$24 billion to the African economy and employ over 12 million people (Africa Progress Panel 2014).

1.7 Conclusion

Wangari Maathai, a celebrated Kenyan environmental activist as well as the first African woman recipient of the Nobel Peace prize once told a story, the story of a hummingbird (Green Belt Movement 2019):

"There once lived a hummingbird that lived in a huge forest that at one point was being consumed by fire. All the animals in the forest came out and they were transfixed as they watched the forest burning. They all felt overwhelmed and very powerless, except the hummingbird. 'I'm going to do something about the fire.' So the hummingbird flew to the nearest stream taking a drop of water at each time. It put it in the fire and it did so repeatedly in a bid to help put out the fire.

In the meantime, all the other animals, some much bigger like the elephant with a big trunk that could bring much more water were standing on the periphery helpless.

And they said to the hummingbird, 'what do you think you can do? You are too little. The fire is too big. Your wings are too little and your beak is so small that you can only bring a small drop of water at a time.'

But as they continued to discourage it, it turned to them without wasting any time and told them, 'I am doing the best I can.'

Even though small and seemingly insignificant, the hummingbird continued in its pursuit to do the best it could to put out the fire."

It is undeniable that Africa faces many environmental and economic challenges that undermine the livelihoods of its young people. However, the youth actions presented in this publication provide sufficient reason for optimism. From the creative Ciiru who is making classic furniture from e-waste, to the young Takawiri Enterprises craftsmen making profits out of a deadly sea weed; youth across the continent continue to be beacons of environmental sustainability. No matter how small in scale their actions seem to be, they are creating innovative and profitable enterprises that not only create green jobs, but are also carefully weaving together a healthy, peaceful, and prosperous Africa. With the realization that the collective action of small sustainability initiatives can make a meaningful impact, they continue to be the modern day hummingbirds.

However, more youth involvement in environmental sustainability is essential. The planet needs more hummingbirds invested in environmental sustainability. As the youth step up their efforts, it is incumbent on Africa's governments and private sector to support these youth initiatives so that more and more green jobs can be created.

References

- African Development Bank (2016a). *Catalyzing Growth and Development Through Effective Natural Resources Management*. Abidjan. https://www.afdb.org/fileadmin/uploads/afdb/Documents/Publications/anrc/AfDB_ANRC_BROCHURE_en.pdf.
- African Development Bank (2016b). *Bank Group Strategy for Jobs for Youth in Africa, 2016-2025*. Abidjan. https://www.afdb.org/fileadmin/uploads/afdb/Documents/Boards-Documents/Bank_Group_Strategy_for_Jobs_for_Youth_in_Africa_2016-2025_Rev_2.pdf.
- African Development Bank (2018a). *Feed Africa*. Abidjan. https://www.afdb.org/fileadmin/uploads/afdb/Documents/GenericDocuments/Brochure_Feed_Africa_En.pdf.
- African Development Bank (2018b). *Africa Tourism Monitor: The High 5s – Tourism as a Pathway to Industrialization, Integration, Quality of Life, Agriculture, and Powering Up Africa (Volume 5 - Issue 1)*. Abidjan. https://www.afdb.org/fileadmin/uploads/afdb/Documents/Publications/Africa_Tourism_Monitor_2018.pdf.
- African Development Bank (2018c). *Jobs for Youth in Africa: Improve the Quality of Life for the People of Africa*. Abidjan. https://www.afdb.org/fileadmin/uploads/afdb/Documents/Generic-Documents/Brochure_Job_Africa-En.pdf.
- Alliance for A Green Revolution in Africa (2017). *Africa Agriculture Status Report 2017: The Business of Smallholder Agriculture in Sub-Saharan Africa (Issue 5)*. Nairobi. <https://agra.org/wp-content/uploads/2017/09/Final-AASR-2017-Aug-28.pdf>.
- Alliance for A Green Revolution in Africa (2018). *Africa Agriculture Status Report 2018: Catalyzing Government Capacity to Drive Agricultural Transformation (Issue 6)*. Nairobi. <https://agra.org/wp-content/uploads/2018/10/AASR-2018.pdf>.
- Bafana, B. (2016). Africa's cities of the future, April. <https://www.un.org/africarenewal/magazine/april-2016/africa%E2%80%99s-cities-future>. Accessed 10 September 2019.
- Baffoe, A. (2018). Time is running out to protect Africa's forests, 11 May. <https://www.weforum.org/agenda/2018/05/time-running-out-protect-africa-forest-palm-oil/>. Accessed 4 September 2019.
- Bhorat, H., Naidoo, K., Ewinyu, A. (2017). Increasing Employment Opportunities. In *Foreight Africa: Top Priorities for the Continent in 2017*. Sy, A. (ed.). Washington, DC: Brookings Institution. Chapter 2. 30-45. https://www.brookings.edu/wp-content/uploads/2017/01/global_20170109_foreight_africa.pdf.
- Breuil, C., Grima, D. (2014). *Fisheries in the ESA-IO Region: Profile and Trends: Country Review*. Rome: Food and Agriculture Organization of the United Nations. <http://www.fao.org/3/a-br801e.pdf>.
- Contu, S. (2012). *Acacia bussei*. International Union for Conservation of Nature and Natural Resources. <https://www.iucnredlist.org/species/pdf/19997688>.
- Ecospeakers (2014). Green Comedy & Humour. Ecospeakers. <http://www.ecospeakers.com/green-environmental-comedy-humor/topic013.html>. Accessed 8 July 2018.
- environmentanalyst (2009). The business challenges facing environmental consultancies, 1 July. <https://environment-analyst.com/mis/26615/the-business-challenges-facing-environmental-consultancies>. Accessed 5 September 2019.
- Food and Agriculture Organization of the United Nations (2009). 2050: Climate change will worsen the plight of the poor, 30 September. <http://www.fao.org/news/story/en/item/35831/icode/>. Accessed on 6 June 2018.
- Food and Agriculture Organization of the United Nations (2013). *Coping with the food and agriculture challenge: smallholders' agenda*. Rome. http://www.fao.org/fileadmin/templates/nr/sustainability_pathways/docs/Coping_with_food_and_agriculture_challenge__Smallholder_s_agenda_Final.pdf.
- Food and Agriculture Organization of the United Nations (2017). *The future of food and agriculture – Trends and challenges*. Rome. <http://www.fao.org/3/a-i6583e.pdf>.
- Green Belt Movement (2019). Be a Hummingbird. <http://www.greenbeltmovement.org/get-involved/be-a-hummingbird>. Accessed 6 June 2019.
- Gribble, J.N. and Bremner, J. (2012). *Achieving a demographic dividend (Volume 67 – Issue 2)*. Washington, DC: Population Bulletin. <https://www.prb.org/wp-content/uploads/2013/11/achieving-demographic-dividend.pdf>.
- International Labour Organization (2018). *World Employment Social Outlook 2018: Greening with jobs*. Geneva. https://www.ilo.org/weso-greening/documents/WESO_Greening_EN_web2.pdf.
- International Monetary Fund (2019). *World Economic Outlook: Growth Slowdown, Precarious Recovery*. Washington, DC. <https://www.imf.org/~en/media/Files/Publications/WEO/2019/April/English/text.aspx?la=en>.
- International Renewable Energy Agency (2019). Renewable Electricity Capacity and Generation Statistics query tool. https://www.irena.org/IRENADocuments/IRENA_RE_electricity_statistics_-_Query_tool.xlsm. Accessed 24 September 2019.
- Intergovernmental Panel on Climate Change (2008). *Climate Change 2007: Synthesis Report*. Pachauri, R.K. and Reisinger, A. (eds.). Geneva. https://www.ipcc.ch/site/assets/uploads/2018/02/ar4_syr_full_report.pdf.
- Linnanen, L. (2005). An insider's experiences with environmental entrepreneurship. *Greener Management International* 2002(38), 71-80. <http://doi.org/10.9774/GLEAF.3062.2002.su.00008>.
- Muggah, R. and Hill, K. (2018). African cities will double in population by 2050. Here are 4 ways to make sure they thrive, 27 June. <https://www.weforum.org/agenda/2018/06/Africa-urbanization-cities-double-population-2050-4%20ways-thrive/>.
- Muumbi, S. (2019). Partners pledge millions in support of EA region's growing forest cover, 28 March. <https://www.theeastafrican.co.ke/scienceandhealth/Partners-pledge-millions-in-support-of-east-africa-forest-cover/3073694-5046522-7mccwgz/index.html>. Accessed 2 June 2019.
- Natural Capital Finance Alliance (2016). *Natural Capital Finance Alliance Brochure*. <https://www.globalcanopy.org/sites/default/files/documents/resources/NCFB-brochure-final-web.pdf>.
- Nellemann, C., Henriksen, R., Raxter, P., Ash, N., Mrema, E. (eds.). (2014). *The Environmental Crime Crisis – Threats to Sustainable Development from Illegal Exploitation and Trade in Wildlife and Forest Resources*. Nairobi and Arendal: United Nations Environment Programme and GRID-Arendal. <https://www.cbd.int/financial/monterreytradetech/uneep-illegaltrade.pdf>.
- Nsehe, M. (2018). 30 Most Promising Young Entrepreneurs In Africa 2018. *Forbes*. <https://www.forbes.com/sites/mfonobongnsehe/2018/04/18/30-most-promising-young-entrepreneurs-in-africa-2018/#38d5b77f7474>. Accessed 25 July 2019.
- REN21 (2018). *Renewables 2018 Global Status Report*. Paris: REN21 Secretariat. <https://www.ren21.net/wp-content/uploads/2019/08/Full-Report-2018.pdf>.
- Rwanda Green Fund (2019). What is the Rwanda Green Fund? <http://www.fonerwa.org>. Accessed 2 June 2019.
- Rwanda Governance Board (2017). *Impact Assessment of Umuganda 2007-2016*. Kigali. http://rgb.rw/fileadmin/Key_documents/HGS/Impact_Assessment_of_Umuganda_2007-2016.pdf.
- Saleem, U. and Hussein, G. (2015). *National Biodiversity Strategy and Action Plan (NBSAP) of Somalia*. Rome: Food and Agriculture Organization of the United Nations. <https://www.cbd.int/doc/world/so/so-nbsap-01-en.pdf>.
- Sarkar, A. (2017). Trends, Opportunities & Challenges in Small Scale and Cottage Industries in Assam. *International Journal of Engineering Science* 7(11). <http://ijesc.org/upload/c57e31cbb69a868a924e0b4fbaab274a>. Trends.%20Opportunities%20&%20Challenges%20in%20Small%20Scale%20and%20Cottage%20Industries%20in%20Assam.pdf.
- Spence, A., Poortinga, W. and Pidgeon, N. (2012). The psychological distance of climate change. *Risk analysis* 32 (6), 957-72. <https://doi.org/10.1111/j.1539-6924.2011.01695.x>.
- United Kingdom, Department for International Development (2018). *DFID Rwanda*. Kigali. <https://reliefweb.int/sites/reliefweb.int/files/resources/DFID-Rwanda-Profile-July-2018.pdf>.
- United Nations (2010). *World Youth Report: Youth and Climate Change*. New York. <https://www.un.org/esa/socdev/unyin/documents/wyr10/YouthReport-FINAL-web-single.pdf>.
- United Nations (2013). *United Nations World Youth Report: Youth and Migration*. New York. <https://www.un.org/esa/socdev/unyin/wyr/2013/report.pdf>.
- United Nations Children's Fund (2015). *The State of the World's Children 2015: Reimagine the future - Innovation for every child - Innovation for every child*. New York. <http://sowc2015.unicef.org/>.
- United Nations Department of Economic and Social Affairs (2017). *World Population Prospects: The 2017 Revision, Key Findings and Advance Tables*. ESA/P/WP/248. https://reliefweb.int/sites/reliefweb.int/files/resources/WPP2017_KeyFindings.pdf.





- United Nations Development Programme and World Health Organization (2009). *The Energy Access Situation in Developing Countries: A Review Focusing on The Least Developed Countries and Sub-Saharan Africa*. New York: United Nations Development Programme. <https://www.undp.org/content/dam/undp/library/Environment%20and%20Energy/Sustainable%20Energy/energy-access-situation-in-developing-countries.pdf>.
- United Nations Economic Commission for Africa and United Nations Environment Programme (2012). *A Green Economy in the Context of Sustainable Development and Poverty Eradication: What are the Implications for Africa?* Addis Ababa: United Nations Economic Commission for Africa. <http://www1.uneca.org/Portals/rio20/documents/cfssd7/1AfricaGE-BackgroundReportEN.pdf>.
- United Nations Economic Commission for Africa (2017). *Africa's Youth and Prospects for Inclusive Development: Regional Situation Analysis Report*. Addis Ababa. <https://www.ohchr.org/Documents/Issues/Youth/UNEconomicCommissionAfrica.pdf>.
- United Nations Environment Programme (2016). Is Africa's Natural Capital the Gateway to Finance Its Development? 21 September. <https://www.unenvironment.org/news-and-stories/story/africas-natural-capital-gateway-finance-its-development>. Accessed 13 June 2019.
- United Nations Environment Programme (2008). *Green Jobs: Towards Decent Work in a Sustainable, Low-Carbon World*. Nairobi. UNEP/ILO/IOE/ITUC. https://www.ilo.org/wcmsp5/groups/public/—ed_emp/—emp_ent/documents/publication/wcms_158727.pdf.
- United Nations Environment Programme (2010). *Africa Water Atlas*. Nairobi. DEW/1313/NA. https://na.unep.net/atlas/africaWater/downloads/africa_water_atlas.pdf.
- United Nations Environment Programme (2011). *Towards a Green Economy: Pathways to Sustainable Development and Poverty Eradication - A Synthesis for Policy Makers*. Nairobi. DTI/1353/GE. https://sustainabledevelopment.un.org/content/documents/126GER_synthesis_en.pdf.
- United Nations Environment Programme (2014). *UNEP Year Book 2014: Emerging Issues in Our Global Environment*. Nairobi. http://www.unep.org/yearbook/2014/PDF/UNEP_YearBook_2014.pdf.
- United Nations Environment Programme (2016a). *GEO-6 Regional Assessment for Africa*. Nairobi. DEW/1963/NA. http://apps.unep.org/publications/index.php?option=com_pub&task=download&file=012099_en.
- United Nations Environment Programme (2016b). Understanding and Operationalizing the Green Economy into National Development Planning in the Caribbean Context: Enabling Economic Growth and Investment while Increasing Environmental Quality and Social Well-being. https://www.un-page.org/files/public/report_on_the_process_of_institutionalization_of_a_ge_course_at_uwi.pdf.
- United Nations Environment Programme (n.d. a). Our Work in Africa. United Nations Environment. <https://www.unenvironment.org/regions/africa/our-work-africa>. Accessed 25 October 2018.
- United Nations Environment Programme (n.d. b). 2018 Winners – Young Champions of the Earth. <https://www.unenvironment.org/youngchampions/winners/2018/>. Accessed 25 July 2019.
- U.S. Forest Service (2019). Silviculture. <https://www.fs.fed.us/forestmanagement/vegetation-management/silviculture/index.shtml>. Accessed 28 May 2019.
- Wawire, N.W. (2004). *Review of the impact of water hyacinth on Lake Victoria: the case of Winam Gulf, Kenya*. Lake Victoria Environmental Management Project (LVEMP). <http://repository.eac.int/bitstream/handle/11671/798/Review%20of%20the%20impact%20of%20water%20hyacinth%20on%20the%20Lake%20Victoria%20-%20the%20case%20of%20Winam%20Gulf%2c%20Kenya.pdf?sequence=1&isAllowed=y>.
- World Bank (2017). *State of Electricity Access Report 2017*. Washington, DC. <http://documents.worldbank.org/curated/en/364571494517675149/full-report>.
- World Bank (2010). *International Assessment of Agricultural Knowledge, Science and Technology for Development (Volume 4 - Issue 2)*. Washington, DC. <http://documents.worldbank.org/curated/en/636821468316165959/pdf/576450NWP0Box31am0review0v40issue02.pdf>.
- World Economic Forum (2012). *Energy for Economic Growth: Energy Vision Update 2012*. Geneva. http://www3.weforum.org/docs/WEF_EN_EnergyEconomicGrowth_IndustryAgenda_2012.pdf.
- Young Professionals for Agricultural Development (n.d.). Michael Osei, a recognized and promising young scientist from Ghana. <https://ypard.net/testimonials/michael-osei-recognized-and-promising-young-scientist-ghana>. Accessed 25 July 2019.

Chapter 2

A Breath of Fresh Air





Key Messages

Air pollution is responsible for approximately 7 million deaths annually around the world, 600,000 of which are recorded in Africa. Africa must address this through sustainable solutions such as better-ventilated housing and clean cooking stoves. The involvement of youth in the procurement and distribution of clean cooking stoves can be a path to economic empowerment.

The transport sector is a major contributor to air pollution in Africa. Youth should be on the forefront of lobbying for and utilizing non-motorised transport like cycling.

Energy created through solar PV cells, landfill gas, and biomass plants, create more jobs per unit of energy than energy created from fossil fuels. Jobs in renewable energy can be created along the sector's value chain: the production of inputs like tools and chemicals; manufacture and distribution of equipment; or services that include project management, installation, operation, and maintenance.

The inability of young people to successfully navigate the rigorous climate funding process leaves their climate action impaired. It would be prudent for global climate funds to have customised funding mechanisms that specifically target young people in Africa, or to peg a youth-funding conditionality on funds given to nationally-accredited agencies, compelling them to fund youth initiatives.

2.1 Introduction

Air pollution is a major challenge in Africa and across the world. The World Health Organization (WHO) estimates that air pollution causes approximately 7 million deaths annually, 600,000 of which are recorded in Africa (UNEP 2016a). New data from the WHO report on air quality in May 2018 shows that globally, nine out of ten people breathe in air containing high levels of pollutants (World Health Organization [WHO] 2018).

People living in towns and cities of the Copperbelt Province of Zambia, for example, are exposed to a variety of pollutants, such as SO₂, that is emitted during copper smelting and subsequent production of sulphuric acid, all of which are associated with respiratory problems (Ncube *et al* 2012). In Addis Ababa, the rapidly expanding transport sector together with fast urbanization, are among the major drivers of air quality degradation. As a result, acute upper respiratory infections increased by 47.18 per cent annually. In addition, Addis Ababa's chronic obstructive pulmonary diseases (COPD) and pneumonia rates have increased annually by about 53.44 and 24.89 per cent respectively (Tarekegn *et al.* 2018). As of 2013, the Organization for Economic Cooperation and Development (OECD) estimated the economic cost of ambient air pollution in Africa at US\$215 billion calculated as healthcare costs, sick leave days, reduced economic output, and loss of manpower, among other parameters (Roy 2016).

2.2 Youth role in addressing air pollution

Urban areas continue to record unhealthy air quality (Strosnider *et al.* 2017) partly due to issues like traffic congestion (Zhang 2010)

and poor waste management (Fundació ENT 2015). The transport sector is a major contributor to air pollution in Africa (UNEP 2016b) as well as greenhouse gas (GHG) emissions. This state of affairs is attributed to the importation of inefficient fuel, used vehicles, inadequate vehicle-import regulation policies and standards, low purchasing power, and loss of urban forests that act as city lungs.



Traffic in Accra, Ghana



The population, unable to afford newer, cleaner, fuel-efficient vehicles, are thus left vulnerable to the adverse effects of transport-related air pollution (Haq and Schwela 2012).

Fuel quality is a major issue in terms of air pollution. The sulphur in the fuel of some African countries is as much as three hundred times the sulphur in the fuel of North-American and European countries (Abdoun 2018), which exposes people in these African countries to more health risks (See Table 1 below for data on maximum sulphur limits in gasoline in selected African countries).

Many of Africa's youth are employed within the informal public transport industry that emerged to fill the gaps in the public transportation system, and where they do not earn enough to save or build a functional society (United Nations Human Settlements Programme [UN Habitat] 2000).

For youth employed within the public transport industry, either as drivers or conductors, the level of exposure to air pollution from dirty fuels coupled with polluting vehicles is extensive. Airborne Sulphur compounds when inhaled irritate the respiratory system and can lead to long-term health complications such as swollen

lungs, breathing complications and even death (UNEP 2018). This is alarming in developing nations that are still struggling to clean up their vehicle fleet and fuels.

Today, Algeria is the only African country that is still using leaded petrol. The rest have phased it out (UNEP 2016c). Eleven countries have adopted 50 ppm sulphur-content fuels or lower while 2 cities (Nairobi and Accra) are already developing soot-free bus strategies for their cities (UNEP 2017; Climate and Clean Air Coalition 2017). In addition, over 20 countries in Africa are engaged in reviewing their vehicle import policies in a bid to attract cleaner and more fuel-efficient vehicles (Climate and Clean Air Coalition 2018). Through 'Share the Road' initiatives, Lagos (Nigeria) and Nairobi (Kenya) are developing citywide non-motorized transport policies, while Uganda has taken it a notch higher to develop a nationwide policy (UNEP 2019).

The Economic Community of West African States (ECOWAS) together with UNEP and other partners are currently engaged in formulating harmonized fuel grades and vehicle emission standards to reduce the negative impact of transport on air quality (UNEP 2018). African young people should engage in advocacy efforts to

Table 1: Maximum sulphur limits in gasoline in selected African countries, 2018

Maximum sulphur ppm	Countries
0-10	Tunisia
11-30	-
31-50	Malawi, Morocco, Mozambique
51-150	Algeria, Côte d'Ivoire, Kenya, Libya, United Republic of Tanzania, Uganda
151-500	Angola, Cameroon, Congo, Egypt, Gabon, Mali, Niger, Sudan, Sierra Leone, Zambia, Zimbabwe
501-3500	Benin, Botswana, Burkina Faso, Democratic Republic of the Congo, Eritrea, Ethiopia, Ghana, Madagascar, Mauritania, Namibia, Nigeria, Senegal, South Africa, Togo
No information / Not regulated	Chad, Central African Republic, Guinea, Liberia, Somalia, South Sudan

Source: Data from Abdoun (2018)



push their governments to adopt more policies supporting cleaner mobility.

African youth can champion cleaner mobility by advocating for cycling lanes in African cities. This will result in significant healthcare savings from less air pollution, more physical activity and fewer road fatalities. Moreover, cycling would enhance the mobility of Africa's urban poor since most of them walk to cut on transport costs. It is therefore evident that there are convincing environmental and socioeconomic reasons for cities to invest in safe and seamless cycling infrastructure (Kirkels 2011).



Lots of young Egyptians are using bikes for commuting and regular exercise

Mustafa Eid

2.3 Youth economic empowerment through renewable energy and energy efficiency

Youth Action 10: Auto Truck, Kenya

The global shift towards electric mobility, as opposed to fossil fuel-based mobility, can be an opportunity for young people. Kenneth Guantai, founder of the Auto Truck, is one such example of youth taking a lead in innovations towards clean mobility. He is currently working on prototypes for self-charging electric vehicles. It is incumbent on African Governments to support young innovators like Kenneth since their inventions have the potential of creating green jobs even as they raise green energy awareness amongst the youth.

Youth Action 11: Tagaddod, Egypt

The word "Tagaddod" means renewal in Arabic. It's the name of a start-up based in Cairo that produces biodiesel from used cooking oil. Many Egyptian families pour used oil down the drains of their sinks, consequently polluting

the country's water supply. Such mix of used oil and water costs the country millions of Egyptian pounds to be treated with all other pollutants found in the traditional municipal wastewater. And while all Egyptian cities are covered with sanitation networks, rural areas are less fortunate, posing many challenges regarding the quality of agricultural water and its impact on their health. Tagaddod took a stand end this permanently by utilizing used cooking oil.

Egypt is also one of the leading vegetable oil importers globally. Egyptians use millions of litres annually to fry some of their most popular dishes, like falafel.

Tagaddod was founded in 2013 by Mariam Afifi, business development coordinator, Nour El-Assal, petrochemical engineer, and Ahmed Rafat, a mechanical engineer. It was originally intended as a senior class project at the German University in Cairo, to address the issue of waste management of vegetable oil.

They filter the oil and add chemical additives until they convert it into glycerine and biodiesel, an alternative to diesel. The start-up purchases the plentiful low-cost waste vegetable oil from trash collectors, who collect it along with other garbage from hotels and restaurants. The European market is their chief target; being the biggest global importer of biodiesel. The waste oil recycling process produces crude glycerine as a by-product that they sell to chemical companies and science labs. This enables them to provide free biodiesel services to businesses.

While the start-up indeed acknowledges that solar and wind energy are cleaner than biodiesel, Egypt's vast, unused land and tons of waste oil make biodiesel a viable option for the country, especially when there is no other fuel that can easily replace the current system. Thus, from a business standpoint, the biodiesel business model looks to be the most feasible because of its attractive easy implementation methods.



Falafel fried in vegetable oil, one of the most popular dishes in Egypt

Isabelle Boucher, ACC BYA/C-ND-2.0



Production and distribution of clean energy cooking stoves, Nigeria

Nigeria is the most populous country in Africa and the seventh most populous country in the world, with approximately 198 million people (Punch 2018). Despite decreasing fertility, Nigeria's population is expected to grow to 239 million by 2025 and 440 million by 2050 (Etebong 2018). Over 70 per cent of Nigeria's estimated 198 million inhabitants still rely on fuelwood for cooking and heating (Nigeria Cleancooking 2018). This mirrors extreme dependence on fuelwood in the rest of Africa, causing indoor pollution to run amok. Indoor air pollution caused by solid fuel use and/or traditional cooking stoves adversely affects the health of nine out of ten Africans (Mbatchou *et al.* 2015).

Because of IAP's impact on health and mortality, governments and non-governmental organizations (NGOs) have adopted strategies for reducing its environmental and health impacts; subsidizing cleaner fuel technologies, making improved cooking stoves available at affordable prices, providing electric stoves in areas with high electricity levels (Duflo *et al.* 2007).

The involvement of youth in the procurement and distribution of clean cooking stoves can be a path to economic empowerment. The use of efficient and clean cooking stoves saves lives, improves livelihood, empowers communities and contributes to combatting climate change. Clean cooking stoves inject speedy relief into the society, economy, and environment, even as they realize many SDGs and implement Agenda 2063.

Producing and selling clean cooking stoves also creates jobs together with apprenticeship and entrepreneurship opportunities. For example, during implementation of the UNDP/Eco-Bank funded Eco-Stove project in Nigeria, some youth were gainfully employed for six months to work on the project (Kirk *et al.* 2006). Although six months does not constitute a sustainable livelihood, such an approach can be up-scaled with a focus on the resultant entrepreneurship.

The International Centre for Energy, Environment and Development (ICEED) with funding from the Food and Agriculture Organisation of the United Nations (FAO) has established three fuel-efficient cooking stove production and training centres in Borno State, Nigeria. The centres have trained 100 people across the state on the technical and business aspects of fuel-efficient cooking stoves production (FAO 2018). Youth were among the beneficiaries. However, stagnated investment has resulted in slow expansion of this sector (Clean Cooking Alliance 2019).

Technologies such as co-generation, biogas, and liquid biofuels are capable of delivering affordable and locally-available energy, thus creating jobs locally. Moreover, the conversion of existing plants to burn biofuels through co-firing would lead to energy generation efficiency and reductions in CO₂ emissions.

2.3.1 The economic rewards of off-grid electricity

Electricity supply remains a major global problem with 1,200 million people still lacking access to electricity (Bhattacharyya *et al.* 2016). Off-grid electricity has emerged as a viable solution and demonstrated job-creation potential. Energy created through solar PV cells, landfill gas and biomass plants, creates more jobs per unit of energy than energy created from fossil fuels (UNEP 2008). These jobs can easily exceed 20 million by 2030 (UNEP 2008).

The additional jobs created by off-grid electricity result from longer and more diverse supply chains, higher labour intensity, and increased net profit margins. Jobs in renewable energy can be created along the sector's value chain. These jobs can be created in the production

of inputs like tools and chemicals; manufacture and distribution of equipment; or services that include project management, installation, operation, and maintenance.

In this regard, regional cooperation between institutions of higher learning may be helpful in increasing youth mobility, learning experience, and knowledge exchange to better prepare them for these employment opportunities. Furthermore, cooperation between universities and the private sector is needed to support innovation and entrepreneurship hubs for young people. Employment agencies should also create a job mobility scheme to help youth locate employment, traineeship, or apprenticeship opportunities (Antonio 2015).

One of the ways in which youth can tap into the economic rewards of off-grid electricity is through the training opportunities provided by energy stakeholders. Such training can empower young entrepreneurs to start businesses in the renewable energy sector. In addition, local governments can implement policies that spur job creation and improve the employability through, for example, skills development (Baah-Boateng 2016).



2.4 Climate change in Africa

Greenhouse gases have risen drastically from 280 parts per million in 1850 to 390 ppm in 2011, an unprecedented rise that has most likely led to global warming and climate change (World Meteorological Organization [WMO] 2015). Despite its relatively insignificant GHG emissions compared to global levels, Africa is severely exposed to the effects of climate change (UNEP 2012). In this regard, climate change will adversely impact the availability of arable land and freshwater in Africa (UNEP 2016b). Consequently, crop yields and livestock output will suffer, which will affect livelihoods and exacerbate an already high youth unemployment rate (Lewis 2018). This vulnerability is compounded by Africa's weak capacity to adapt to the impacts of climate change (Engelbrecht *et al.* 2015; Schaeffer *et al.* 2014; Niang *et al.* 2014; Boko *et al.* 2007). It is against this backdrop that African youth need to play a central role in tackling climate change.



Barotse Floodplain - a wetland under siege, Zambia

Barotse Floodplain, one of Africa's biggest wetlands, lies in the Western province of Zambia. It is estimated to cover an area that can extend up to 1.2 million hectares (Emerton 2005). It has a population of over 250,000 (Nyambe, Chabala, Banda, Zimba and Phiri 2018). For decades, this wetland ecosystem has dictated the way of life, livelihoods, society, and culture of the Lozi people who are skilled fishermen, peddlers, swimmers, and boat builders. Unfortunately, climate change in the form of unusual floods and droughts is emerging as one of the most pressing challenges affecting the livelihoods of the Barotse Floodplain's communities (Rajaratnam, Cole, Fox, Dierksmeier, Puskur, Zulu, Teoh and Situmo 2015).

For centuries, the Lozi have practiced wetland farming on the nutrient-rich soil that remains after the floodwater recedes. The plain that produced abundant food through the cultivation of crops like cassava, maize, rice, and sweet potatoes is slowly turning into a clogged mass of reed that remains wet all year-round making planting difficult. In

the past years, a canal system was built to dry and prepare the fertile land for cultivation. In the present day, these canals have turned into evidence of the adverse impacts of climate change as they are becoming clogged due to unusual floods. The changing climate in the Barotse Floodplain also threatens the Kuomboka, one of Zambia's biggest traditional ceremonies (Banda *et al.* 2015).

Once a year, the Lozi people pack their belongings onto a boat and leave their homesteads to the encroaching waters of the Zambezi floodplain (Johnston 2010). The Kuomboka attracts foreign tourists, government officials, and traditional leaders from across Zambia. This celebrated annual migration of people to drier lands usually takes place in March, but has been held in April for the past few years because the timing of the floodwater has become increasingly unpredictable with the changing climate. For many years, longstanding indigenous knowledge informed the Lozi about looming floods and triggered migration preparations. However, the seasons have become so unpredictable that many of the traditional signals used in the past cannot provide accurate messages anymore. As this uncertainty persists, the Lozi face difficult choices between permanent migration to arid heights, or adaption to live their migratory lives on a rich but increasingly unpredictable floodplain (Johnston 2010).



2.4.1 Challenges faced by youth in accessing global climate funds

Despite the growing number of international climate finance initiatives to help different countries in addressing the challenges caused by climate change, African youth still face a lot of constraints when seeking funds for their climate action (UNEP 2014). Generally speaking, Africa continues to face challenges in accessing international climate funding (AfDB 2014).

Youth Action 12: Pan-African youth climate advocacy

Most youth action has been focused on lobbying and advocacy in international climate events. The Africa Youth Initiative on Climate Change (AYICC) exemplifies this concentration of youth efforts in lobbying and advocacy. Founded by youth from several African countries in 2006 during the United Nations Framework Convention on Climate Change (UNFCCC) twelfth Conference of Parties (COP 12), AYICC has had a presence in all UNFCCC COPs since then.

There is therefore a need to equip youth with accurate and coherent information on the modalities of accessing green funds. The inability

of young people to successfully navigate the rigorous climate funding process leaves their climate action impaired. For instance, accessing the Adaptation Fund which was established under the UNFCCC and Kyoto protocol to provide additional funding for adaptation activities in developing countries is difficult but surmountable for national organisations. The only entities that can apply for funding are those accredited by the Adaptation Fund Board and operating on national, multinational, or regional levels. The accreditation process is quite intensive. An alternative is to partner with a national implementing entity which is accredited (International Federation of Red Cross and Red Crescent Societies [IFRC] 2013). This lengthy and highly technical processes often has short financing cycles but long approval processes. In light of this, it would be prudent for global climate funds to have customised funding mechanisms that specifically target young people, or to support locally-administered initiatives by nationally accredited agencies that can allocate funds to support local youth action.

Food for thought

- Climate knowledge needs to be mainstreamed into formal education in order to raise a climate aware generation that will ensure that climate change adaptation amongst African communities will be the norm, not the exception.
- The setting up of irrigated organic gardens in schools can help in providing healthy food for school children, especially in rural parts of Africa.
- Young people can play a vital role in shaping the development agenda on the continent. By harnessing the power of information technology and tools, such as social media platforms, young people can be at the forefront of advocacy campaigns urging governments and other stakeholders to increase efforts towards cleaner mobility.
- The involvement of youth in the procurement and distribution of clean cooking stoves can be a path to economic empowerment. The use of efficient and clean cooking stoves saves lives, improves livelihood, empowers communities, and contributes to combatting climate change.

2.4.2 Enhancing youth adaptation to climate change

Due to erratic rainfall patterns, and other environmental pressures, young people in many parts of rural Africa face a bleak future. This

pushes many of them into unsafe migration (United Nations 2017). As such, young people need viable opportunities and adequate resources to remain in their communities of origin.

Climate smart adaptation in South Africa

GenderCC Southern Africa in partnership with Seed Community South Africa, and Oxfam South Africa offers climate smart training to youth groups in Siyandhani Village and Dzingi Dzingi Village in Giyani Township, Limpopo Province. The training helps them to develop skills adapting to climate change, including: setting up solar energy, organic farming, biogas digesters, rainwater harvesting, market access, and value chains within the cities.



Improving adaptation to climate change in Burkina Faso

Burkina Faso is a landlocked country in West Africa whose economy is highly dependent on agriculture and livestock. With Burkina Faso considered one of the Least Developed Countries (LDCs) (FAO 2014), the constant pressure from human activities such as overexploitation of land, deforestation, and rural-urban migration threaten its vulnerable socio-economic situation (Oumarou 2011).

In 2012, the government of Burkina Faso implemented a National Climate Change Adaptation Plan (NAP). The NAP is a framework for the operationalization of all the international conventions ratified by the country. This corresponds to the objectives of the UNFCCC (Burkina Faso, Ministère de l'Environnement et des Ressources Halieutiques 2015).

In line with Burkina Faso's NAP, the Burkinabè community of Zandoma has embraced better agricultural techniques that can withstand erratic rainfall (Fluet 2006). They include drought tolerant animals, improved seeds and tillage equipment. However, Zandoma has also seen a gradual decline in cotton cultivation since this is a crop that requires abundant rainfall and large areas for cultivation (Fluet 2006).

In addition, young Burkinabe farmers have adopted new large-scale, land-use planning techniques. These include the introduction of Zai practices (Amanda, Glennie, Intscher, Ali and Morin 2014), the half-moons (Global Water Partnership [GWP] 2010), stone bunds, organic manure, hedgerows, rainwater storage wells, and drip irrigation (Association pour la recherche et la formation en agroécologie [ARFA] 2011). This mode of adaptation is taught to farmers through agricultural cooperatives, the vast majority of which are financed by government projects or by NGOs.

Zai entails digging a grid of planting pits that increase soil fertility in diverse ways. Apart from capturing windblown soil and organic matter, the pits also attract termites that then dig channels that enhance soil architecture, water infiltration and retention. In addition, the termites digest organic matter, consequently increasing the availability of nutrients to plant roots (Ouedraogo and Sawadogo 2001).

As the second NAP pilot project, the Livestock Climatic Insurance aims at reconstituting livestock breeding centres while providing support for the production of milk and eggs after major climatic events. Accordingly, young breeders go for smaller livestock that are less demanding in pastures and more resistant to water stress (GWP 2010).

There is also support for young people funded by the Quebec government through its green fund. A good example is a project on building low-carbon, green buildings by employing Nubian Vaults (Unisfera 2019). Another example is 'your future climate', which was financed by the International Secretariat for Water (ISW). It seeks to enable young people from rural and peri-urban areas of Burkina Faso to become actors of change and promoters of new ideas for adaptation in the agricultural and forestry sectors (Canada, Ministère de l'Environnement et de la Lutte contre les changements climatiques 2015).

Finally, the renewable energy sector also offers enormous job creation opportunities for young people. This potential has been further unlocked by the parliament of Burkina Faso which voted to liberalize the production and sale of energy in Burkina Faso opening a market of US\$2.2 million in private sector opportunities (Mbaye 2017). The direct consequence of this liberalization was the inauguration of the Zagtouli PV solar power plant (maximum capacity of 33 MW) on 29 November 2017. The project carried out through PPP with French (Cegelec) and German (SolarWorld) companies. The construction and maintenance of this solar power plant offers Burkinabe youth in the field real opportunities for green jobs (jeuneafrique 2017).

In addition to the Zagtouli Solar Power Plant, there is also a biogas power station in Kossodo district of Ouagaoudou. With a total capacity of 1.4 MW, this plant created 50 permanent jobs and provides electricity to nearly 22,700 households (Kindo 2015).



Cumulonimbus Cloud Over Senegal and Mali, Africa

NASA's Marshall Space Flight Center / CC BY-NC-ND 2.0

The race to keep global warming to a maximum of 1.5°C

Education, information, and community approaches, including those that are informed by indigenous and local knowledge, can accelerate widespread behavioural changes consistent with adapting to and limiting global warming to 1.5°C. These approaches are more effective when combined with other policies and tailored to the motivations, capabilities, and resources of specific actors and contexts.

Social justice and equity are core aspects of climate-resilient development pathways that aim to limit global warming to 1.5°C as they address challenges and inevitable trade-offs, widen opportunities, and ensure that options, visions, and values are deliberated, between and within countries and communities, without making the poor and disadvantaged worse off.

Source: IPCC 2018



Quick facts

- The WHO estimates that air pollution causes approximately 7 million deaths annually, 600,000 of which are recorded in Africa (UNEP 2016a).
- Globally, nine out of ten people breathe in air containing high levels of pollutants (WHO 2018).
- Indoor air pollution caused by solid fuel use and/or traditional cooking stoves adversely affects the health of nine out of ten Africans (Mbatchou *et al.* 2015).
- Energy created through solar PV cells, landfill gas and biomass plants, creates more jobs per unit of energy than energy created from fossil fuels; easily exceeding 20 million jobs by 2030 (UNEP 2008).

2.5 Conclusion

Young people can play a vital role in shaping the development agenda on the continent. By harnessing the power of information technology and tools, such as social media platforms, young people can be at the forefront of advocacy campaigns urging governments and other stakeholders to increase efforts towards cleaner mobility.

Young people in Africa must play a bigger role in mitigating air pollution and climate change as well as building the resilience of their communities and countries to the impacts of climate change. These roles can range from traditional advocacy efforts to green economy opportunities to promoting energy efficiency and renewable energy. Funding and support from both the public and private sectors is

needed for sustainable youth action in areas such as transportation, energy efficiency, and renewable energy. Scarcity of such funding has resulted in sub-optimal youth action in these areas. There is, therefore, a need for youth across Africa to step up concrete interventions in their respective communities. National legislation and international funding mechanisms should support such concrete interventions, such as the borehole project that was affected by Green Icon, the Tanzanian youth organisation.

Young African scholars and scientists should focus on solutions for energy efficiency and renewable energy. More holistically, African youth must approach climate change adaptation discourse with a solution-oriented mind-set that places them at the centre of those solutions.

References

- Abdoun, A. (2018). *Fuel Quality and Emission Standard Developments in Africa*. Presentation at the Africa Clean Mobility Week 2018, 12-16 March 2018, Nairobi, Kenya. <https://wedocs.unep.org/bitstream/handle/20.500.11822/25233/FuelQualityEmissionStandardDevelopments.pdf?sequence=3&isAllowed=y>.
- African Development Bank (2014). Establishment of the Africa Climate Fund. <https://www.afdb.org/en/topics-and-sectors/initiatives-partnerships/africa-climate-change-fund>.
- Amanda, L., Glennie, G., Intscher, N., Ali, A. and Morin, G. (2014). *A Greener Burkina: Sustainable farming techniques, land reclamation and improved livelihoods*. London: Overseas Development Institute. <https://www.odi.org/sites/odi.org.uk/files/odi-assets/publications-opinion-files/9153.pdf>.
- Antonio, J. (2015). *Opportunities for young people in times of climate change and energy transition*. Macedonia: Konrad-Adenauer-Stiftung. https://www.kas.de/c/document_library/get_file?uuid=5fae19ab-8a1a-6919-9742-4bc13b90618a&groupId=252038.
- Association pour la recherche et la formation en agroécologie (2011). *Burkina Faso: Souveraineté Alimentaire Et Changement Climatique*. Luxembourg: Action Solidarité Tiers Monde. http://www.klimabuendnis.lu/files/doccenter/11352107350ARFA_Burkina_Faso.pdf.
- Baah-Boateng, W. (2016). *Developing Youth Skills for Employment*. Accra: African Center for Economic Transformation. <http://acetforafrica.org/acet/wp-content/uploads/publications/2016/03/Developing-Youth-Skills-Paper.pdf>.
- Bhattacharyya, S. and Palit, D. (2016). Mini-grid based off-grid electrification to enhance electricity access in developing countries: What Policies may be required? *Energy Policy*, 94, 166-178. <https://doi.org/10.1016/j.enpol.2016.04.010>.
- Boko, M., Niang, I., Nyong, A., Vogel, C., Githeko, A., Medany, M., Osman-Elasha, B., Tabo, R. and Yanda, P. (2007). Africa. In *Climate Change 2007: Impacts, Adaptation and Vulnerability: Contribution of Working Group II to The Fourth Assessment Report of The Intergovernmental Panel on Climate Change*. Parry, M., Canziani, O., Palutikof, J., van der Linden, P. and Hanson, C. (eds.). Cambridge: Cambridge University Press. Chapter 9. 433-469. https://www.ipcc.ch/site/assets/uploads/2018/03/ar4_wg2_full_report.pdf.
- Burkina Faso, Ministère de l'Environnement et des Ressources Halieutiques (2015). *Plan national d'adaptation aux changements climatiques (PNA) du Burkina Faso*. Ouagadougou. <http://extwprlegs1.fao.org/docs/pdf/BKF161723.pdf>. 1-155.
- Cervero, R. (2000). *Informal Transport in the Developing World*. Nairobi: United Nations Human Settlements Programme. <http://mirror.unhabitat.org/pmss/getElectronicVersion.aspx?nr=1534&alt=1&AspxAutoDetectCookieSupport=1>.
- Clean Cooking Alliance (2019). *2019 Clean Cooking Industry Snapshot: An Inaugural Report on Sector Investment and Innovation*. Washington, DC. <https://www.cleancookingalliance.org/reports/2019-Clean-Cooking-Industry-Snapshot/2019-Clean-Cooking-Industry-Snapshot.html#page=1>.
- Climate and Clean Air Coalition (2017). Bus Manufacturers Commit to Bring Cleaner 'Soot-Free' Buses to 20 Megacities, 27 September. <https://www.ccacoalition.org/es/node/2044>. Accessed 08 June 2019.
- Climate and Clean Air Coalition (2018). African countries move toward cleaner car imports, 6 April. <https://ccacoalition.org/en/news/african-countries-move-toward-cleaner-car-imports>. Accessed 08 June 2019.



- Dovi, E.A. (2017). Migration: taking rickety boats to Europe. <https://www.un.org/africarenewal/magazine/special-edition-youth-2017/migration-taking-rickety-boats-europe>. Accessed 10 June 2019.
- Duffo, E., Greenstone, M. and Hanna, R. (2007). Cooking Stoves, Indoor Air Pollution, and Respiratory Health in Orissa. *Economic & Political Weekly* 43(32), 71-76. <https://casi.sas.upenn.edu/sites/default/files/it/MIT%202008.pdf>.
- Engelbrecht, F., Adegoke, J., Bopape, M.-J., Naidoo, M., Garland, R., Thatcher, M., McGregor, J., Katzfey, J., Werner, M. and Ichoku, C. (2015). Projections of rapidly rising surface temperatures over Africa under low mitigation. *Environmental Research Letters* 10(8), 085004. <https://doi.org/10.1088/1748-9326/10/8/085004>.
- Etebong, P.C. (2018). Demography in Nigeria: Problems and Prospects. *Biostat Biometrics Open Access Journal* 5(1), 555654. <http://doi.org/10.19080/BBOAJ.2018.05.555654>.
- Food and Agriculture Organization of the United Nations (2014). Country Fact Sheet on Food and Agriculture Policy Trends. <http://www.fao.org/in-action/fapda/publications/country-fact-sheets/en/>.
- Food and Agriculture Organization of the United Nations (2018). FAO promotes solar, fuel-efficient technologies among internally displaced people in northeast Nigeria, 22 November. <http://www.fao.org/nigeria/news/detail-events/en/c/1171919/>. Accessed 08 June 2018.
- Fluet, M. (2006). *Impacts des changements climatiques sur les agriculteurs de la province du Zondoma au Burkina Faso: adaptation, savoir et vulnérabilité*. Montreal: Université Du Québec. <http://www.giersa.ulaval.ca/sites/giersa.ulaval.ca/files/memoires/m9543.pdf>.
- Fundació ENT (2015). *Air Pollution from Waste Disposal: Not for Public Breath*. Zero Waste Europe. http://www.eipie.eu/storage/files/REF00024%20WE%20case%20studies%20inc%20co_inc%202015.pdf.
- Global Water Partnership (2010). *Changements climatiques: Inventaire de stratégies d'adaptation des populations locales et échanges d'expériences de bonne pratique entre régions du Burkina Faso*. Ouagadougou. https://www.gwp.org/contentassets/c9eeff4dec44543b92bbf52711af009/changement-climatique_inventaire-de-strategies-au-burkina-faso.pdf.
- Haq, G. and Schwela, D. (2012). *Transport and Environment in Sub-Saharan Africa*. York: SEI Policy Brief. <https://www.sei.org/mediamanager/documents/Publications/sei-pb-2013-africa-transport.pdf>.
- International Federation of Red Cross and Red Crescent Societies (2013). Accessing climate finance: An overview. Geneva. <https://www.climatecentre.org/downloads/files/IFRCGeneva/IFRCClimateFinance.pdf>.
- Intergovernmental Panel on Climate Change (2018). Summary for Policymakers. In *Global Warming of 1.5°C: An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty*. Masson-Delmotte, V., Zhai, P., Pörtner, H.O., Roberts, D., Skea, J., Shukla, P.R., Pirani, A., Moufouma-Okia, W., Péan, C., Pidcock, R., Connors, S., Matthews, J.B.R., Chen, Y., Zhou, X., Gomis, M.I., Lonnoy, E., Maycock, Tignor, M. and Waterfield, T. (eds.). Geneva: World Meteorological Organization.
- jeuneafrique (2017). Burkina: la plus grande centrale solaire d'Afrique de l'Ouest inaugurée en présence d'Emmanuel Macron, 29 November. <https://www.jeuneafrique.com/497685/economie/burkina-la-plus-grande-centrale-solaire-dafrique-de-louest-inauguree-en-presence-demmanuel-macron/>. Accessed 11 September 2019.
- Kindo, N (2015). Développement durable: le Burkina dispose désormais d'une centrale électrique à biogaz, 2 November. <https://www.burkina24.com/2015/11/02/developpement-durable-le-burkina-dispose-desormais-dune-centrale-electrique-a-biogaz/>. Accessed 16 July 2018.
- Kirk, R.S., Dutta, K., Chengappa, C., Gusain, P.P.S., Masera, O., Berrueta, V. et al. (2006). Monitoring and evaluation of improved biomass cookstove programs for indoor air quality and stove performance. *Energy for Sustainable Development* 11(2), 5-18. [https://doi.org/10.1016/S0973-0826\(08\)60396-8](https://doi.org/10.1016/S0973-0826(08)60396-8).
- Kirkels, M. (2011). *Cycling at the Crossroads of Poverty Alleviation and Sustainable Transport*. Utrecht: Interface for Cycling Expertise. http://www.slocat.net/sites/default/files/u3/cycling_at_the_crossroads_of_poverty_alleviation_and_sustainable_transport.pdf.
- Lewis, P., Monem, M.A. and Impiglia, A. (2018). *Impacts of climate change on farming systems and livelihoods in the near East and North Africa*. Cairo: Food and Agriculture Organization of the United Nations. <http://www.fao.org/3/ca1439en/CA1439EN.pdf>.
- Mbatchou, N.B.H., Ze, A.E., Chebu, C., Mapoure, N.Y., Temfack, E., Nganda, M. and Luma, N.H. (2015). Effects of cooking fuel smoke on respiratory symptoms and lung function in semi-rural women in Cameroon. *International Journal of Occupational and Environmental Health* 21(1), 61-65. <https://dx.doi.org/10.1179/2F2049396714Y.0000000090>.
- Mbaye, K. (2017). Burkina-Faso: le Parlement autorise la production de l'électricité par le privé, 22 April. <https://afrique.latribune.fr/economie/strategies/2017-04-22/burkina-faso-le-parlement-autorise-la-production-de-l-electricite-par-le-prive.html>. Accessed 16 July 2018.
- Canada, Ministère de l'Environnement et de la Lutte contre les changements climatiques (2015). Coopération Climatique Internationale: Liste des projets acceptés. <http://www.environnement.gouv.qc.ca/programmes/coop-climatique-internationale/tableau-projets-acceptes.pdf>. Accessed 16 July 2018.
- Ncube, E., Banda, C. and Mundike, J. (2012). Air pollution on the Copperbelt province of Zambia: Its sulphur dioxide. *Journal of Natural and Environmental Sciences* 3(1), 34-41. https://www.researchgate.net/profile/Jhonnah_Mundike/publication/253650701_Air_Pollution_on_the_Copperbelt_Province_of_Zambia_Effects_of_Sulphur_Dioxide_on_Vegetation_and_Humans/links/0deec51fa51f15806000000/Air-Pollution-on-the-Copperbelt-Province-of-Zambia-Effects-of-Sulphur-Dioxide-on-Vegetation-and-Humans.pdf?origin=publication_detail.
- Niang, I., Ruppel, O.C., Abdrabo, M.A., Essel, A., Lennard, C., Padgham, J. and Urquhart, P. (2014). Africa. In *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part B: Regional Aspects, Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. Barros, V.R., Field, C.B., Dokken, D.J., Mastrandrea, M.D., Mach, K.J., Bilir, T.E., Chatterjee, M., Ebi, K.L., Estrada, Y.O., Genova, R.C., Girma, B., Kissel, E.S., Levy, A.N., MacCracken, S., Mastrandrea, R.R. and White, L.L. (eds.). Cambridge: Cambridge University Press. https://ipcc-wg2.gov/AR5/images/uploads/WGIIAR5-PartA_FINAL.pdf.
- Nigeria Cleancooking (2018). *Cooking Shouldn't Kill: Let Us Press for Progress for Women*. 2018. 8 March. <https://www.naccnigeria.org/cooking-shouldnt-kill-let-us-press-for-progress-for-women-press-release>.
- Ouedraogo, A. and Sawadogo, H. (2001). Three Models of Extension by Farmer Innovators in Burkina Faso. In *Farmer innovation in Africa: A Source of Inspiration for Agricultural Development*. Reij, C. and A. Wayers-Bayer, A. (eds.). London: Earthscan. <https://doi.org/10.4324/9781315071886>.
- Oumarou, K. (2011). *Changements Climatiques, Réponses Endogènes D'atténuation Et D'adaptions au Burkina Faso: Cas Des Mouvements De Populations*. PhD Thesis, Ouagadougou University, Ouagadougou.
- Punch (2018). Nigeria ranks seventh most populous country in the world, 11 April. <https://punchng.com/nigeria-ranks-seventh-most-populous-country-globally-with-198-million-people-npc/>. Accessed 11 September 2019.
- Roy, R. (2016). *The cost of air pollution in Africa (Working Paper No. 333)*. Paris: OECD Publishing. <https://doi.org/10.1787/5j1qzq77x6f8-en>.
- Schaeffer, M., Baarsch, F., Charles, L., de Bruin, K., Freitas, S., Hare, B., Hof, A. et al. (2014). *Loss and damage in Africa*. Addis Ababa: Climate Development (ClimDev-Africa). https://www.uneca.org/sites/default/files/PublicationFiles/acpc-loss-and-damage-report_final_en.pdf.
- Strosnider, H., Kennedy, C., Monti, M. and Yip, F. (2017). Rural and Urban Differences in Air Quality, 2008–2012, and Community Drinking Water Quality, 2010–2015 – United States. *Surveillance Summaries* 66(13), 1-10. <http://dx.doi.org/10.15585/mmwr.ss6613a1>.
- Tarekegn, M.M. and Gulilat, T.Y. (2018). Trends of Ambient Air Pollution and the Corresponding Respiratory Diseases in Addis Ababa. *Clinical Pharmacology & Toxicology Journal* 2 (1), 5. <http://www.imedpub.com/articles/trends-of-ambient-air-pollution-and-the-corresponding-respiratory-diseases-in-addis-ababa.pdf>.
- Unisfera (2019). Climate cooperation, job creation, and adapted housing, 19 May. <https://www.lavoutenubienne.org/climate-cooperation-job-creation-and-adapted-housing>. Accessed 18 May 2019.
- United Nations Environment Programme (2008). *Green Jobs: Towards decent work in a sustainable, low-carbon world*. Nairobi. UNEP/ILO/IOE/ITUC. http://wedocs.unep.org/bitstream/handle/20.500.11822/8825/UNEPGreenJobs_report08.pdf?sequence=3&isAllowed=y.
- United Nations Environment Programme (2012). *Climate Change Challenges for Africa: Evidence from selected EU-Funded Research Projects*. Nairobi. <https://wedocs.unep.org/bitstream/handle/20.500.11822/8656/-Climate%20change%20challenges%20for%20Africa.%20evidence%20from%20selected%20EU-Funded%20Research%20%20projects%20-2012Climate%20Change%20Policy%202012.pdf?sequence=3&isAllowed=y>.
- United Nations Environment Programme (2014). *Accelerating Youth Action Towards Africa's Greener Future*. Nairobi. DRC/1831/NA. https://wedocs.unep.org/bitstream/handle/20.500.11822/8998/-Accelerating_youth_action_towards_Africa%E2%80%99s_Greener_Future-2015Youth_Action-Africas_Gre.pdf?sequence=3&isAllowed=y.



- United Nations Environment Programme (2016a). Air Pollution: Africa's Invisible, Silent Killer, 20 October. <https://www.unenvironment.org/news-and-stories/story/air-pollution-africas-invisible-silent-killer-1>. Accessed 6 June 2019.
- United Nations Environment Programme (2016b). *GEO-6 Regional Assessment for Africa*. Nairobi. DEW/1963/NA. http://apps.unep.org/publications/index.php?option=com_pub&task=download&file=012099_en.
- United Nations Environment Programme (2016c). *Leaded Petrol Phase Out: Global Status as at January 2016*. Nairobi. http://wedocs.unep.org/bitstream/handle/20.500.11822/18259/MapWorldLead_January2016.pdf?sequence=1&isAllowed=y. Accessed 11 September 2019.
- United Nations Environment Programme (2017). Four more countries in Africa switch to low sulfur fuels, 2 November. <https://www.unenvironment.org/news-and-stories/blogpost/four-more-countries-africa-switch-low-sulfur-fuels>. Accessed 8 June 2018.
- United Nations Environment Programme (2018). UN Environment calls to stop flow of "dirty fuel" to West Africa, 9 July. <https://www.unenvironment.org/news-and-stories/press-release/un-environment-calls-stop-flow-dirty-fuel-west-africa>. Accessed 7 June 2018.
- United Nations Environment Programme (2019). *Share the Road Programme Annual Report 2018*. Nairobi. <https://wedocs.unep.org/bitstream/handle/20.500.11822/27503/SRP2018.pdf?sequence=1&isAllowed=y>.
- World Health Organization (2018). 9 out of 10 people worldwide breathe polluted air, but more countries are taking action, 2 May. <https://www.who.int/news-room/detail/02-05-2018-9-out-of-10-people-worldwide-breathe-polluted-air-but-more-countries-are-taking-action>. Accessed 6 June 2019.
- World Meteorological Organization (2015). *The State of Greenhouse Gases in the Atmosphere Based on Global Observations through 2014*. Geneva. http://www.meteorf.ru/upload/pdf_download/Bulleten-VMO-po-PG-2014.pdf.
- Zhang, K. (2010). Exposures and Health Risks due to Traffic Congestion. PhD Thesis, The University of Michigan, Ann Arbor, Michigan. https://deepblue.lib.umich.edu/bitstream/handle/2027.42/77813/zhangkai_1.pdf?sequence=1.

Chapter 3

Restoring our Land





Key Messages

Land access determines livelihood prospects for youth. It is therefore critical for African governments to enact policies that will expand land access for youth.

Waste does not just belong in landfills. It is valuable. The global market for post-consumer scrap metal is estimated at 400 million tons annually and around 175 million tons annually for paper and cardboard. This presents economic opportunities that youth can tap into.

Climate smart agriculture (CSA) reinforces the livelihoods of smallholder farmers by equipping them with more effective ways of managing natural resources and deploying technologies that will help them produce and sell more.

The global food value chain already employs almost one billion people and generates up to US\$2.4 trillion to the global economy and it is estimated that the world will need to increase food production by at least 50 per cent by 2050 to adequately feed the population. As such, CSA presents a golden opportunity for African youth to insert themselves into the global food production value chain in a sustainable manner.

Global and country-led initiatives such as the REDD+, the Bonn Challenge, and the African Forest Landscape Restoration Initiative (AFR100) also contain multiple employment opportunities that greatly benefit African youth.

3.1 Introduction

Land is the true wealth of Africa (Liniger, Studer, Hauert and Gurtner 2011) and is home to a dazzling diversity of natural resources and ecosystems including soils, vegetation, water and genetic diversity. Together, they form the continent's main natural capital; provide food, water, wood, fibre, and industrial products, as well as essential ecosystem services and functions (Liniger, Studer, Hauert

and Gurtner 2011). Furthermore, Africa is home to 60 per cent of unconverted arable land resources (UNEP 2016). Approximately 66 per cent of Africa is classified as desert or drylands; and 45 per cent of the population lives in drylands (Liniger, Studer, Hauert and Gurtner 2011; FAO 2011).

Current activities and trends show that land and water resources in some regions face grave threats from over-exploitation, although their per capita availability is among the highest in the world (UNEP 2013). This stems from the growing needs of a burgeoning population, often combined with inappropriate land management practices.

3.2 Sustainable land management

Unsustainable land management practices result in land degradation that threatens the environment and stifles livelihoods. Africa remains exposed to threats such as natural resource degradation and poverty due to various reasons that include: changing demographics, urbanization, mining, fragile natural resources and ecosystems, increased soil erosion and land degradation, low yields and high post-harvest yield losses (UNEP 2016). Land degradation is severe and ongoing because of economic pressures and slower evolution of environmental awareness. In addition, the number of natural disasters and sensitivity to climate variability and long-term climate change are on the rise (Liniger, Studer, Hauert and Gurtner 2011).





Sustainable Land Management (SLM) is the use of land resources for the production of goods to meet changing human needs, while simultaneously ensuring the long-term productive potential of these resources and their environmental sustainability (FAO 2015). SLM is a key response to Africa's land resources facing new challenges from myriad uses, including urbanization, mining, deforestation, agricultural expansion, and infrastructure development (UNEP 2016). Regional bodies such as the African Union and its programmes including the African Mining Vision 2009 continue to advocate for sustainable mining while protecting the environment (African Union 2009).

In addition, tourism in wildlife sanctuaries can also be a great economic asset especially when we know that in Africa almost all wildlife reserves are located in arid zones. Such a pathway will have immense benefits for young people. Land reclamation may not only result in improved natural resource management and environmental practices, but could also create direct jobs for youth. However, land access for youth must be addressed if youth are to optimally benefit from land. Land access determines livelihood prospects for youth. Studies have shown that increased land inheritance translates into greater employment opportunities in agriculture (Kosec *et al.* 2018). This presents a challenge for youth in rural Africa because they typically depend on inheritance and gift, or informal leasing, to access land (Deininger 2003). Inherited or gifted land is however too small to power sustainable livelihoods (Bezu and Holden 2014). It is therefore critical for African governments to enact policies that will expand land access for youth.

Investing in the reclamation of degraded mined lands could help enhance the livelihood potential of youths through the development of

income-generating ventures. Besides agriculture, properly reclaimed land can be used for recreational purposes, grazing, wildlife habitats, wetlands, bricks and blocks making, swimming pools, forestry, and aquaculture, just to name a few (Mborah *et al.* 2016).

3.3 Waste generation and economic opportunities

The United Nations Environment Programme (UNEP) defines waste as substance or objects which are disposed of, or are intended to be disposed of, or are required to be disposed of by the provisions of national law (UNEP 1992). The amount of Municipal Solid Waste (MSW) that a country generates is directly proportionate to the country's development rate. With a development rate of four per cent per year, Africa is growing rapidly and consequently producing huge amounts of MSW, thus imperilling public health and the environment (Muzenda, Belaid, Mollagee, Motampane and Ntuli 2011)

In recent years, the global market for recyclable products has gone up significantly. The world market for post-consumer scrap metal is estimated at 400 million tons annually and around 175 million tons annually for paper and cardboard (World Bank 2012). This presents economic opportunities that youth can tap into.

Major African cities produce an average of 0.78 kg of waste per capita per day (van Beukering, Sekher, Gerlagh and Kumar 1999; Mkwambisi 2007; Chijioko 2013). In Nairobi, Kenya, for example, waste is collected by both the public sector and private companies that are registered and licensed by the city. These companies provide waste collection and disposal at a fee in specific areas (van Dijk 2008).





Youth Action 13: Youth entrepreneurship in waste disposal, Malawi

Malawi's Mzuzu City Council promotes involvement of different stakeholders to work together with the city council in fighting waste through privatizing waste management. One of the private players is a youth-led company known as ComFert Limited, a waste management and composting company situated in Blantyre at the Zingwangwa Sanitation centre also known as the "Zing San Center". The company aims at encouraging sustainable waste management practices which are eco-friendly. Some of the practices include: compost made from organic waste such as food leftovers, and production of briquettes and biogas used for cooking and heating. These practices are not only eco-friendly but also solve community challenges by creating employment opportunities for youths.



Bottle sculpture used to educate students in Accra about waste management

Divine Agborli

Food for thought

- Because inherited or gifted land is too small to power sustainable livelihoods, it is critical for African governments to enact policies that will expand land access for youth.
- Land reclamation may not only result in improved natural resource management and environmental practices, but could also create direct jobs for youth. Besides agriculture, properly reclaimed land can be used for recreational purposes, grazing land, wildlife habitat, wetlands, bricks and blocks making, swimming pools, forestry and aquaculture, amongst others.
- Climate Smart Agriculture reinforces the livelihoods of smallholders by equipping them with more effective ways of managing natural resources and deploying technologies that will help them produce and sell more.
- Use of precision agriculture, and predictive technologies like climate forecasting tools, remote sensing and satellite imaging can allow for faster responses, thus fostering CSA.

Youth Action 14: Empowering African youth through organic farming, Kenya

Organic farming has greatly benefited young Kenyans from smallholder-farm communities by increasing food and agricultural production and productivity using cheaper organic inputs originating from within the farms. The youth have come together and unified in making Smallholder Farmer Youth Groups. Through this, they have provided greater opportunities for themselves. Below are some of their success stories.

Watema AIC Candet and Battalion Youths in Makeni County are among the youths tapping the potential of organic farming. The youths have been supported by Biovision Africa Trust (Farmer Communication Program) through training and are now practicing and reaping big from organic poultry keeping projects. The youths are managing their poultry using agro-ecological methods to control pests and diseases as well as produce feeds. Through this, they have managed to get cash income from the sale of eggs and indigenous poultry which has greatly improved their livelihoods.

Sylvia's Basket, founded by a female youth called Sylvia, is a young organic farm based in Limuru, Kiambu County. Sylvia's Basket sells fresh organic vegetables which it supplies to its customers at their doorsteps upon order within 24 hours of harvest. The organization also sells to traders, restaurants, and local markets. Through this, it has employed five staff who manage the farm. It has also created a website for the Half-Acre Movement where they show people how to plant and manage their own food organically on a small portion of land like the kitchen garden. After realizing that many farmers in the local community are practicing mono-cropping, the company is currently working with the local women's group to train them on how to farm varieties of vegetables in their farms.

Elcah Barasa Nafula, an international relations graduate, never imagined herself working on a farm despite owning a piece of land in her rural home in Kitale. She dreamt of working in the tall skyscrapers of Nairobi in her field. However, her perception changed after working as a communications intern with the Young Professionals for Agricultural Development (YPARD) movement. This global network enables youths to exploit their potential in innovative farming practices. Elcah is now a successful organic farmer in Ndalul and Kitale which are rural communities. She has empowered her fellow youths and farmers in the local community by training them on the technologies and innovation of organic farming through the support of Biovision Africa Trust where she uses her small farm as a demonstration plot.

Organic Technology Extension and Promotion, an initiative centre founded by a young farmer Philip Munyasia from Northern Kenya has successfully brought knowledge, empowerment and joy to northern Kenyan communities. The initiative that started by growing varieties of organic vegetables, making compost, saving seeds, and planting trees has expanded and has even managed to employ staff who offer training to hundreds of farmers each year, do follow-ups and organize farmer exchange programmes. The growing self-reliance in food and income within the community has resulted

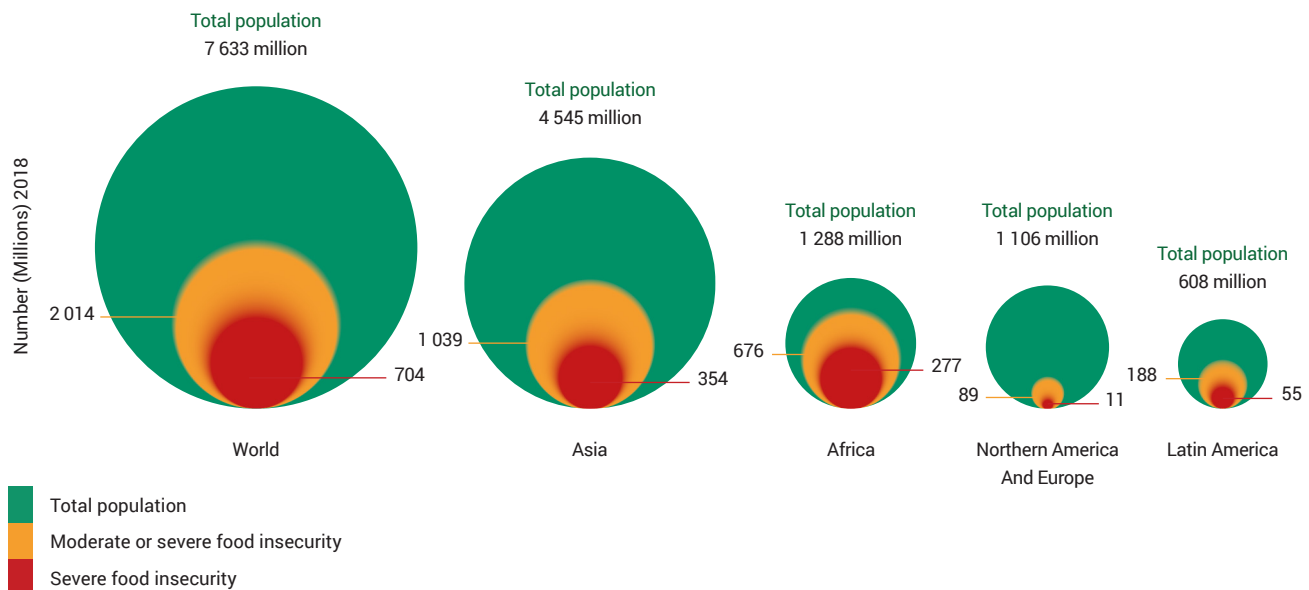
in successful transformation and adoption of organic farming by the village community members.

3.4 Climate Smart Agriculture

Climate Smart agriculture (CSA) is an approach to transform and reorient agricultural systems to effectively support development and ensure food security in a changing climate (FAO 2013). Its benefits are three dimensional: It boosts food security by enhancing increased agricultural productivity as well as incomes of smallholder farmers; it helps farmers build resilience to climate change; and it contributes to climate change mitigation. Food security is already a challenge to many African countries, in fact Africa has one of the highest concentrations of food insecurity in the world (Figure 3). Climate Smart Agriculture can be a means to achieving national food security. Productivity, adaptation, and mitigation are the three pillars of CSA. Firstly, CSA aims to sustainably increase productivity and income; secondly, to strengthen ecosystems and improve the resilience of production systems against climate change; and lastly, to reduce GHG production and increase carbon storage on farmlands.



Figure 3: Concentration and distribution of food insecurity by severity globally and by region, 2018



Source: FAO et al. (2019)



Enhancing livelihoods in Niger through sustainable agriculture

Sustainable Land Management (SLM) practices and technologies can be applied in a diversity of combinations according to local environmental and climatic conditions of the areas exploited, in order to enhance productivity, better livelihoods, and re-establish ecosystem services. Accordingly, SLM greatly contributes to CSA and strengthens food security and smallholders' prosperity (Bunning, McDonagh and Rioux 2011). Positive impacts of SLM practice on productivity and resilience of agricultural land have been proven not only in Niger, but also in several other countries such as Kenya, Ghana, etc. (Branca, McCarthy, Lipper and Jolejole 2011). SLM practices include the following: using improved varieties for seed diversity in the same crop; water harvesting and irrigation; applying the "Zai" or tied ridges techniques for better soil moisture; using cover crops to lessen erosion and nutrient leaching; rotating crops with the use of legumes to increase soil fertility and lower dependence on chemical fertilizers; reducing or eliminating tillage to keep soil moisture; using compost, green and animal manure to increase soil fertility; incorporating tillage residues to increase soil water retention; and incorporating crops and livestock to have access to animal manure (Branca, McCarthy, Lipper and Jolejole 2011).

Youth Action 15: The Climate Smart Agriculture Youth Network, Cameroon

The Climate Smart Agriculture Youth Network (CSAYN) was created in 2014 by Divine Ntiokam, a young Cameroonian. Its goal was to provide youth with a platform to effectively adopt CSA concepts for positive action in adaptation, reducing emissions (mitigation), increasing food productivity and creating green jobs. This network has now spread to at least 20 African countries facilitating peer-to-peer learning on CSA. CSAYN has learnt from experience that the agriculture sector presents an opportunity to generate home-grown prosperity in the African continent. With increased agricultural productivity and sustainable livelihoods achieved through CSA, the agriculture sector can once again become attractive to young people, thereby stemming grave unemployment consequences like illegal and unsafe migration to Europe.

Youth Action 16: Tanzanian youth tackling climate change-induced water scarcity

Green Icon is a youth group that is based in Dar es Salaam, United Republic of Tanzania. It has partnered with Tengeneza Generation to provide water for Babayu Village in a semi-arid region of the central United Republic of Tanzania. Before Green Icon's intervention, this semi-arid region was already facing water challenges that were exacerbated by several factors, key among them being a changing climate (Mkonda *et al.* 2018).

Community members in Babayu village were mostly dependent on a natural spring called 'Dundo' as their primary source of water. The gradual decline of this water source left them at a loss.

It is against this backdrop that the Green Icon and Tengeneza Generation came together to solve the challenge of water supply in Babayu Village. They sourced for and acquired funds for drilling a borehole, installing a solar-powered water pump and related infrastructure for water supply in Babayu. After completion of project, more than 80 households and 500 pupils from a local primary school started to enjoy access to safe and clean water from the borehole.

Accompanying this water access project was practical training for youth and women groups on climate resilient farming practices. These training sessions were further supported by a village extension officer.

Youth Action 17: Potential of CSA for Malawian youth

In Malawi, a study to document Best Practices and Lessons learnt under the National Climate Change Programme (NCCP) shows that the NCCP employed a deliberate strategy to target and engage women and youth in CSA through income-generating activities such as integrated fish farming, goat production and gravity-fed irrigation farming of valuable crops including tomatoes and green maize. This was done to reduce the inherent finance-related vulnerability associated with these social groups (Malawi, Ministry of Finance and Development Planning 2011).

One of the project beneficiaries was a fish farming group in Mulanje. Chifundo Kananji, one of the group members reported that, "I already had a fish pond but the project supported me with fingerlings, a goat, and ducks. I use the droppings



Green Icon's Solar-Powered Project

Tajiel Urtoh

from the livestock as manure for my garden while the ducks supply my pond with nutrients [from the droppings] but also help to clean the surroundings of my pond as they feed on grass and snails" (Mkomwa and Phalira 2018).

3.5 Nurturing the next crop of Africa's farmers

Scores of young people are curating innovative, profitable and sustainable agricultural enterprises that are aiding them to shed the shackles of unemployment that previously dogged their lives. With their ingenuity, innovation and energy, youths are becoming the driving force – a catalyst towards agricultural transformation. The global food value chain already employs almost one billion people and generates up to US\$2,400 billion to the global economy and it is estimated that the world will need to increase food production by at least 50 per cent by 2050 to adequately feed the population (FAO 2015). It would be ludicrous to ignore the lucrative opportunity that this presents.

Youth Action 18: Coffee passion, Uganda

Take James Kyewalabye, Uganda, for instance. After completing his undergraduate degree in commerce from Makerere University, the lure of a career in the banking industry was quite eminent. Yet, he chose an uncommon path: he ignored the desk job and fed his passion for coffee. Fast forward six years later, James is the executive director of Real Agricultural Solutions for Africa (RASA), an agribusiness start-up that produces high-quality coffee liqueur. And while the business faces the normal teething problems experienced by all start-ups, he makes a decent living for himself and has gone on to employ six young people. "Economic opportunities in agriculture are much bigger than you may realise," he said. And this begs the question, what does he see that other young people might not?

Youth Action 19: Digital farming platform in Kenya

When Peris Bosire and Rita Kimani met at a computer science class at the University of Nairobi, they combined their knowledge in agriculture from growing up in small farming communities in rural Kenya with technology to provide a solution for the lack of access to finance faced by a majority of smallholder farmers. They figured that with little aggregated data about smallholder farmers' financial history and performance, financial institutions would continue to view farmers as high risk and therefore lock them out of the formal financial system.

Through their enterprise, Farm Drive, they have provided a digital record platform that helps farmers to follow up on their farming activities through their mobile phones. Further to this, this digital platform fuses farmers' data with relevant agricultural data to develop wide-ranging credit profiles that financial institutions can use when farmers apply for funding. Farm Drive hopes to help 500,000 farmers access mainstream financing.

3.6 The potential synergies between climate change mitigation, youth employment, and food security goals

Climate change, youth unemployment, and food insecurity are all issues at the heart of the SDGs. By 2030, the international development community aims to eradicate poverty (SDG1), end hunger (SDG2), promote productive employment for all (SDG8), and combat climate

change and its impacts (SDG13), amongst other goals (World Development Indicators 2016). With the deadline fast approaching, policymakers need, more than ever, to create synergies between sectors of development, in order to create employment opportunities for young people. Due to the adverse impacts of climate change, African countries are already experiencing loss of agricultural land, employment opportunities, and smallholder food production (FAO 2008). This can be reversed through CSA that reinforces the livelihoods of smallholders by equipping them with more effective ways of managing natural resources and deploying technologies that will help them produce and sell more (Williams, Mul, Cofie, Kinyangi, Zougmore, Wamukoya, Nyasimi, Mapfumo, Speranza, Amwata, Frid-Nielsen, Partey, Girvetz, Rosenstock, and Campbell 2015).

Further to this, more jobs can be created through strategic implementation of global agreements like the 2015 Paris Agreement which seeks to keep global temperature rise this century to substantially below 2°C above pre-industrial levels. For this to happen, countries must change the way they produce and consume energy. Such a transition will create new job opportunities (ILO 2018). In the same vein, global and country-led initiatives such as the REDD+, the Bonn Challenge and the African Forest Landscape Restoration Initiative (AFR100) also contain multiple employment opportunities that greatly benefit African youth. For AFR100 to succeed in its quest to restore degraded landscapes, it must enlist the participation of youth. In the same vein, employment can be found through initiatives like AFR100 which seek to restore degraded African landscapes while enhancing food security and fighting poverty. In pursuance of this mission, AFR100 can spur economic growth and create jobs for youth (World Resources Institute 2018).

However, economic opportunities for young people don't just lie in restoration but also in the already existing ecosystems across Africa. Some of these opportunities can be found in the so-called Payments for Environmental – or Ecosystem – Services (PES). PES are formally defined as "...voluntary transactions between services users and service providers that are conditional on agreed rules of natural resource management for generating environmental services" (Wunder 2015). African countries can enact policies that secure central involvement of youth in natural resource management that benefits from payments of ecosystem services.

While they vary substantially in their implementation, PES often entail offering monetary incentives to individuals or communities conditional on the provision of a well-defined environmental service. Proponents of the tool argue that, in addition to offering strong incentives for environmental conservation, PES have the potential to also deliver socio-economic and welfare outcomes, making it an ideal tool for tackling both climate change and job creation.





Participatory forest management, Burkina Faso

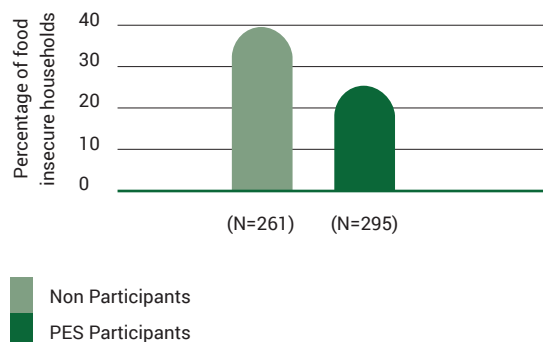
A team of researchers from Development Impact Evaluation (DIME), partnered with the government of Burkina-Faso and embedded an impact evaluation into a pilot REDD+ project called Participatory Forest Management (PGFC/REDD+ from its French acronym) (Adjognon and van Soest 2019). The goal of the study was to evaluate whether a policy intervention geared towards climate mitigation targets could also deliver welfare outcomes such as food security. The project was part of the Burkina-Faso Forest Investment Plan (FIP) with financing from the Climate Investment Fund (CIF), and co-supervision by the World Bank and the African Development Bank. The project's primary objective was to improve the carbon sequestration capacity of gazetted forests while reducing poverty in rural areas. As part of this programme, the communities living around the targeted forests were invited every year to participate in afforestation campaigns targeting selected gazetted forests in the country. These campaigns involved tree-planting activities in well-defined areas of the forests in exchange for immediate cash. After tree planting, groups of individuals were enrolled in PES contracts, whereby they would receive additional payments based on tree survival rate.

The impact evaluation embedded in the project was designed to answer the following main research question: What is the impact of participating in the PES schemes on participants' food security status? With widespread food insecurity exacerbated by climate change affecting the reliability of rains during the study, the study design involved randomly assigning representatives of 630 households from settlements neighbouring 11 gazetted forests to a treatment and control group. The participants were mostly farmers who depend on the forests for household needs like fuelwood. Those assigned to the treatment group were grouped into teams of five and were informed that they had the opportunity to earn money, as a group, when maintaining and keeping alive newly planted trees on a given reforestation parcel. They were given PES contracts that stated that their group would receive about US\$0.70 for every tree that was still alive almost a year later and that each of them would receive 20 per cent of the total amount received.

The results suggested that participation in the PES schemes shielded farmers against food insecurity at a time where they were most prone to it (Figure 4). The payments coincided with the pre-harvest period where very few farmers still have stocks from the previous harvest. Apart from tackling food insecurity, studies have now proved that such PES schemes can also create employment (UNEP 2019).

Figure 4: Conservation incentives and food security

Evidence from the Burkina Faso Forest Investment Programme (FIP)



Source: Adjognon and van Soest (2019)



Quick facts

- Africa is home to 60 per cent of unconverted arable land resources (UNEP 2016).
- Sustainable Land Management (SLM) practices and technologies can be applied in a diversity of combinations according to local environmental and climatic conditions of the areas exploited, in order to enhance productivity, better livelihoods and re-establish ecosystem services (Bunning, McDonagh and Rioux 2011).
- Agriculture accounts for 61 per cent of Africa's employment and 25 per cent of its gross domestic product (GDP). Between 2001 and 2016, it accounted for 9.16 per cent of total exports (Viljoen 2017).
- The world market for post-consumer scrap metal is estimated at 400 million tons annually and around 175 million tons annually for paper and cardboard. This presents economic opportunities that youth can tap into (World Bank 2012).

3.7 Conclusion

Agriculture can be a key pillar in Africa's green economy because it already drives a large percentage of the continent's economy. It currently accounts for 61 per cent of employment, 25 per cent of gross domestic product (GDP) and between 2001 and 2016, accounted for 9.16 per cent of total exports (Viljoen 2017). Meanwhile, many young people are smallholders whose livelihood depends on agriculture. A greener agricultural system will lead to higher earnings, replenishment of key ecosystem services, decent jobs and

livelihoods, a smaller ecological footprint, increased resilience to climate change, and enhanced food security. This can be a golden opportunity for African youth to engage in sustainable farming that will lead to a greener Africa. However, this will also require strong legal and institutional frameworks which will be possible only with genuine political commitment on the part of decision-makers. Young people can infuse unique insights into challenges related to land resources, and in the process, pave the way for earning decent livelihoods through sustainable land management.

References

- Adjognon, S.G. and van Soest, D. (2019). Can Payments for Ecosystem Services deliver food security outcomes? *Agricultural and Applied Economics Association 2019 Annual Meeting*. Georgia, 21-23 July. Milwaukee, Wisconsin. https://ageconsearch.umn.edu/record/291131/files/Abstracts_19_05_10_12_35_30_94__138_220_130_123_0.pdf.
- Bezu, S. and Holden, S. (2014). Are rural youth in Ethiopia abandoning agriculture? *World Development* 64, 259-272. <https://doi.org/10.1016/j.worlddev.2014.06.013>.
- Branca, G., McCarthy, N., Lipper, L., and Jolejole, M.C. (2011). *Climate-Smart Agriculture: A Synthesis of Empirical Evidence of Food Security and Mitigation Benefits from Improved Cropland Management*. Rome: Food and Agriculture Organization of the United Nations. <http://www.fao.org/3/i2574e/i2574e00.pdf>.
- Bunning, S., McDonagh, J. and Rioux, J. (2011). Land degradation assessments in drylands. Rome: Food and Agriculture Organization of the United Nations. <http://www.fao.org/3/a-mc981e.pdf>.
- Chijjoke, E. (2013). Waste Management in Africa: An Invitation to Wealth Generation. International Conference on Waste Management and Environment. Kuala Lumpur, 26-27 August 2013. https://www.researchgate.net/publication/265511623_Waste_Generation_in_Africa_An_Invitation_to_Wealth_Generation/link/54ef3af40cf2495330e1c25d/download.
- Deininger, K. (2003). *Land Policies for Growth and Poverty Reduction*. World Bank Policy Research Report. Washington, DC: World Bank; Oxford: Oxford University Press. <http://documents.worldbank.org/curated/en/485171468309336484/pdf/multi0page.pdf>.
- Food and Agriculture Organization of the United Nations (2008). *Climate Change and Food Security: A framework Document*. Rome. <http://www.fao.org/3/k2595e/k2595e00.pdf>.
- Food and Agriculture Organization of the United Nations (2013). *Climate Smart Agriculture Sourcebook*. Rome. <http://www.fao.org/3/a-i3325e.pdf>.
- Food and Agriculture Organization of the United Nations (2015). *FAO Statistical Pocketbook 2015*. Rome. <http://www.fao.org/3/a-i4691e.pdf>.
- Food and Agriculture Organization of the United Nations, International Fund for Agricultural Development, United Nations Children's Fund, World Food Programme and World Health Organization (2019). *The State of Food Security and Nutrition in the World 2019: Safeguarding against economic slowdowns and downturns*. Rome, FAO. <http://www.fao.org/3/ca5162en/ca5162en.pdf>.
- International Labour Organization (2018). *World Employment Social Outlook: Greening with Jobs*. Geneva. https://www.ilo.org/weso-greening/documents/WESO_Greening_EN_web2.pdf.
- Kosec, K., Ghebru, H., Holtemeyer, B., Mueller, V. and Schmidt, E. (2018). The Effect of Land Access on Youth Employment and Migration Decisions: Evidence from Rural Ethiopia. *American Journal of Agricultural Economics* 100(3), 931-954. <https://doi.org/10.1093/ajae/aax087>.
- Liniger, H., Studer, R.M., Hauert, C. and Gurtner, M. (2011). *Sustainable Land Management in Practice: Guidelines and Best Practices for Sub-Saharan Africa*. Critchley, W. (ed.). Rome: Food and Agriculture Organization of the United Nations. <http://www.fao.org/3/a-i1861e.pdf>.
- Malawi, Ministry of Finance and Development Planning (2011). *Malawi Growth and Development Strategy II: 2011–2016*. Lilongwe. <http://www.mw.one.un.org/wp-content/uploads/2014/04/Malawi-Growth-and-Development-Strategy-MGDS-II.pdf>.
- Mborah, C., Bansah, K. and Boateng, M. (2016). Evaluating Alternate Post-Mining Land-Uses: A Review. *Environment and Pollution* 5(1), 14-22.
- Mkonda, Y.M. and He, X. (2018). Vulnerability Assessment of the Livelihoods in Tanzania's Semi-Arid Agro-Ecological Zone under Climate Change Scenarios. *Climate* 6(2), 27. <https://doi.org/10.3390/cli6020027>.



- Mkomwa, E.C. and Phalira, W. (2018). Gender Mainstreaming and Youth Engagement in Climate Change Management Interventions: Lessons from the National Climate Change Programme, Malawi. *National Climate Change Adaptation Symposium*. Lilongwe: Bingu International Center.
- Mkwambisi, D.D. (2007). Urban Agriculture in Malawi, Poverty Reduction Waste Management and Institutional Barriers. Thesis, University of Leeds, Leeds.
- Muzenda, E., Belaid, M., Mollagee, M., Motampane, N. and Ntuli, F. (2011). Reflecting on Waste Management Strategies for South Africa. *Proceedings of the World Congress on Engineering and Computer Science 2*, 19-21. October 2011. San Francisco: World Congress on Engineering and Computer Science (WCECS).
- Obeng-Ofori, D. and Boateng, B.A. (2008). *Global Population growth, crop losses and postharvest technology*. Accra: Smartline Publishing Limited.
- United Nations Environment Programme (1992). *Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal*. Geneva. <https://www.basel.int/Portals/4/Basel%20Convention/docs/text/BaselConventionText-e.pdf>.
- United Nations Environment Programme (2009). *Environmental Law: A Handbook for Afghan Judges*. Kabul: United Nations Environment Programme. https://postconflict.unep.ch/publications/afg_tech/theme_01/afg_judges_EN.pdf.
- United Nations Environment Programme (2013). *Africa Environment Outlook 3: Our Environment, Our Health*. Nairobi. <http://www.unep.org/pdf/aeo3.pdf>.
- United Nations Environment Programme (2016). *GEO-6 Regional Assessment for Africa*. Nairobi. http://www.unep.org/media/docs/assessments/GEO_6_regional_assessment_for_africaprint_finalallow_res.pdf.
- United Nations Environment Programme (2019). *Global Environment Outlook – GEO-6: Healthy Planet, Healthy People*. Cambridge: Cambridge University Press. https://wedocs.unep.org/bitstream/handle/20.500.11822/27539/GEO6_2019.pdf?sequence=1&isAllowed=y.
- van Beukering, P., Sehker, M., Gerlagh, R. and Kumar, V. (1999). *Analysing Urban Solid Waste in Developing Countries: A Perspective on Bangalore, India*. London: International Institute for Environment and Development. <https://pubs.iied.org/pdfs/8113IIED.pdf>.
- van Dijk, M.P. (2008). *Urban management and institutional change: An integrated approach to achieving ecological cities*. Rotterdam: Institute for Housing and Urban Development Studies. https://repub.eur.nl/pub/32187/IHS%20WP_016%20Urban%20management%20an%20institutional%20change%202008.pdf.
- Viljoen, W. (2017). The face of African agriculture trade, 17 May. <https://www.tralac.org/discussions/article/11629-the-face-of-african-agriculture-trade.html>. Accessed 11 September 2019.
- Williams, T.O., Mul, M., Cofie, O., Kinyangi, J., Zougmore, R., Wamukoya, G., Nyasimi, M. et al. (eds.) (2015). Climate Smart Agriculture in the African Context. *Feeding Africa*, 21-23 October 2015. Dakar: African Development Bank, United Nations Economic Commission for Africa.
- World Bank (2012). *What a waste: a global review of solid waste management, Chapter 7*. Washington DC: World Bank. https://siteresources.worldbank.org/INTURBANDEVELOPMENT/Resources/336387-1334852610766/What_a_Waste2012_Final.pdf.
- World Resources Institute (2018). RELEASE: AFR100 initiative celebrates 111 million hectares of commitments, signalling the continuing drive across Africa to bring back productivity to its land. 1 October. <https://www.wri.org/news/2018/10/release-afri100-initiative-celebrates-111-million-hectares-commitments-signalling>.
- Wunder, S. (2015). Revisiting the concept of payments for environmental services. *Ecological Economics* 117, 234-243. <https://doi.org/10.1016/j.ecolecon.2014.08.016>.

Chapter 4

Our Water, Our Life Force





Key Messages

Arid and semi-arid regions represent around 67 per cent of Africa's surface area. As such, it is critical for African youth to play a central role in restoring freshwater ecosystems since this will endow them with more blue economy opportunities.

African youth should be on the forefront of championing water use efficiency in households, industry and particularly agriculture, which accounts for 90 per cent of total freshwater use.

Better water supply, proper management of water resources, sanitation and hygiene can reduce the global disease burden by ten per cent, according to the WHO. This is also crucial for fostering sustainable livelihoods. Against this backdrop, African youth should spearhead practices and policies that boost water quality across the continent.

Solutions for water problems do not always need to be complex, high-cost, or high-tech. Simpler solutions, such as clay water filters, rainwater harvesting, and wastewater reuse in agriculture could be very efficient and practical, especially in rural areas.

The blue economy presents multiple job opportunities for African youth in diverse sectors that include coastal tourism, energy and mineral production, fisheries, boat building, shipping, and ports activities; as well as emerging industries like wave and tidal energy; marine renewable energy technologies; aquaculture; 'blue carbon' (carbon storage in mangroves, seagrass and saltmarsh); desalination; and bioproducts (pharmaceutical and agrichemicals).

Due to their demographic dominance, African youth can revolutionize water management paradigms through effective community mobilization. The involvement and collaboration with youth in water policy development could, therefore, result in successful implementation of water policies.

4.1 Introduction

Water is a vital resource to sustain life and development on earth. Freshwater resources constitute only 3 per cent of worldwide water resources (Niemczynowicz, Rodda, Priscoli and Teich 1996). There are 63 shared basins spread over 64 per cent of the continent (UNEP 2010) and great rivers such as the Congo, Nile, Zambezi, and Niger. It is also home to Lake Victoria; the world's largest tropical, and second largest, freshwater lake (UNEP 2002). However, Africa experiences freshwater scarcity: arid and semi-arid regions represent around 67 per cent of its area (Oyebande 2001). Freshwater remains a pressing challenge in Africa, with one in three Africans still lacking access to potable water due largely to uneven distribution of freshwater resources and increasing demand (UNEP 2016). Water scarcity requires efficient management to minimize demand and increase availability.

More than 64 per cent of the continent's population lives in rural areas and owns small farms (UNEP 2010). These farms largely depend on erratic rainfall, which is why farms in Africa are the least productive in the world, and agriculture is the most unproductive sector in African economies (Filmer *et al.* 2014; Boutraa 2010). Droughts and climatic

variability worsen the vulnerability of African agriculture and make achieving the SDGs related to food security and poverty a real challenge (FAO and UNECA 2018).



Zambezi River, Livingstone, Zambia

David Ngwenyama

African youth have an important role to play in overcoming water problems and enhancing the continent's economies. This chapter provides an overview of the challenges and opportunities in the water sector in Africa as well as some ideas to inspire African youth to engage more in it; whether through involvement in agriculture, water availability, enhancing water quality, involvement in the blue economy, or working on transboundary water resources.

4.2 Water availability

Water availability is crucial to sustaining life and furthering development. One-fifth of Africa consists of arid and semi-arid land where water availability is a pressing challenge (World Water Assessment Programme [WWAP]/United Nations Water [UNW] 2018). Rainfall in these regions is erratic and much of the available water should be utilized in a sustainable manner. Availability of



Water scarcity in Cape Town, South Africa

In April 2018, after three years of extreme drought, the City of Cape Town faced a dire prospect: it would be the first major city in the world to run out of water. There are various causes for the Cape Town water crisis, but the main cause is climate change (World Weather Attribution 2018). Undoubtedly, factors such as poor governance and over-consumption were influential. Cape Town's award-winning Water Conservation and Demand Management Programme (C40 Cities Climate Leadership Group n.d.) has nevertheless managed to level-out consumption since 2000, even as its population has grown dramatically (Groundup 2018). Drought is not uncommon in Southern Africa or even Cape Town, but the winter rains have always brought reprieve. However, following two successive dry winters, 2017 brought no relief and proved to be one of the driest years in recent decades - a once-in-a-millennium event, which arguably exonerates "the Cape's government, as well as water engineers designing Cape Town's water supply system from blame for the current water crisis" (Wolski 2017). As a result, Cape Town's residents were forced to more than halve their water usage from 1,200 million litres per day in 2015, to just over 500 million litres per day in 2018, restricting individuals to 50 litres a day - less than a third of the global average (Cotterill 2018).

As expected, the local economy felt the effects of these water restrictions, too. Enterprises were at risk of closing down, because of restrictions and the fact that they were unable to offer safe water and sanitation to employees. Although the full extent of the economic impact is still unknown, it is evident that tourism, and even more so, agriculture, bore and will continue to bear the brunt of the impacts. With regards to agriculture, a sector on which the City of Cape Town's province, Western Cape, is heavily reliant, 2018 had the lowest harvest in decades, "which will cause projected losses of ZAR1 billion [US\$70 million] to the sector and deprive 50,000 seasonal workers of their jobs" (Zille 2018). Addressing the risk of recurrence has been brought to the fore. In addition, in a city plagued by severe inequality, sluggish economic growth, and high unemployment, especially amongst the youth, "the level of risk that already exists is being heightened in an unprecedented way by climate change" (Espinosa and Mizutori 2018).

Nowadays, the priority for Cape Town is putting measures in place that safeguard it against what the former Executive Mayor referred to as "the new normal" (de Lille 2017), whilst simultaneously addressing the socio-economic issues that continue to characterise the city it governs. Though this is a demanding and complex task, there is promise in committing to and investing in such actions, especially long-term policies and strategies of climate adaptation strategies, which could foster new innovations and bring about new job opportunities – especially for the youth, for whom the unemployment rate sits at almost 40 per cent (South Africa, Department of Statistics 2018). Global cities that have experienced similar water crises are often criticised for failing to foster public-private agreements and establish robust partnerships (Böhm and Flores 2015). As such, the City of Cape Town would do well to work with the private sector in providing the regulatory frameworks for innovation to occur. Although dam levels have improved, the City of Cape Town's water supplies still remain precarious due to the uncertainty of rainfall patterns, and alternative sources of water are recommended, such as permanent desalination plants, treated effluent stations, and water re-use facilities. All of this requires not just manual labour in construction, but also training and capacity-building for knowledge transfer – preparing the next generation of engineers to adapt and build according to 'the new normal'.



Africa's freshwater is unevenly distributed and is susceptible to erratic rainfall patterns. Moreover, this availability depends on climatic conditions that consign arid countries to groundwater, and climate change-induced droughts have increased across the continent (UNEP 2016).

4.3 Rainwater harvesting

Water Harvesting (WH) practices are able to prevent erosion, increase crop productivity and reliability, and enhance food security (Abdel-shafy *et al.* 2010; Kimera 2018). WH is defined as a method of inducing, collecting, storing, and conserving local surface runoff for subsequent beneficial use (Prinz and Singh 2000). Water is collected from watercourses for use in household consumption as well as irrigation of annual crops, pastures, and trees; livestock consumption; and groundwater recharge (Critchley *et al.* 1991). Since the 1980s, NGOs and development organizations have introduced WH techniques in several African countries (Lee and Visscher 1990).

Although communities across Africa have adopted some WH techniques, uptake of these practices remains low due to high cost. The techniques can be classified into three groups: rooftop harvesting systems, runoff farming systems, and surface catchment systems. The latter is known as overland WH, where the harvested water is mainly collected from rainfall runoff, and has two categories; namely rainwater harvesting and floodwater harvesting (Prinz 1996). WH for agricultural purposes in Africa has improved the stability of crop yields and raised productivity from 1 to 3–4 tons per hectare (Rockström and Falkenmark 2015). According to UNEP (2006), nine African countries; namely Botswana, Ethiopia, Kenya, Malawi, Mozambique, Uganda, the United Republic of Tanzania, Zambia, and Zimbabwe, have a massive potential for rainwater harvesting practices. Kenya has sufficient rainfall for the needs of 250 million people (UNEP 2006). Recognizing the importance of this issue, many African countries are working towards widespread adoption of rainwater-harvesting practices.

Youth Action 20: Rainwater harvesting in Sinai, Egypt

Egypt is a water-scarce country and the Nile River contributes around 97 per cent of its water resources (Omar *et al.* 2016). The Egyptian government tries hard to fill the gap between resources and demands by maximizing use efficiency and developing non-conventional water resources (e.g., rainwater harvesting) in some areas where flash floods occur. A wide range of rainwater harvesting techniques is available and applicable in various geographical conditions. One success story involved mountain lakes as a low-cost technique for water harvesting and was implemented to support progress towards achieving the SDGs.

The technique was implemented in the South Sinai area, where water scarcity is the case. Since the area is characterized by its high mountains (e.g., Mount Catherine, and Mount Sinai), along the sides of these mountains, narrow

channels that drain rainwater into the main valley were installed, and small low-cost structures (riprap walls) (EGP25,000 = US\$1 400) were built where the mountainsides meet, or are closest, to store some of the flowing water. After harvesting, the stored water is conveyed to the Bedouin settlements and can be used in agricultural, domestic, and industrial uses.

A group of young Bedouins started their own business near these mountain lakes by cultivating various medical herbs with high economic value. The aridity of the region drives the cultivation process to depend mainly on groundwater. For the sustainability of the project and the environment, they needed to rely on a specific renewable groundwater aquifer for cultivation. This experience shows the confluence between the desire of young people to enhance their income and that of preserving the environment.



Farm cultivated with medical herbs

Mohamed Salah



In 2017, Kenya launched a national chapter of the Billion Dollar Alliance for WH to construct one million water ponds (Imbai and Onyango 2017). Such initiatives can help African citizens to secure their water needs during prolonged droughts. In 2005, Egypt officially endorsed a National Water Resources Plan (NWRP) to support economic development based on sustainable resource use and to avoid serious water shortages in the future (Egypt, Ministry of Water Resources and Irrigation 2005). The most effective way of utilizing available water resources in an environmentally safe and economical manner is to store it using low-cost techniques where water is collected from watercourses and distributed for its beneficial use. There are two forms of floodwater harvesting: floodwater harvesting within stream bed and floodwater diversion (Prinz and Singh 2000).

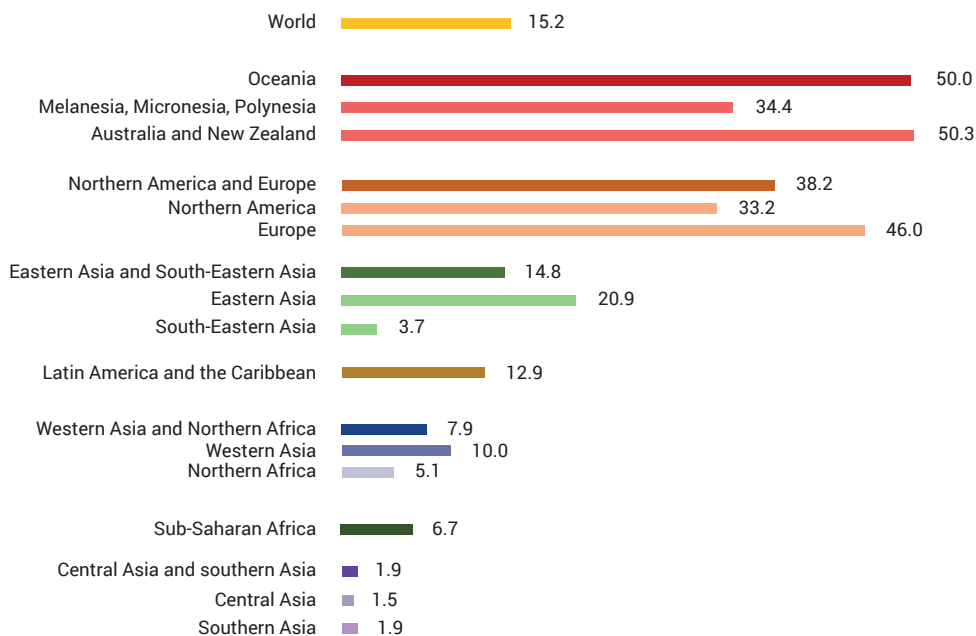
4.4 Water use efficiency

Over the past few decades, there has been a surge in global water consumption. This trend is expected to continue into the future

and water scarcity is seen as a global systemic risk. Agriculture consumes 90 per cent of freshwater, making it the largest consumer of this resource, with irrigation being responsible for approximately 70 per cent of total blue water use (Gleick 2014; Hoekstra *et al.* 2012). Insufficient water resources can thus greatly undermine agricultural production and the situation can be more dramatic with climate change (Geng *et al.* 2019).

In agriculture, water-use efficiency (WUE) is a broad concept that can be defined in many ways (Cai *et al.* 2011; Singh, Wani, Pathak and Singh 2011). From an engineering perspective, improving WUE can be achieved by reducing water losses from drainage, canal seepage, non-productive evaporation, and by using water saving devices (Schaldach *et al.* 2012). In agricultural production, WUE is often defined as physical and economic outputs per unit of water use, i.e., 'more crop per drop' (Fishman *et al.* 2015). FAO defines irrigation WUE as the ratio between effective water use and actual water withdrawal (2018). By improving application, conveyance, distribution, and management of irrigation;

Figure 5: Water-use efficiency by region (US\$ per m³), 2015



Source: FAO (2019)



irrigation efficiency in Africa can improve substantially (Rohwer, Gerten and Lucht 2007). Global WUE is a little over US\$15 per m³, though significant differences exist among countries and regions, with the lowest regional water-use efficiencies about US\$2 per m³ in Central and Southern Asia, around US\$7 per m³ in sub-Saharan Africa, and almost US\$8 per m³ in Northern Africa and Western Asia (Figure 5) (FAO 2018).

Economic opportunities in wastewater recycling

Although wastewater is not pleasant to deal with, the economic and environmental potential of recycling it is immense. Wastewater can be a resource in different sectors, such as agriculture, fisheries, and power generation. Wastewater has been reused for centuries, especially for irrigation purposes due to freshwater shortage in arid and semi-arid parts of Africa (Ruma *et al.* 2010).

The use of treated wastewater for irrigation of cash crops such as sisal and cotton can be of great use since the products are not consumed directly by people, but are instead sold to factories for further processing and subsequent production of goods such as clothes (Kimwaga, Nyomora, Mwegoha, Mahenge and Gastory 2013). In addition, wastewater can boost livelihoods through utilization in activities such as flower gardening.

Due to the increase in fish consumption and demand, treated wastewater from wetlands can be used for aquaculture (Kimwaga, Nyomora, Mwegoha, Mahenge and Gastory 2013). Such aquaculture farms can thrive due to the nutrients present in wastewater (Bansal *et al.* 2007).

Youth can play an important role in improving water use efficiency. Youth organizations can mobilize young people to have a sense of ownership and awareness about water use efficiency. They can also encourage collective actions and attitude change related to water use through participatory approaches.

Youth Action 21: Water-saving youth, Tunisia

Youth and youth leaders should be pivotal actors in tackling the conservation process of freshwater and play a key role in decision-making processes at all levels. For instance, the Tunisian Youth Alternative Network (Réseau Alternatif des Jeunes [RAJ] -TUNISIE) is one of these youth associations working on sustainable development with a focus on water issues, which is the main challenge in the region (RAJ 2018). RAJ-Tunisia supports youth projects related to the development of new technologies for water-saving devices for agricultural, domestic, and industrial use. Help can be financial or through capacity building processes. It was inspired by other recent youth movements in the world; horizontal and self-managed.



Fetching water in Accra, Ghana

Divine Agborli

Involving youth in the development of long-term planning is also of value, though youth have largely been absent from the development and implementation of policy (Patterns of Resilience to Drought Project Team [PRDPT] 2018), yet having an engaged and empowered youth is listed as one of the African Union's Agenda 2063 Goals (African Union 2015). It is also important to remember that accounting for young people's wellbeing is just as important as providing them with employment opportunities. Climate shocks, such as droughts, negatively impact the socio-economic and socio-ecological systems that affect youth mental health, intersecting with inequality, poor education, exclusion, and poor employability skills (PRDPT 2018). Moreover, due to their demographic dominance, young people can revolutionize water management paradigms through effective community mobilization. Involvement of, and collaboration with, youth in such policy development could, therefore, prove to be integral with regards to buy-in and future successes of these policies and the economy at large.

4.5 Water quality

Considering that water in many parts of Africa is used directly without any treatment, it's not surprising that, water-related diseases in Africa are widely spread (Omole and Ndambuki 2014). According to WHO, more than 3.4 million people die every year from water-related diseases. The WHO reports that better water supply, proper management of water resources, sanitation, and hygiene can reduce the global disease burden by ten per cent (Prüss-Üstün, Bos, Gore and Bartram 2008). This is not only important to ensure people's health, but also crucial to fostering sustainable livelihoods.



Out of the 159 million people in the world that still fetch drinking water from surface water sources, 58 per cent live in Africa (World Health Organization [WHO] and United Nations Children's Fund [UNICEF] 2017). In addition, only 15 per cent of people in sub-Saharan Africa have access to handwashing facilities with soap (WHO and UNICEF 2017). This could be due to different constraints, such as lack of Water, Sanitation and Hygiene (WASH) education and awareness, socio-economic factors, poor governance and lack of adequate policy frameworks. Improving WASH facilities

will not only improve human health, but also enhance economic growth and create sustainable livelihoods. For instance, Community Cleaning Services (CSS), a social enterprise focused on improving urban sanitation in Kenya, has created profitable entrepreneurial opportunities for youth from low-income communities especially in Nairobi (Thieme *et al.* 2012). It provides sanitation services that include: selling cleaning products, creating awareness and training, quality assurance, product supply, and marketing support to sanitation service providers.

Food for thought

- Youth can play an important role in improving water use efficiency. Youth organizations can mobilize young people to have a sense of ownership and awareness about water use efficiency. They could also encourage collective actions and attitude changes related to water use through participatory approaches.
- Although wastewater is not pleasant to deal with, the economic and environmental potential of recycling it is immense. Wastewater can be a resource in different sectors, such as agriculture, fisheries, and power generation. Wastewater has been reused for centuries, especially for irrigation purposes due to the freshwater shortage in arid and semi-arid parts of Africa.
- African youth need to be empowered so that they can be heard at, and take part in international dialogues and debates about transboundary water resources.

Simple solutions for drinking water problems

In Sudanese villages on the banks of the Nile, most of the houses have clay pots that are known as a "zeer". In this hot place, these clay pots work as simple refrigerators to cool water. Unfortunately, these Zeers are usually not covered, which exposes the water to contamination. The Zeers themselves look old and they are dirty inside due to the absence of regular cleaning. Many studies (e.g., Abdel-Magid *et al.* 2017; Ahmed 2017) showed that water stored in Zeers is highly contaminated (biologically and chemically), especially if it is stored for a long period.

This is a typical situation in rural areas throughout the continent of Africa; water is contaminated from the source, from transporting it, or from storage facilities (Pan African Chemistry Network 2010). Water should be filtered to an adequate level in order to be suitable for drinking. However, water-filtering systems are usually costly and of high technology, which makes them impractical solutions for rural regions.

Examples of low-tech/cost filtration systems/measures include: ceramic filters, activated carbon filters, sand filtration, solar sterilization, solar distillation and bottle filters. In addition, many natural materials can be used to purify water. They include: seeds of *Moringa olifera*, raw bauxite, and fishbone (Pan African Chemistry Network 2010).

Some simple changes in traditional forms of water storage could enhance water quality. For instance, a simple solution entails drinking water that has been filtered through customised clay pots instead of drinking water stored in the pots themselves (Mohammed *et al.* 2011; Zereffa *et al.* 2017).



Nairobi River flowing through the Eastlands part of Nairobi.

Eufiki Uwineza

The Nairobi River dream

I envision a Nairobi River running deep and wild with beauty, a sight to behold, a name to reckon with. I dream of a Nairobi river where children play freely and skip rocks in its deep clear water. People fishing and laughing under the bright African sun. Nevertheless, these dreams can only be realized if we start with ourselves, having a recycling, reusing, and reducing mentality within our spaces.

The waste from our houses can be transformed into biogas which, in turn, can be used by the communities living along the river to cook and as an alternative to the expensive gas sold in the market. By implementing controlled irrigation along the river banks, I believe that Nairobi can be one of the food capitals in Kenya, which will create self-sustaining communities along the Nairobi River. I envision a Nairobi where landlords take responsibility and put in the right measures as required by housing laws, the whole community standing together in numbers to restore the river through community clean-ups. Nairobi River could be like the lover's canal in Amsterdam or a water sport centre for recreational purposes. This may be a farfetched dream for most, but it is a distinct reality for those that believe like us.

Youth Action 22: The water lady, Sudan

My name is Amna, or as my friends love to call me 'The Water Lady'. I was born and raised in Sudan, I studied in public schools, I used to walk 10 to 15 min to reach my school. Although this is not that far, can you imagine an eight-year-old girl carrying a bag weighing more than 10 kg in one hand and in the other hand 10 litres of water? Because there was no water in my school, I used to carry 10 litres of water daily. I would look at the Nile and wonder why we didn't have any water in our school, yet Africa's longest river passed right through our neighbourhood.

It was then that I decided to study civil engineering and specialize in water engineering.

Unfortunately, the first job opportunity that I came across after graduation was clearly marked, "ONLY FOR MEN." Though disappointing, this inspired me to keep striving harder in order to minimize this gender gap that seemed evident in the water sector in Sudan.

I was able to get a scholarship to pursue a Master's degree in Integrated Water Resource Management (IWRM) in Germany. Afterwards, I travelled around Sudan visiting water projects. I was even able to travel to Darfur, one of the most unstable areas in Sudan. Most of the families and projects that I visited were quite intrigued by the fact that a young lady from Khartoum was travelling alone to far-off places. This experience has taught me that you will never understand the problems of people until you step into their shoes and live their life.



Field work of SYPW in remote villages

Amna Omer

In 2015, I was selected to represent Sudan at the World Youth Parliament for Water (WYPW) for three years. This gave me a chance to meet young people from more than 71 countries. The aim of the parliament is also to help forge stronger links between young people and experts. The parliament facilitates cooperation between young people and local authorities, taking part in political decision-making and consultations

I was also able to participate in the Young African Leaders Initiative (YALI), a programme launched by the former president of the United States, Barack Obama, as a signature effort to invest in the next generation of African leaders. This helped in honing my leadership skills.

After finishing my master's studies in Germany, I founded the Sudan Youth Parliament for Water (SYPW) which has since grown to more than 300 members who are aged between 18 and 35 years old. These members have been able to engage in water activities in dozens of Sudanese communities. One of the key activities was promotion of hygiene amongst 1,500 children in a refugee camp in Western Sudan. Being able to do this in a country where female presence in development work is weak was not an easy task, but I was determined to do it so that Sudanese youth could play a critical role in solving their country's water woes.

My biggest dream is to make an effective and scalable contribution to the SDGs, by empowering young people in Sudan to implement water solutions in their communities. By 2030, I aspire to empower at least 1,000 young leaders, with young women comprising at least 50 per cent, to realize their water solutions in their communities so that at least one million people can have access to clean water and sanitation.



SYPW's three female engineers leading a field visit in River Nile State

Amna Omer

4.6 Blue economy and blue jobs

The African Union calls it the "new frontier of African renaissance" (UNECA 2016) and has placed a high premium on the blue economy as the new economic frontier to create employment and income, including for youth. The main challenge implementing a blue

economy is achieving a balance between the mixed uses of the ocean and aquatic environment. The industries presented in the blue economy incorporate diverse sectors that include coastal tourism, energy and mineral production, fisheries, boat building, shipping, and ports activities; as well emerging industries like wave and tidal energy; marine renewable energy technologies for wind; aquaculture; 'blue carbon' (carbon storage in mangroves, seagrass and saltmarsh); desalination and bioproducts (pharmaceutical and agrichemicals).

What is the blue economy?

The blue economy includes economic activities in areas such as fishing; shipping and maritime transport; coastal tourism; marine energy including both fossil and renewable, such as wind and tidal power and energy derived from marine microbial fuel cells; pharmaceutical and cosmetic industries; genetic resources; general sea-based products; and blue carbon trading opportunities. For activities to be considered as elements of the 'blue Economy', they should have social and economic benefits for present and future generations, and ensure the protection and management of the diversity and productivity of marine ecosystems. The blue economy approach offers the prospect of sustained, environmentally sound, but also socially inclusive, economic growth based on small-island strengths in the coastal and marine sectors (UNECA 2014).

The blue economy concept was initially established by the Small Island Developing States (SIDS), which have always relied mostly on the ocean for their development. Therefore, they wanted to promote economic growth through the sustainable use of environmental resources to improve human well-being and social equity (United Nations Department of Economic and Social Affairs [UNDESA] 2014). For oceanic activities to be considered as elements of the 'blue Economy', they should have social and economic benefits for present and future generations, and ensure the protection and management of the diversity and productivity of marine ecosystems; clean technologies and renewable energy should be used to reduce waste, and materials should be recycled (World Bank and UNDESA 2017).

Africa is endowed with abundant coastal and aquatic resources and their sustainable innovative development can create socio-economic transformations (UNECA 2018). There are 38 African States with a collective coastline of over 47,000 km and about 64 per cent of the





region's land area is covered with inland water sources, among them 63 shared river basins. This network of ocean and aquatic resources sustains natural life and provides ecosystem goods and services that are inextricably linked with life on the continent (Millennium Ecosystem Assessment 2005).



Blue Nile River, Khartoum

Rami Elsayed

Currently, fisheries and aquaculture contribute US\$24 billion to the African economy and employ over 12 million people (Africa Progress Panel 2014). The maritime industry is estimated at approximately US\$1 trillion a year (World Bank and UNDESA 2017) and 90 per cent of the continent's imports and exports are conducted by sea (World Ocean Review 2010). The rapid economic growth rates of India (Parikh *et al.* 2018) and China (McKibbin and Huang 1996) have been attributed to the role played by the Indian Ocean, indicating the enormous untapped potential of coastal zones.

The 'business as usual' approach to utilizing the continent's environmental resources can no longer be sustained by its natural life. According to IUCN's Eastern Central Atlantic Red List of Threatened Species report, many marine fish species in Africa are in danger of global extinction due to overfishing along the coast of western and central Africa (Polidoro *et al.* 2016). The list revealed that 37 of the assessed species are threatened with extinction while 14 are Near Threatened (Polidoro *et al.* 2016). Further to this, in 2014, mangrove deforestation was estimated to result in US\$42 billion in economic losses annually (UNEP 2014).

These combined changes have undermined the natural capacity and ability of the ocean and aquatic resources to regenerate (Burke and Reyntar 2011). The litter reaching the ocean from land-based sources

is a major problem to both marine life and the natural beauty of the beaches. It is estimated that by 2050, we may have more plastics than fish in the ocean (WEF 2016). Unfortunately, in many cases, the value of ecosystems goods and services have been recognized only when lost through the impacts of human activities (Millennium Ecosystem Assessment 2005).

Sustainable and equitable solutions are critical in tackling the intertwined challenges of protecting the health of both the natural environment and people. It is estimated that 1.2 billion people living in Africa rely on natural resources for their livelihood and income (Angelsen *et al.* 2014). The blue economy is envisaged to harness these resources for economic growth through aquaculture, tourism, mining, energy, agriculture, cosmetics, and pharmaceutical production; and provide protection to coastal inhabitants from disasters, such as floods and storms (UNEP 2013).

Aquaculture - business and jobs

According to FAO (2014), aquaculture production has created job opportunities for many youths in Africa. In 2005, aquaculture provided youth with 244,435 direct jobs and 342,209 indirect jobs. In Madagascar, on average, 1 hectare of commercial shrimp farms generates US\$33,000 in value added and US\$827 in labour incomes. In Egypt, for every 100 tons of fish produced, 14 full time jobs are created, 60 per cent of which are in production. In Nigeria, the same amount contributed to 150 job opportunities.

Youth Action 23: Earning a living from the ocean sustainably, Mauritius

My name is Rick, also known as 'the crab'. For several years, I have earned a decent living as a marine eco-guide. My experience has left me convinced that young people who live in coastal areas can also earn a living in similar manner but only if they invest sufficient time and resources into relevant training about their respective ecosystems and into skills like diving and snorkelling.

Today, we are ready to explore the beautiful turquoise lagoon of the east coast of Mauritius. Sea conditions are great, the sky is blue, and the thermometer reads 30°C. It is 10.00 hours and our boat is ready to take off to our favourite snorkelling site.

Our volcanic island is about 8 million years old. Soil and land erosion created a barrier around the island called coral reefs. Corals are formed by tiny animals all joined as a colony. This animal is called the Polyp. Now, let's jump into the water and find out what beautiful creatures our oceans would like to show us today. Coral reefs are amazing as they shelter a great variety of fishes making them



Marine Ecosystem in Egypt

Ahmed Fathy



Our Water, Our Life Force

ideal spots for snorkelers and divers. Moreover, coral reefs are a great place for fishermen to increase their chance of having a nice Parrot Fish to sell and earn a living or to feast on with the family.

Sadly, we can also see dead and broken corals, and plastic trash in the ocean. We can also see invasive species such as algae and crown of thorn, while climate change has killed some of our coral reefs. Changes in temperature, light, or nutrients stress corals and expel the algae that live in coral tissues. This expulsion causes corals to turn completely white. This is a huge problem for small islands like Mauritius, Seychelles, and others.

Against the backdrop of this changing climate and its effects on our Island, Mauritian youth are increasingly taking action, especially in awareness raising through social media and other means. One such youth group is Roches Noires Eco Marine.

Based on the eastern coast of Mauritius, Roches Noires Eco Marine promotes the interests of the fishing community of Roches Noires and the surrounding villages through the local Voluntary Marine Conservation Areas (VMCA). VCMAs are specially designated sites whose entire coastal ecosystem is kept intact through the express consent and participation of local communities. This results in the flourish and regeneration of marine life (Reef Conservation 2019). Another great example in the west coast is Enn Losean Vivab whose mission is awareness raising, education, and identification of sustainable solutions for ocean pollution.

Youth Action 24: Examples of water-based businesses by African youth from Rwanda, Kenya, and Uganda

- Iriba Clean Water Delivery: Suppling clean water to households and institutions. A project by: Yvette Ishimwe (<http://iribawatergroup.com/>)
- Sand Dam Technology: Rainwater harvesting system for drylands. A project by: John Tomaini (<https://rsr.akvo.org/en/project/6612/>)
- Kabuyonjo Pit Latrines Project: Providing proper sanitation for slum areas. A project by: Alice Ndagire (<https://rsr.akvo.org/en/project/6611/>)

4.7 Transboundary water resources

Sixty-three of the world's 263 international river basins are located in Africa (Wolf *et al.* 2003) (Figure 6). These basins cover about 62 per cent of the continent's total land area which is home to roughly 75 per cent of its entire population and accounts for 90 per cent of its total surface water resources (Lautze, Giordano and Borghese 2005; Turton *et al.* 2006). In addition, the continent appears to have tremendous untapped water resources even though it is also characterized as one of the driest regions of the world (UNEP 2010).



Most of the shared river basins in Africa have established River Basin Organizations (RBOs) which have become a key feature of transboundary water governance (Wingqvist and Nilsson 2015). RBOs mainly provide each riparian state representation and a means for consideration

of multiple viewpoints that help in sustainable management of transboundary water resources. African youth need to be empowered so that they can be heard at, and take part in, these international dialogues and debates, so that they can define the future in which they will live.

Simple water actions

Every challenge related to water can be an opportunity to enhance livelihoods and protect the environment:

- **Little awareness on water problems** - start a campaign with your friends, spread the word, and equip people with knowledge.
- **No reliable water supply** - become a social entrepreneur, establish your enterprise, and provide clean drinking water to your people.
- **No proper sanitation** - design an innovative and cheap toilet and feel achievement and money as a compensation.
- **Dirty drinking water** - find a cheap and effective way to purify water and sell your innovative water filters.
- **Large amount of wastewater** - What a wonderful free resource! Reuse it for gardens watering or for energy production.

Maybe, one day, you will discover that you have contributed in saving lives and protecting our planet and contributed to the sustainable development of your country. Do not wait, start now!

Open-source data

Data availability is one of the most important challenges that hinder efficient water management in Africa. For sound management of water resources, continuous monitoring of the different components of the water cycle is vital. Recent developments in remote sensing and modern sensors offers a great opportunity to quantify the available water, use patterns, and the interactions between different components in the water cycle. Recently, many open platforms have been providing information with good spatial and temporal resolution. This ocean of open source data offers a golden opportunity for researchers, activists, practitioners, and policymakers. Below are links to four examples of such platforms:

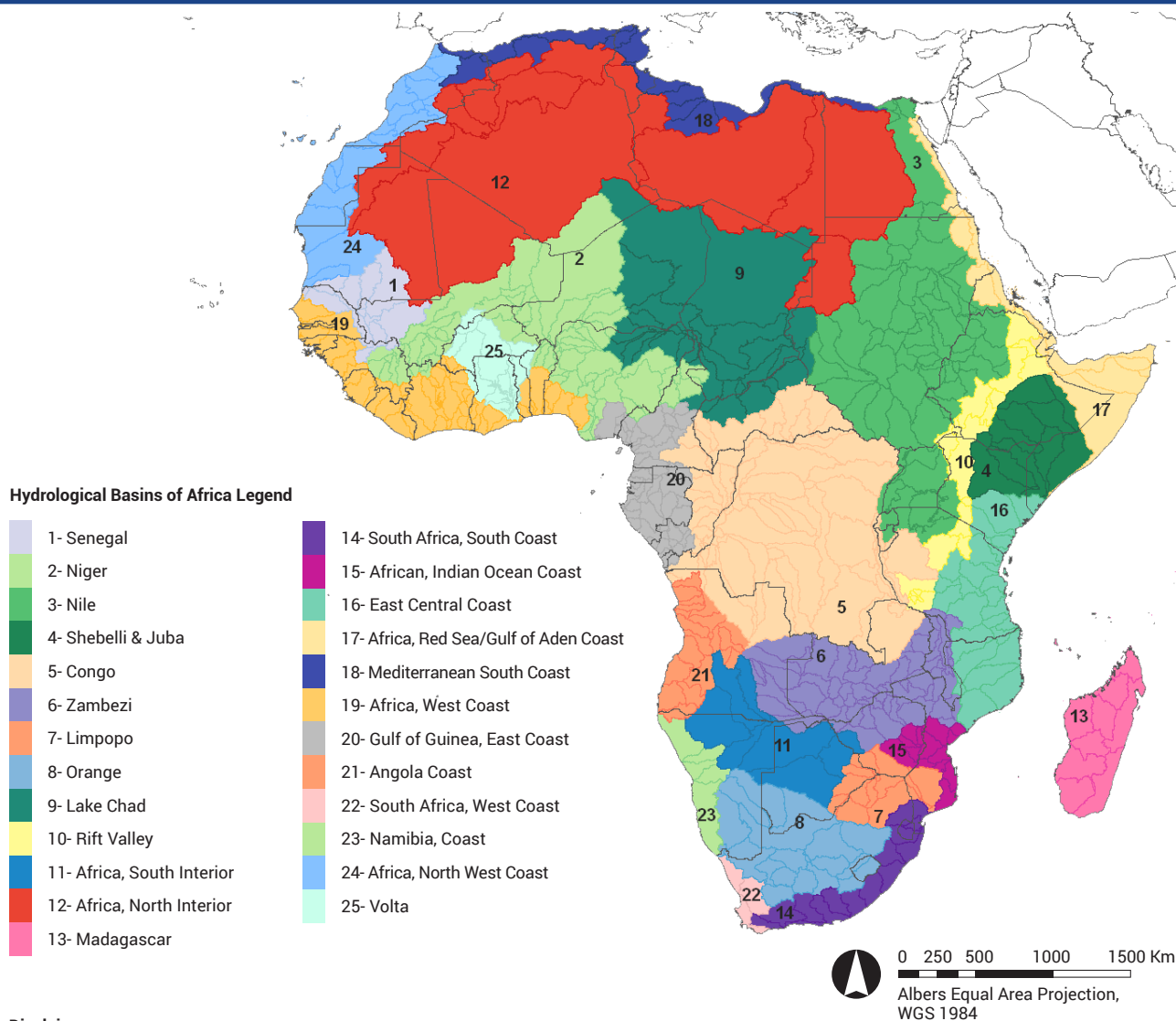
- Aquastat: <http://www.fao.org/home/en/index.html>
- Giovanni - NASA: <https://giovanni.gsfc.nasa.gov/giovanni/>
- Water Quality database: <https://gemstat.org/>
- Water Accounting Plus: <http://www.wateraccounting.org/>

Quick facts

- There is 100 times more water under the continent's surface than on it (MacDonald *et al.* 2012).
- The majority of Africans rely on groundwater as their primary source of drinking water, while its use for irrigation is projected to increase for food security (MacDonald *et al.* 2012).
- One-fifth of Africa consists of arid and semi-arid land where water availability is a pressing challenge. (WWAP/ UNW 2018).
- Agriculture consumes 90 per cent of freshwater, making it the largest consumer of this resource, with irrigation being responsible for approximately 70 per cent of total blue water use (Gleick 2014; Hoekstra *et al.* 2012).
- Out of the 159 million people in the world that fetch drinking water from surface water sources, 58 per cent live in Africa (WHO and UNICEF 2017).
- There are 38 African States with a collective coastline of over 47,000 km and about 64 per cent of the region's land area is covered with inland water sources, among them 63 shared river basins. This network of ocean and aquatic resources sustains natural life and provides ecosystem goods and services that are inextricably linked with life on the continent (Millennium Ecosystem Assessment 2005).
- It is estimated that by 2050 we may have more plastics than fish in the ocean (WEF 2016).
- Currently, fisheries and aquaculture contribute US\$24 billion to the African economy and employ over 12 million people (Africa Progress Panel 2014).
- The maritime industry is estimated at approximately US\$1 trillion a year (World Bank and UNDESA 2017) and 90 per cent of the continent's imports and exports are conducted by sea (World Ocean Review 2010).



Figure 6: Hydrological basins in Africa



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Source: FAO (2011)



4.8 Conclusion

The challenges facing the water sector in Africa are enormous, and every little contribution to solving them counts. The solutions for many of these problems are not beyond the ability of youth. It is not difficult for youth to contribute to raising awareness among their peers, families, and communities with regards to water saving. Using containers to harvest rainwater from rooftops would be an effortless job to increase

water availability in places that lack reliable water supply, but have regular rain.

Young people should not be limited by existing solutions. There already exists a vibrant entrepreneurial culture with about 80 per cent of Africans embracing entrepreneurship as a viable career opportunity (AfDB, OECD and UNDP 2017). African youth should tap into the wealth of blue economy opportunities in their communities and countries.

References

- Abdel-Magid, H.M., Abdellah, A.M., Abbakar, S.M., and Adam, F.A. (2017). Assessment of Well drinking Water Quality in Samrab, Dardog and Hattab Communities, Khartoum North, Sudan. *JOSR Journal of Applied Chemistry* 10 (1), 32-73. <http://doi.org/10.9790/5736-1001023237>.
- Abdel-shafy, H., El-saharty, A.A., Regelsberger, M. (2010). Rainwater in Egypt : Quantity, distribution and harvesting. *Mediterranean Marine Science* 11 (2), 245-257. <https://doi.org/10.12681/mms.75>.
- African Development Bank, Organization of Economic Development and Cooperation, and the United Nations Development Programme (2017). *African Economic Outlook 2017: Entrepreneurship and Industrialisation*. Paris: OECD Publishing. <https://doi.org/10.1787/aef-2017-en>.
- Africa Progress Panel (2014). *Africa Progress Report 2014: Grain, Fish, Money: Financing Africa's Green and Blue Revolutions*. Geneva. https://www.afdb.org/fileadmin/uploads/afdb/Documents/Project-and-Operations/Africa_Progress_Report_2014.PDF.
- African Union Commission (2015). Agenda 2063: The Africa We Want. The African Union Commission. <https://au.int/en/agenda2063/overview>. Accessed 30 September 2018.
- Ahmed, H.A. (2017). Microbial Contamination of Domestic Drinking Water in Khartoum (Sudan). *African Journal of Medical Sciences*, 2(1). [http://www.ajmsc.info/images/Vol2/1/Hiba per cent20Article.pdf](http://www.ajmsc.info/images/Vol2/1/Hiba%20per%20cent20Article.pdf).
- Angelsen, A., Jagger, P., Babigumira, R., Belcher, B., Hogarth, N.J., Bauch, S., Börner, J. et al. (2014). Environmental Income and Rural Livelihoods: A Global-Comparative Analysis. *World Development* 64(1), 12-28. <https://doi.org/10.1016/j.worlddev.2014.03.006>.
- Banda, S., Namafe, C.M. and Chakanika, W.W. (2015). Traditional Environmental Knowledge among Lozi Adults in Mitigating Climate Change in the Barotse Plains of Western Zambia. *International Journal of Humanities Social Sciences and Education* 2(9), 222-239. <https://www.arcjournals.org/pdfs/ijhsse/v2-19/25.pdf>.
- Bansal, A.K., A. Mitra, A., R.P. Arora, R.P., T. Gupta, T. and Singhvi, B.S.M. (2007). Biological treatment of domestic wastewater for aquaculture. *Journal of Agricultural and Biological Science* 2(1), 6-12. http://www.arnjournals.com/jabs/research_papers/rp_2007/jabs_0107_38.pdf.
- Böhm, S. and Flores, R.K. (2015). São Paulo water crisis shows the failure of public-private partnerships, 6 May. <https://theconversation.com/sao-paulo-water-crisis-shows-the-failure-of-public-private-partnerships-39483>. Accessed 30 September 2018.
- Boutraa, T. (2010). Improvement of Water Use Efficiency in Irrigated Agriculture: A Review. *Journal of Agronomy* 9(1), 1-8. <http://doi.org/10.3923/ja.2010.1.8>.
- Burke, L. and Reyter, K. (2011). *Reefs at Risk Revisited: Technical Notes on Modeling Threats to the World's Coral Reefs*. Washington, DC: World Resources Institute. https://pdf.wri.org/reefs_at_risk_revisited.pdf.
- C40 Cities Climate Leadership Group (n.d.). C40 Cities Awards 2015. <https://www.c40.org/awards/2015-awards/profiles>. Accessed 30 September 2018.
- Cai, X., Yang, Y.-C. E., Ringler, C., Zhao, J. and You, L. (2011). Agricultural water productivity assessment for the Yellow River Basin. *Agricultural Water Management* 98(8), 1297–1306. <https://doi.org/10.1016/j.agwat.2011.03.010>.
- Cotterill, J. (2018). South Africa: How Cape Town beat the drought, 2 May. <https://www.ft.com/content/b9bac89a-4a49-11e8-8ee8-cae73aab7ccb>. Accessed 25 May 2019.
- Critchley, W., Siegert, K. and Chapman, C. (1991). *Water harvesting: A Manual for the Design and Construction of Water Harvesting Schemes for Plant Production*. Rome: Food and Agriculture Organization of the United Nations. <http://www.fao.org/3/U3160E/U3160E00.htm>.
- de Lille, P. (2017). Advancing water resilience: getting to an additional 500 million litres of new water a day. Cape Town, 17 August. <http://www.capetown.gov.za/Media-and-news/Advancing%20water%20resilience%20getting%20to%20an%20additional%20500%20million%20litres%20of%20new%20water%20a%20day>.
- Egypt, Ministry of Water Resources and Irrigation (2005). National Water Resources Plan for Egypt 2017. Cairo. <http://www.nwrpeg.net/images/Documents/home/objectivesofwaterresourcesdevelopmentinegypt.pdf>.
- Emerton, L. (2005). *Values and Rewards: Counting and Capturing Ecosystem Water Services for Sustainable Development*. IUCN Water, Nature and Economics Technical Paper No. 1, IUCN - The World Conservation Union, Ecosystems and Livelihoods Group Asia. Colombo. https://cmsdata.iucn.org/downloads/2005_047.pdf.
- Espinosa, P. and Mizutori, M. (2018). Climate Change Is a Major Multiplier of Disaster Losses. United Nations Climate Change. Editorial, 12 October 2018. <https://unfccc.int/news/climate-change-is-a-major-multiplier-of-disaster-losses>. Accessed 25 May 2019.
- Filmer, D. and Fox, L. (2014). *Youth Employment in Sub-Saharan Africa. Report No: ACS8133*. Washington, DC: The World Bank. <http://documents.worldbank.org/curated/en/301371468003940792/pdf/ACS81330WP0P12977300Box385165B00PUBLIC0.pdf>.
- Fishman, R., Devineni, N. and Raman, S. (2015). Can improved agricultural water use efficiency save India's groundwater? *Environmental Research Letters*, 10(8), 084022. <http://doi.org/10.1088/1748-9326/10/8/084022>.
- Food and Agriculture Organization of the United Nations (2011). Hydrological Basins of Africa. <http://www.fao.org/nr/water/aquastat/maps/AfricaBasins.png>. Accessed 19 September 2019.
- Food and Agriculture Organisation of the United Nations (2014). *Youth and Aquaculture in Africa*. <http://www.fao.org/resources/infographics/infographics-details/en/c/217122/>. Accessed 30 September 2018.
- Food and Agriculture Organisation of the United Nations (2018). *Progress on water use efficiency - Global baseline for SDG 6 Indicator 6.4.1*. Rome: Food and Agriculture Organisation of the United Nations and United Nations Water. https://www.unwater.org/app/uploads/2018/12/SDG6_Indicator_Report_641_Progress-on-Water-Use-Efficiency_2018_ENGLISH.pdf.
- Food and Agriculture Organisation of the United Nations and United Nations Economic Commission for Africa (2018). *Regional Overview of Food Security and Nutrition: Addressing the threat from climate variability and extremes for food security and nutrition*. Accra: Food and Agriculture Organisation of the United Nations. <http://www.fao.org/3/CA2710EN/ca2710en.pdf>.
- Geng, Q., Ren, Q., Nolan, R.H., Wu, P. and Yu, Q. (2019). Assessing China's agricultural water use efficiency in a green-blue water perspective: A study based on data envelopment analysis. *Ecological Indicators* 96 (1), 329-335. <https://doi.org/10.1016/j.ecolind.2018.09.011>.
- Gleick, P.H. (ed.) (2014). *The World's Water Volume 8: The Biennial Report on Freshwater Resources*. Washington, DC: Island Press/Center for Resource Economics. <http://doi.org/10.5822/978-1-61091-483-3>.
- GroundUp (2018). Facts and myths about Cape Town's water crisis. 18 January. <https://www.groundup.org.za/article/facts-and-myths-about-cape-towns-water-crisis/> Accessed 25 August 2019.



- Hoekstra, A.Y. and Mekonnen, M.M. (2012). The water footprint of humanity. *Proceedings of the National Academy of Sciences* 109(9), 3232-3237. <http://doi.org/10.1073/pnas.1109936109/-/DCSupplemental>.
- Imbai, L. and Onyango, S. (2017). Kenya launches national program to harvest rainwater, 10 May. <http://blog.worldagroforestry.org/index.php/2017/05/10/kenya-launches-national-program-to-harvest-rainwater/>. Accessed 30 September 2018.
- Johnston, N. (2010). Ancient ways in deep water, 10 May 2010. <https://mg.co.za/article/2010-05-10-ancient-ways-in-deep-water>. Accessed 11 September 2019.
- Kimera, F. (2018). Economic Benefits of Surface Runoff Harvesting for Supplemental irrigation for Sub-Saharan Africa. Case Study of Soroti, Uganda. MSc Thesis, American University in Cairo, Cairo.
- Kimwaga, R., Nyomora, A., Mwegoha, W., Mahenge, A. and Gastory, L. (2013). Opportunities for Re-Use of Treated Effluent and Valorization of By-Products. http://www.constructedwetlands.net/IR6%20-%20Opportunities%20for%20re-use_FIN.pdf.
- Lautze, J., Giordano, M. and Borghese, M. (2005). Driving forces behind African transboundary water law: Internal, external, and implications. Paper presented at the International workshop on African Water Law: Plural Legislative Frameworks for Rural Water Management in Africa. Johannesburg, 26-28 January.
- Lee, M.D. and Visscher, J.T. (1990). *Water Harvesting in Five African Countries*. The Hague: International Water and Sanitation Centre. <https://www.ircwash.org/sites/default/files/213.1-90WA-7744.pdf>.
- MacDonald, A.M., Bonsor, H.C., Dochartaigh, B.É.Ó. and Taylor, R.G. (2012). Quantitative maps of groundwater resources in Africa. *Environmental Research Letters* 7(2). <http://doi.org/10.1088/1748-9326/7/2/024009>.
- McKibbin, J.W. and Huang, Y. (1996). Rapid Economic Growth in China: Implications for the World Economy. AJRC International Conference on China and the WTO: Issues and Impacts on China and the East Asian and Pacific Economies. Tokyo, Japan, 8-9 May. <https://www.brookings.edu/research/rapid-economic-growth-in-china-implications-for-the-world-economy/>.
- Millennium Ecosystem Assessment (2005). *Ecosystems and Human Well-being: Synthesis*. Washington, DC: Island Press. <https://www.millenniumassessment.org/documents/document.356.aspx.pdf>.
- Mohammed G., Müller, M., Michalscheck, M., Khalifa, M. and Al Marji, R. (2011). Simple, but effective, 2 December. <https://www.dandc.eu/en/article/tradition-purifying-drinking-water-clay-filters-deserves-be-revitalised-arab-world>. Accessed 30 September 2018.
- Niemczynowicz, J., Rodda, J.C., Priscoli, J.D. and Teich, D.H. (1996). Down to the Last Drop. In *Down to the Last Drop*. United Nations Educational, Scientific and Cultural Organization (ed.). Paris: United Nations Educational, Scientific and Cultural Organisation. <https://unesdoc.unesco.org/ark:/48223/pf0000104613>.
- Nyambe, I., Chabala, A., Banda, K., Zimba, H. and Phiri, W. (2018). Determinants of spatio-temporal variability of water quality in the Barotse Floodplain, western Zambia. In *Climate change and adaptive land management in southern Africa – assessments, changes, challenges, and solutions*. Revermann, R., Krewenka, K.M., Schmiedel, U., Olwoch, J.M., Helmschrot, J. and Jürgens, N. (eds.). <http://dx.doi.org/10.7809/b-e.vol06>.
- Omar, M. and Moussa, A.M. (2016). Water management in Egypt for facing the future challenges. *Journal of advanced research* 7(3), 403-412. <https://doi.org/10.1016/j.jare.2016.02.005>.
- Omole, D.O. and Ndambuki, J.M. (2014). Sustainable Living in Africa: Case of Water, Sanitation, Air Pollution and Energy. *Sustainability* 6, 5187-5202. <http://doi.org/10.3390/su6085187>.
- Oyebande, L. (2001). Water problems in Africa-How can the sciences help? *Hydrological Sciences Journal* 46(6), 947-962. <https://www.tandfonline.com/doi/pdf/10.1080/02626660109492888>.
- Pan African Chemistry Network (2010). *Africa's Water Quality - A Chemical Science Perspective*. London: Royal Society of Chemistry. http://www.rsc.org/images/RSC_PACN_Water_Report_tcm18-176914.pdf.
- Parikh, K.S., Ghosh, P.B., and Binswanger-Mkhize, H.P. (2018). Rapid Economic Growth in India: Technical Change in Agriculture, Irrigation and Food Security. *The Indian Economic Journal*, 64(1-4), 115-136. <https://doi.org/10.1177/0019466216652530>.
- Patterns of Resilience to Drought Project Team (2018). *United We Stand: Youth Perspectives on Developing Resilience to Drought in South Africa*. England/South Africa: University of Brighton/Beingboing. https://www.brighton.ac.uk/_pdf/research/crsj/united-we-stand.pdf.
- Polidoro, B., Ralph, G.M., Strongin, K., Harvey, M., Carpenter, K.E., Adeofe, T.A., Arnold, R. et al. (2016). *Red List of Marine Bony Fishes of the Eastern Central Atlantic*. Gland: International Union for Conservation of Nature and Natural Resources. <https://portals.iucn.org/library/sites/library/files/documents/RL-2016-002.pdf>.
- Prinz, D. (1996). Water Harvesting: Past and Future. In *Sustainability of Irrigated Agriculture*. Pereira, L.S. (ed.). 137-168. Rotterdam: Kluwer Academic Publishers.
- Prinz, D. and Singh, A. (2000). Technological Potential for Improvements of Water Harvesting. Prepared for Thematic Review IV.2: Assessment of Irrigation Options. Cape Town: World Commission on Dams.
- Prüss-Üstün, A., Bos, R., Gore, F. and Bartram, J. (2008). *Safer water, better health: costs, benefits and sustainability of interventions to protect and promote health*. Geneva: World Health Organization. https://apps.who.int/iris/bitstream/handle/10665/43840/9789241596435_eng.pdf;jsessionid=126B5BC9C53DC52CCECD01FC9A03183?sequence=1.
- Rajaratnam, S., Cole, S.M., Fox, K.M., Dierksmeier, B., Puskur R., Zulu, F., Teoh, S.J. et al. (2015). *Social and gender analysis report: Barotse Floodplain, Western Province, Zambia*. Penang: CGIAR Research Program on Aquatic Agricultural Systems. http://pubs.iclarm.net/resource_centre/AAS-2015-18.pdf.
- Reef Conservation (2019). Voluntary Marine Conservation Areas. <https://www.reefconservation.mu/projects/community-outreach-and-conservation/voluntary-marine-conservation-areas-vmcas/>. Accessed 5 June 2019.
- Réseau Alternatif des Jeunes Tunisie (2018). Environment & Climate. <https://www.raj-tunisie.org/environnement-climate/?lang=en>. Accessed 30 September 2018.
- Rockström, J. and Falkenmark, M. (2015). Agriculture: Increase water harvesting in Africa. *Nature* 519, 283-285. <https://doi.org/10.1038/519283a>.
- Rohwer, J., Gerten, D. and Lucht, W. (2007). *Development of Functional Irrigation Types for Improved Global Crop Modelling*. Potsdam: Potsdam Institute for Climate Impact Research. http://pubs.iclarm.net/resource_centre/AAS-2015-18.pdf.
- Ruma, M.M. and Sheikh, A.U. (2010). Reuse of wastewater in urban farming and urban planning implications in Katsina metropolis, Nigeria. *African Journal of Environmental Science and Technology* 4(1), 28-33. <https://www.ajol.info/index.php/ajes/article/download/56308/44752>.
- Schalldach, R., Koch, J., Aus Der Beek, T., Kynast, E. and Flörke, M. (2012). Current and future irrigation water requirements in pan-Europe: An integrated analysis of socio-economic and climate scenarios. *Global and Planetary Change* 94-95, 33-45. <https://doi.org/10.1016/j.gloplacha.2012.06.004>.
- Singh, P., Wani, S., Pathak, P. and Singh, A.K. (2011). Increasing crop productivity and water use efficiency in rainfed agriculture. In *Integrated Watershed Management in Rainfed Agriculture*. Wani, S.P., Rockstrom, J. and Sahrawat, K.L. (eds.). Chapter 10. 315-347. Balkema: CRC Press.
- South Africa, Department of Statistics (2018). Youth unemployment still high in Q1: 2018, 15 May. <http://www.statssa.gov.za/?p=11129>. Accessed 30 September 2018.
- Thieme, T.A. and DeKoszmovszky, J.P. (2012). Community Cleaning Services: combining market- and donor-based approaches to urban sanitation and youth engagement. *Field Actions Science Reports* Special Issue 4. <http://journals.openedition.org/factsreports/1575>.
- Turton, A.R., Patrick, M.J. and Julien, F. (2006). Transboundary water resources in Southern Africa: conflict or cooperation? *Development* 49(3), 22-31. <https://doi.org/10.1057/palgrave.development.1100269>.
- United Nations Department of Economic and Social Affairs (2014). Blue Economy Concept Paper. New York: United Nations. <https://sustainabledevelopment.un.org/content/documents/2978BEconcept.pdf>.
- United Nations Economic Commission for Africa (2016). *Africa's Blue Economy: A Policy Handbook*. Addis Ababa. https://www.uneca.org/sites/default/files/PublicationFiles/blue-eco-policy-handbook_eng_1nov.pdf.
- United Nations Economic Commission for Africa (2014). *Unlocking the full potential of the blue economy: Are African Small Island Developing States ready to embrace the opportunities?* Addis Ababa. https://www.uneca.org/sites/default/files/uploaded-documents/SROs/EA/HIGH-LEVEL-SUSTAINABLE-BLUE-ECONOMY-CONFERENCE-2018/the_eca_issues_paper_nairobi_2018_sb.ec.pdf.
- United Nations Economic Commission for Africa (2018). *Africa's Blue Economy: Opportunities and challenges to bolster sustainable development and socioeconomic transformation*. Addis Ababa. https://www.uneca.org/sites/default/files/uploaded-documents/SROs/EA/HIGH-LEVEL-SUSTAINABLE-BLUE-ECONOMY-CONFERENCE-2018/the_eca_issues_paper_nairobi_2018_sb.ec.pdf.
- United Nations Environment Programme (2002). *Vital Water Graphics: An Overview of the State of the World's Fresh and Marine Waters*. Nairobi. https://wedocs.unep.org/bitstream/handle/20.500.11822/20624/Vital_water_graphics.



pdf?sequence=1&isAllowed=y.

United Nations Environment Programme (2006). *Manual on Compliance with and Enforcement of Multilateral Environment Agreements*. Nairobi. <https://wedocs.unep.org/bitstream/handle/20.500.11822/7458/-Manual%20on%20Compliance%20with%20and%20Enforcement%20of%20Multilateral%20Environmental%20Agreements-2006743.pdf?sequence=3&isAllowed=y>.

United Nations Environment Programme (2010). *Africa Water Atlas*. Nairobi. http://wedocs.unep.org/bitstream/handle/20.500.11822/7919/africa_water_atlas.pdf?sequence=3&isAllowed=y.

United Nations Environment Programme (2013). *Africa Environment Outlook 3: Our Environment, Our Health*. Nairobi. <http://www.unep.org/pdf/aeo3.pdf>.

United Nations Environment Programme (2014). *The Importance of Mangroves to People: A Call to Action*. Nairobi. https://www.unep-wcmc.org/system/dataset_file_fields/files/000/000/275/original/DEPLMangrove_ES_report_complete_Low_Res.pdf?1416237427.

United Nations Environment Programme (2016). *GEO-6 Regional Assessment for Africa*. Nairobi. DEW/1963/NA. http://apps.unep.org/publications/index.php?option=com_pub&task=download&file=012099_en.

World Health Organization and the United Nations Children's Fund (2017). *Progress on Drinking Water, Sanitation and Hygiene: 2017 Update and SDG Baselines*. Geneva. https://www.unicef.org/publications/index_96611.html.

Wingqvist, G. and Nilsson, A. (2015). Effectiveness of River Basin Organisations - an institutional review of three African RBOs. Sida's Helpdesk for Environment and Climate Change. <http://doi.org/10.13140/RG.2.1.1046.0006>.

Wolf, A. T., Yoffe, S. B., and Giordano, M. (2003). International waters: identifying basins at risk. *Water Policy* 5(1), 29-60. <https://doi.org/10.2166/wp.2003.0002>.

Wolski, P. (2017). How severe is this drought, really?, 28 August. <http://www.csag.uct.ac.za/2017/08/28/how-severe-is-this-drought-really/>. Accessed 11 September 2019.

World Bank and United Nations Department of Economic and Social Affairs (2017). *The Potential of the Blue Economy: Increasing Long-term Benefits of the Sustainable Use of Marine Resources for Small Island Developing States and Coastal Least Developed Countries*. Washington, DC: World Bank. <https://openknowledge.worldbank.org/bitstream/handle/10986/26843/115545.pdf?sequence=1&isAllowed=y>.

World Economic Forum (2016). *The New Plastics Economy - Rethinking the future of plastics*. Geneva. http://www3.weforum.org/docs/WEF_The_New_Plastics_Economy.pdf.

World Ocean Review (2010). *Living with the Oceans*. Hamburg: Maribus. https://worldoceanreview.com/wp-content/downloads/wor1/WOR1_english.pdf.

World Weather Attribution (2018). Likelihood of Cape Town water crisis tripled by climate change, 13 July. <https://www.worldweatherattribution.org/the-role-of-climate-change-in-the-2015-2017-drought-in-the-western-cape-of-south-africa/>. Accessed 25 May 2019.

World Water Assessment Programme/United Nations Water (2018). *The United Nations World Water Development Report 2018: Nature-Based Solutions for Water*. Paris: United Nations Educational, Scientific and Cultural Organization. <https://unesdoc.unesco.org/ark:/48223/pf0000261424>.

Zereffa, E.A. and Bekalo, T.B. (2017). Clay Ceramic Filter for Water Treatment. *Materials Science and Applied Chemistry* 34(1), 69-74. <https://doi.org/10.1515/msac-2017-0011>.

Zille, H. (2018). From the Inside: The Countdown to Day Zero, 22 January. <https://www.dailymaverick.co.za/opinionista/2018-01-22-from-the-inside-the-countdown-to-day-zero/>. Accessed 25 May 2019.

Chapter 5

Our Invaluable Biodiversity





Key Messages

Twenty-five per cent of the world's biodiversity can be found in Africa.

Youth are mostly full of energy, technologically endowed, consistently evolving, geared towards solving problems and dynamic consumers. They are thus uniquely suited to play a major part in restoring landscapes and conserving biodiversity.

The biodiversity of Africa's rangelands is so rich that the world's greatest diversity of large mammals can be found in Eastern and Southern Africa's rangelands. This immense natural wealth is however threatened by conversion of rangeland to cropland.

The extent of Africa's biodiversity riches makes it critical for African youth to increasingly anchor their livelihoods in the intersection between biodiversity and sustainable development because the continent's shared wealth, health, and well-being is rooted in this intersection.

In most African countries, only one tree is planted for every thirty trees that are cut down. African youth should therefore play a lead in ensuring restoration and a community-based approach to saving our forests.

Despite global efforts, landscape degradation and biodiversity loss is occurring at an alarming rate. Nothing short of a revolution in attitudes will suffice in solving this problem. Behavioural change, adopting a conservation lifestyle, increased investment in sustainable land-use practices, political momentum, and concerted local action, are needed to conserve biodiversity.

5.1 Introduction

Africa's vast land, water bodies, and skies are full of mammals, reptiles, forests, birds, and all manner of plant and animal life that constitute the continent's rich biodiversity. So rich is this biodiversity that 25 per cent of the world's biodiversity can be found in Africa (Tittensor *et al.* 2014).

Africa's many plant and animal species live symbiotically with each other. More than half of the terrestrial species of animals, insects, and plants live in forests. In this regard, deforestation and forest degradation undermine their very survival (FAO 2015). The wealth of Africa's biodiversity extends beyond forests into rangelands that cover 65 per cent of the continent's total land area. The natural grasslands and savannahs that dot the continent are part of these rangelands that provide habitat for wild plants together with wild animals and domestic livestock (Niamir-Fuller *et al.* 2012). The biodiversity of Africa's rangelands is so rich that the world's greatest diversity of large mammals can be found in Eastern and Southern Africa's rangelands (Blench and Sommer 1999). Although mostly dry, Northern Africa's landscapes are also centres of biodiversity. Despite being the largest warm desert in the world, studies suggest that the Sahara has a larger number of species with a high rate of endemism (Brito *et al.* 2014). This shows how Africa's biodiversity spreads through every part of the continent. African youth must therefore champion biodiversity conservation across the region.



5.2 Biological wealth under threat

While the immense natural wealth of Africa's rangelands is threatened by conversion of rangeland to cropland (Gemedo-Dalle *et al.* 2006), and as a result of widespread industrial logging, a staggering 44 million hectares of forest in the Congo Basin is under concession (Wit and van Dam eds. 2010). Artisanal logging is however also responsible for deforestation in the basin since it produces at least five times more than official industrial



timber production (Wit and van Dam eds. 2010). All this logging has an adverse effect on Congo Basin's biodiversity since it interferes with wildlife habitats (Laurance *et al.* 2009). Consequently, the diversity and abundance of Central Africa's primates has been dealt a blow by habitat loss (Remis and Robinson 2012). Similar habitat loss has also affected West Africa's chimpanzee populations (Torres *et al.* 2010).

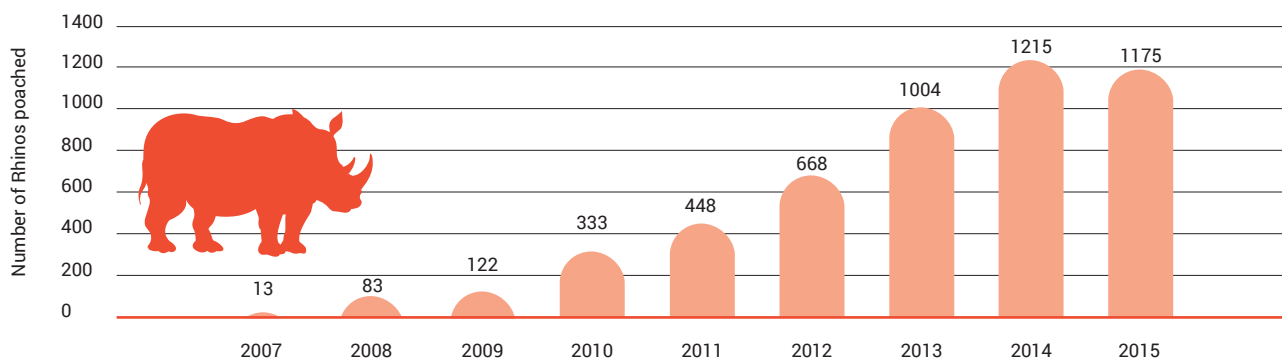
Moreover, logging necessitates an infrastructure that negatively impacts local soils and rivers, which leads to the kind of flooding and water shortages that affect wetlands negatively (Laurance *et al.* 2009; Saunders *et al.* 1991).

Industrial and artisanal logging are however not the sole culprits of Central Africa's deforestation and the ensuing wildlife habitat loss.

At least nine out of ten people in Central African countries like the Democratic Republic of the Congo use fuelwood for cooking (UNEP 2001). This high dependence on fuelwood pushed the Congo Basin's charcoal production by 20 per cent between 1990 and 2009 (Megevand *et al.* 2013).

In addition to logging and fuelwood, poaching directly threatens Central Africa's biodiversity and has pushed the northern white rhinoceros (*Ceratotherium simum*), which is endemic to the Democratic Republic of the Congo, to near extinction (Maisels *et al.* 2013). In fact, poaching is a huge threat to several species all over Africa. In South Africa alone, over 4,000 Rhinos were poached between 2007 and 2015 (Figure 7) (South Africa, Department of Environmental Affairs 2016a).

Figure 7: Rhino Poaching numbers, 2007-2015



Source: adapted from UNEP (2016), data from South Africa, Department of Environmental Affairs (2016a).

Africa's aquatic ecosystems are also flowing with rich biodiversity. Across the continent, wetlands, rivers, lakes, and coastal environments are home to distinctive aquatic biodiversity. Among them is the Eritrean Red Sea ecosystem, which hosts at least 1 in 6 of the world's seagrass species. This seagrass grows within an ecosystem replete with diverse coral reefs (Eritrea Coastal, Marine and Island Biodiversity project 2007). But just like terrestrial-based biodiversity, Africa's aquatic biodiversity is also facing dire challenges from issues like pollution, damming, and water diversion (Stiassny *et al.* 2011).

Despite being considered as the most water-scarce sub-region in Africa, Northern Africa hosts a rich array of biodiversity. As the home of the most extensive river system in the region, Morocco hosts several mountain lakes and coastal brackish marshes that are mainly found along the Atlantic coast (Garcia *et al.* 2010). Morocco is located in the Mediterranean Basin hotspot, which is where approximately 8 per cent of the world's plant species can be found, with 60 per cent of them endemic to the region (Quézel 1985; Greuter 1991).



Against this backdrop of a biodiversity-rich continent, it is incumbent on African youth to increasingly anchor livelihoods in the intersection between biodiversity and sustainable development because our shared wealth, health, and well-being is rooted in this intersection (Secretariat of the Convention on Biodiversity [CBD] 2014).

What is biodiversity?

The term biodiversity is said to have been coined in 1985, as a contraction of the term 'biological diversity' (Benn 2010). The Convention on Biological Diversity (1992) defines it as the variability among living organisms from all sources including, inter alia, terrestrial, marine, and other aquatic ecosystems, and the ecological complexes of which they are a part; this includes diversity within species, between species, and of ecosystems.

The Convention on Biological Diversity was opened for signature in 1992 (CBD 1992). It provides a global legal framework for action on biodiversity and is considered a key instrument for sustainable development whose three main goals are: the conservation of biological diversity, the sustainable use of the components of biological diversity, and the fair and equitable sharing of benefits arising from the use of genetic resources.

5.3 Youth, landscape restoration, and biodiversity conservation

Despite global efforts to protect the environment, landscape degradation and biodiversity loss is occurring at an alarming rate (Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services [IPBES] 2019). Many African countries are experiencing land degradation that is caused by increased agriculture, soil erosion, loss of forest cover and low vegetative cover. This causes critical conservation and developmental challenges (UNEP 2016). Youth are often endowed with dynamism, technological know-how, incessant evolution, initiative, and vibrant consumerism (Nadeson and Barton 2014). They are thus uniquely suited to play a major part in restoring landscapes and conserving biodiversity. Nothing short of a revolution in attitudes will suffice in solving this problem. Behavioural change, adopting a conservation lifestyle, increased investment in sustainable land-use practices, political momentum, and concerted local action, are needed to solve major environmental issues. Moreover, we would need what the captain of a ship would call; all hands on deck.

As a continent endowed and dependent on natural resources, sustainability for Africa should be geared towards restoring landscapes and protecting biodiversity. In most African countries, only one tree is

planted for every thirty trees that are cut down (FAO 2011). African youth should therefore play a lead in ensuring restoration and a community-based approach to saving our forests.

In August 2018, the Global Landscape Forum held in Nairobi, Kenya, brought together nearly 100 young minds with an active interest in landscape restoration. They helped to spark a restoration movement and forge action-based pathways (Mumba 2018). This movement which still in its infancy stages, primarily seeks to converge and enhance youth efforts in landscape restoration.

Southern Africa's Transfrontier Conservation Areas and transborder tourism activities

In Southern Africa, Transfrontier Conservation Areas (TFCAs) (Figure 8) are regarded as large transboundary regions with specially designated forms of conservation status. They include private and communal land, national parks and game reserves, forest reserves, and wildlife management areas. TFCAs sometimes consent to diverse forms of land use within their boundaries. Principally, the tripartite aims of TFCAs are: biodiversity conservation, socioeconomic development and promotion of peace.

The development of TFCAs started in 1999 with the establishment of Kgalagadi Transfrontier Park (between Botswana and South Africa). Since then, significant strides have been made across the region to establish additional TFCAs. Currently, there are 18 TFCAs across Southern Africa in different stages of development. Transfrontier Conservation Areas provide a platform for coordinating conservation across boundaries and for the development of cross-border tourism. World renowned tourist destinations in the region are located within TFCAs.

Living in protected areas comes with costs in terms of human wildlife-conflict and poaching syndicates. In the Hwange area of the Kavango-Zambezi TFCA (KAZA), organizations such as Painted Dog Conservation embark on anti-poaching awareness campaigns carried out by youths who are educated to educate their communities. The Hwange Lion Research project employs local men and women who are trained to be livestock guardians against dangerous predators. Through its Long Shields Lion Guardian Programme, the project employs 14 Zimbabweans around Hwange and Zambezi National Parks and has since extended to the Chobe Enclave and Boteti regions of Botswana where 6 community guardians are employed.



5.4 Unlocking biodiversity's green jobs for youth in Africa

Beyond effective financial mobilization and adequate political momentum, which already exist, young people need to think broadly, be selective, and start small, when thinking around the creation of green economy hotspots. Successful initiatives by youth to restore landscapes and conserve biodiversity will require a ground swell of community support and action. Young people must therefore be

innovative in their outreach tactics and mobilize public support, while also assessing current progress.

There are new and current voices, creators, innovators, and community activists, that young minds can learn from. Young people need to inspire one another and share best practices, especially in the field of social entrepreneurship and technology-based start-ups, in order to collectively create waves within broader environmental movements and identify new restoration horizons. The initiatives below are a good place to start.

People and parks in action: The story of the Makuleke contractual park, South Africa

The overall aim of the People and Parks Programme is to spotlight issues at the nexus between conservation and communities, particularly the realization of concrete benefits for communities displaced by the establishment of protected areas (South Africa, Department of Environmental Affairs 2014).

At 26,500 hectare, Makuleke Contractual Park is more than half the size of Seychelles. Located at the northern extremity of Kruger National Park (KNP), it is surrounded by the Limpopo River to the north, the Luvuvhu River to the south and the Mutale River to the west. This community owned park is considered to be one of the highest areas in biodiversity in South Africa.

In 1998, the Makuleke Community won a land claim that gave them rights to use land in this area for socioeconomic development on condition that conservation was a central part of the agenda. This arrangement was part of a settlement plan that also paved the way for this land to be co-managed by the community together with KNP. Consequently, the community was entitled to a share of the tour operators' earnings in addition to a percentage of jobs in this sector. As a result, there has been a significant direct benefit to employees through wages.

There are a number of ways in which Makuleke youth have benefited and can continue to benefit from this initiative. Some of these ways include:

- Capacity building and bursary programmes with partner institutions such as the South African Wildlife College, Southern African College for Tourism; EcoTraining, University of South Africa and others. Between 1998 and 2018, over US\$359,000 were spent on youth capacity-building programmes alone.
- Employment in the Makuleke concession.
- Free access to Makuleke concession.
- Skills development for youth through research programmes where young people are trained on data collection, situation assessments, translation, GIS, and report writing.

The Communal Property Association (CPA) and its Consultative Forum all have youth in their executive structures who are involved in the management of the Makuleke Contractual Park. The youths who have been through the CPA's capacity programmes form the majority of the people employed in the concession at management level. However, a lot of work still needs to be done in this area to ensure that there is equal representation of all segments of economically-active people in the community.

There are other options that the community is exploring, such as having fully-owned community lodges in the concession. This will give youth, who are interested in ecotourism, an opportunity to explore potential business ownership in the form of shareholding or other interest stakes.

Youth Action 25: Green jobs in Nigeria's forestry sector

Forests provide sustainable livelihoods for thousands of people in West Africa. Non-Timber Forest Products (NTFPs) are a key part of this support since they provide income for people in rural areas (Fuwape 2013).

Between 2015 and 2018, the Forestry Research Institute of Nigeria (FRIN) trained over 5,000 students from tertiary institutions in Nigeria on sustainable forest practices. The training mostly focused on four alternative livelihood projects established in Omo Biosphere reserve in Ogun State, Nigeria. These were: grass cutter domestication, rearing snails, fish farming, and mushroom production. These enterprises provided direct benefits for over 200 families and indirect benefits to over 1,500 people.

The fish farmers in particular made over NGN5.6 million (US\$17,300) from the enterprise within a short period of time. Additionally, 59 large snail boxes were constructed and each snail farmer given one box and 50 snails together with other essential materials. Six-hundred polybag mushroom spawns were also procured and stocked by students and their teachers in the locality. Four grass cutter houses with several cages were constructed and stocked in four villages within the biosphere reserve. These green economy projects significantly improved the socio-economic status of the people in the locality.

Food for thought

- It is incumbent on African youth to increasingly anchor livelihoods in the intersection between biodiversity and sustainable development because our shared wealth, health and well-being is rooted in this intersection.
- Young people on the continent have the numbers to take game-changing steps that will ensure conservation of the continent's biodiversity. Some of these steps, like ecotourism and NTFPs, can contribute to sustainable livelihoods for Africa's youth.

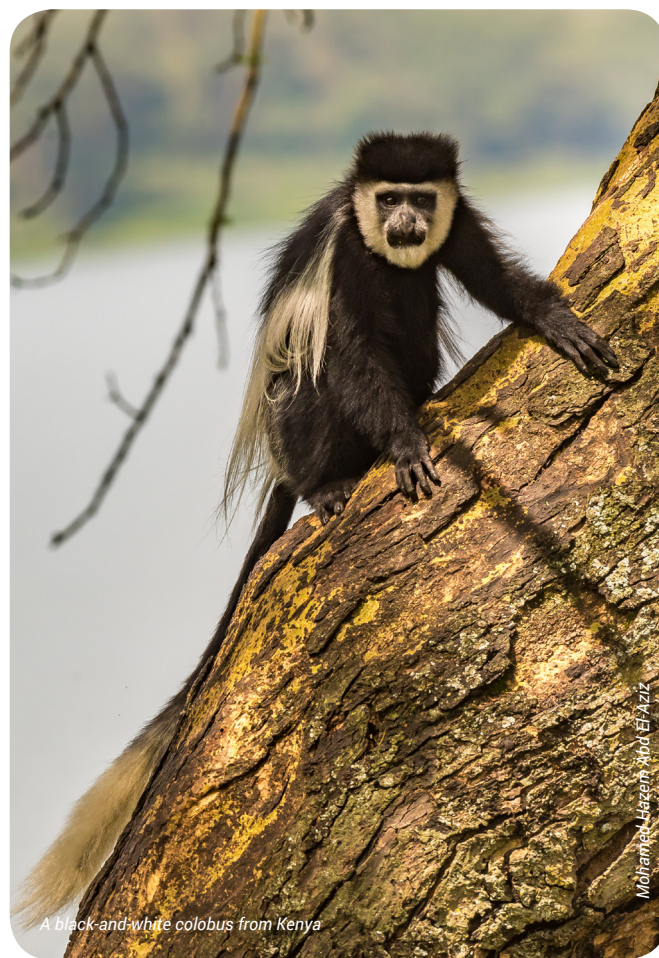
Youth Action 26: Rustika Journeys, a youth-led ecotourism firm in Uganda

Rustika Journeys is an ecotourism firm in Uganda. Rushongoka Wa-Mpiira is a young Ugandan who has embraced eco-tourism and currently works there. He believes that with one successful story after another, more youth from the region will eventually get involved in, and benefit from, ecotourism.

"At Rustika Journeys, our main focus is eco-journeys that revolve around activities that support land restoration and rejuvenation through tree planting. We are no longer focusing on ideal tourism investment norms which have been limited to physical structure and property ownership", Rushongoka Wa-Mpiira. "We took up this practice as a means of reducing the carbon footprint emitted during travelling from bush safaris; airplane

flight; and off-grid trips. While we drive to our destinations, we have zero tolerance to plastics. We vehemently avoid off-road driving while in the park to respect the peace of the wildlife, park rules, and ecosystem".

Through youth engagement and advocacy, this youth-led ecotourism firm acquired a degraded piece of land in Fort Portal, next to Kibale National Park in southern Uganda. The group plans to set up eco-homes, using locally sourced material and eco-friendly designs. However, before they embark on this, they seek to first restore the area using suitable landscaping and ecological designs. "This undertaking is shunned by many investors, but we are more than capable and willing to do it. For the past one year, we have been studying the water systems, wildlife (elephants, primates, birds) and community's perspective about wildlife in the area. We are also promoting secondary succession by planting suitable tree saplings and embracing related ecosystem-based approaches", he says.



A black-and-white colobus from Kenya

Mohamed Hezzen Abd El-Aziz





Transforming African Important Bird Areas into economic opportunity areas for youth

The African continent hosts over 1,300 Important Bird Areas (IBAs) which cumulatively cover an area of approximately 2 million km² ("Important Bird and Biodiversity Areas (IBA) - Africa | BirdLife," n.d.). IBA's wide ranging ecosystem services directly and indirectly benefit both local communities and the broader global community. According to Birdlife Data Zone, approximately 60 gigatons of carbon found in below and above ground vegetation is stored in the global network of IBAs, with some of this carbon stored in forests. Thus, these areas play a significant role in carbon storage and climate change mitigation. Many of the bird species in these areas, are, however, under threat, which underscores the need for IBAs to be conserved consistently.

Ecosystem services within IBAs, include wild goods, cultivated goods and water-related services (Akwany 2015). Wild goods such as fodder and papyrus can provide livelihood when combined

with skilled youth labour and indigenous knowledge. Young and creative Africans can become entrepreneurs by opening and registering cottage industries, co-operatives and NGOs, that would convert goods like fodder and papyrus into economically valuable products such as livestock feeds, mats, thatching material and making furniture for households. Many IBA provide significant ecosystem services which include water, crop production, fishing, wild goods, firewood, recreational services and global climate control (carbon storage).

In addition to providing livelihood options, it is important to take a closer look at bird conservation, a key topic in African biodiversity conservation. Birds are of paramount importance to a variety of production and conservation sectors, including agriculture (pollination and pest control), environmental and wildlife management (game viewing, hunting, monitoring), conservation, and research.

Avian tourism contributes tremendously towards the economy in IBAs, especially since researchers and birdwatchers are more interested in conducting their professional and aesthetic activities around IBAs. If harnessed well, these bird hotspots can be transformed into economic hubs more especially for youth, creating job and entrepreneurship opportunities. With strategic and holistic thinking, local communities and entrepreneurial young people can benefit from these services. According to Birdlife International (2019), IBAs support the livelihoods and wellbeing of local communities. The premises of the IBA can be used for recreational purposes for tourists, where young and skilled community members teach tourists about the traditions and customs of Africa and also form organizations which facilitate income generating bird walks, and bird clubs for tourists.

Despite the opportunities, there remain great challenges and threats to avian fauna. These threats include electrocutions, railway roads collisions, and other human threats (over-harvesting; illegal trade; poisoning; degradation of breeding and nesting sites; and medicinal use). These contravene a myriad of wildlife conventions domesticated in national policies including the Convention on Biodiversity, the African-Eurasian Waterbird Agreement (AEWA), and the Ramsar convention (Schildkrout 1996). Youth can therefore be part of the solution by forming collaborations with policymakers to influence decisions within the IBA, as advocated by Birdlife International from the regional to the global level. Through awareness creation, bird guides and toolkits that focus on transformation of IBA into economic hubs, as opposed to conservation hubs, can offer a win-win solution. Youth can implement the Toolkit for Ecosystem Service Site-based assessment (TESSA) and National IBA Conservation Strategies (NIBACS) to assess ecosystem services within IBA. Youth should strive to consult with national entities, Birdlife International, and other stakeholders of entrepreneurship to implement successfully inductive economic markets within the bird hotspots.



A herd of camels from Sinai, Egypt

Mohamed Hazem Abd El-Aziz

Quick facts

- Twenty-five per cent of the world's biodiversity can be found in Africa (Tittensor *et al.* 2014).
- The biodiversity of Africa's rangelands is so rich that the world's greatest diversity of large mammals can be found in Eastern and Southern Africa's rangelands (Blench and Sommer 1999).
- The African continent hosts over 1,300 IBAs which cumulatively cover an area of approximately 2 million km² ("Important Bird and Biodiversity Areas (IBA) - Africa | BirdLife," n.d.).
- In most African countries, only one tree is planted for every thirty trees that are cut down (FAO 2011). African youth should therefore play a lead in ensuring restoration and a community-based approach to saving our forests.



A migrating flock of swans migrating through Naivasha lake, Kenya

Mohamed Hazem Abd ElAziz

5.5 Conclusion

Africa is synonymous with beautiful natural landscapes and scenery. Biodiverse-rich landscapes spread across each of the continent's 54 countries. Living near or within these landscapes are millions of Africans, most of whom are youth. They are the ones who can act as guardians of these landscapes and protagonists of their restoration. For this to happen, young people in Africa should fully appreciate that their continent's ecosystems and biodiversity are faced with a threat that must be tackled decisively.

Considering that one in five youth globally lives in Africa, young people on the continent have the numbers to take game-changing steps that

will ensure conservation of the continent's biodiversity (United Nations, Department of Economic and Social Affairs 2015). Some of these steps can contribute to sustainable livelihoods for Africa's youth through economic activities revolving around ecotourism and NTFPs (Signé 2018).

Indeed, African youth can rise up to be a restoration- and conservation-minded generation. As they do this, not only will they be saving priceless natural resources and halting environmental degradation with all its detrimental impacts, but also creating green jobs and industries that replenish, instead of deplete, ecosystems and biodiversity. It is therefore critical for youth to be adequately supported as they embark on this journey.

References

- African Union Commission (2006). African Youth Charter. https://au.int/sites/default/files/treaties/7789-treaty-0033_-_african_youth_charter_e.pdf.
- Akwany, L. (2015). Yala Swamp Complex. Accepted Toolkit for Ecosystem Service Site-based Assessment (TESSA) case study, Kenya. <http://www.birdlife.org/sites/default/files/attachments/CS002%20Yala%20Swamp%20Complex.docx>.
- Benn, J. (2010). *What is Biodiversity?*. United Nations Environment Programme. http://www.unesco.pl/fileadmin/user_upload/pdf/BIODIVERSITY_FACTSHEET.pdf.
- Birdlife International (2019). Important Bird and Biodiversity Areas (IBAs). <https://www.birdlife.org/worldwide/programme-additional-info/important-bird-and-biodiversity-areas-ibas>. Accessed 14 July 2019.
- Blench, R. and Sommer, F. (1999). *Understanding rangeland biodiversity*. London: Overseas Development Institute. <http://www.odi.org/sites/odi.org.uk/files/odi-assets/publications-opinion-files/2531.pdf>
- Brito, J.C., Godinho R., Martínez-Freiria, F., Pleguezuelos J.M., Rebelo, H., Santos, X. et al. (2014). Unravelling biodiversity, evolution and threats to conservation in the Sahara-Sahel. *Biological Reviews* 89(1). <https://doi.org/10.1111/brv.12049>.
- Convention on Biological Diversity* (1992), entered into force 29 December 1993.
- Environmental Liaison Centre International (2013). Green Growth. *Ecoforum Journal* 29 (1). <https://www.ecoforumjournal.org/green-growth/>.
- Eritrea Coastal, Marine and Island Biodiversity project (2007). State of the Coast Eritrea, 2006-2007. de Grissac, A.J. and Negussie, K. (eds.). Massawa. http://www.eritreambassy-japan.org/data/State_of_the_Coast_2006-2007_FULL.pdf.
- Food and Agriculture Organization of the United Nations (2011). *The state of food and agriculture: women in agriculture; closing the gender gap for development*. Rome: Food and Agriculture Organization of the United Nations. <http://www.fao.org/docrep/013/i2050e/i2050e.pdf>.
- Food and Agriculture Organization of the United Nations (2015). *Global Forest Resources Assessment 2015: How are the world's forests changing?* Rome: Food and Agriculture Organization of the United Nations. <http://www.fao.org/3/a-i4793e.pdf>.
- Fuwape, J. (2013). Role of forests in poverty alleviation and sustainable development in west Africa. <http://www.fao.org/3/XII/0123-A2.htm>. Accessed 3 September 2019.
- Garcia, N., Cuttelod, A. and Abdul Malak, D. (2010). *The Status and Distribution of Freshwater Biodiversity in Northern Africa*. Gland, Cambridge and Malaga: International Union for Conservation of Nature and Natural Resources. <http://lib.icimod.org/record/14638/files/7057.pdf>.
- Gemedo-Dale, Maass, B.L. and Isselstein, J. (2006). Rangeland condition and trend in the semi-arid Borana lowlands, Southern Oromia, Ethiopia. *African Journal of Range & Forage Science* 23(1), 49-58. <http://dx.doi.org/10.2989/10220110609485886>.
- Greuter, W. (1991). Botanical diversity, endemism, rarity, and extinction in the Mediterranean area: an analysis based on the published volumes of Med-Checklist. *Botanika chronika* 10, 63-79.
- Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (2019). Summary for policymakers of the global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. Diaz, S., Settele, J., Brondizio, E.S., Ngo, H.T., Güéze, M., Agard, J., Arneth, A. et al. (eds.). Bonn: IPBES Secretariat. https://www.ipbes.net/system/tdf/ipbes_7_10_add_1_en_1.pdf?file=1&type=node&id=35329.
- Kenya Wildlife Service (2015). Kisite-Mpunguti Marine Protected Area: Management Plan, 2015-2025. <http://geonode-rris.biopama.org/documents/866/download>.
- Laurance, W.F., Goosem, M. and Laurance, S. (2009). Impacts of roads and linear clearings on tropical forests. *Trends in Ecology & Evolution* 24(12), 659-69. <http://doi.org/10.1016/j.tree.2009.06.009>.
- Maisels, F., Strindberg, S., Blake, S., Wittemyer, G., Hart, J., Williamson, E.A., et al. (2013). Devastating Decline of Forest Elephants in Central Africa. *PLOS One* 8(3). <http://dx.doi.org/10.1371/journal.pone.0059469>.
- Maran, R. and Nedelea, A. (2013). Green Economy: Challenges and Opportunities. *Ecoforum* 6(3). <http://ecoforumjournal.ro/index.php/eco/article/download/643/404>.
- Megevand, C. (2013). *Deforestation Trends in The Congo Basin: Reconciling Economic Growth and Forest Protection*. Washington, DC: World Bank. <http://dx.doi.org/10.1596/978-0-8213-9742-8>.
- Mumba, M. (2018). A presentation at the Global Landscapes Forum. Bonn, June. <http://wedocs.unep.org/xmlui/bitstream/handle/20.500.11822/25563/GLF%20Briefing%20for%20CPR%20June%202018%20FV.pdf?sequence=14&isAllowed=y>.
- Murathe, E. (2018). Seafood Away from Crowds, 22 November. <https://www.businessdailyafrica.com/lifestyle/food/Seafood-Away-From-Crowds/4258338-486466-7u726az/index.html>. Accessed 11 July 2019.
- Nadeson, T., Barton, M. (2014). *The Role of Youth in the Conservation of Biodiversity: WWF-Malaysia's Experiences*. WWF-Malaysia. https://www.researchgate.net/profile/Thiagarajan_Nadeson/publication/260138150_The_Role_of_Youth_in_the_Conservation_of_Biodiversity_WWF-Malaysia's_Experiences/links/0deec52fad9d35ef400000/The-Role-of-Youth-in-the-Conservation-of-Biodiversity-WWF-Malaysia's-Experiences.pdf.
- Nakako, F., Lambrechts, C., Gachanja, M. and Woodley, B. (2005). *Maasai Mau Forest Status Report 2005*. Narok: Ewaso Ngiro South Development Authority. http://wedocs.unep.org/bitstream/handle/20.500.11822/7597-Maasai%20Mau%20forest%20status%20report%202005-2005maasai_mau_report.pdf?sequence=3&isAllowed=y.
- National Geographic (2019). Ocean Threats. <https://www.nationalgeographic.com/environment/habitats/ocean-threats/>. Accessed 11 July 2019.
- Niamir-Fuller, M., Kerwen, C., Reid, R. and Milner-Gulland, E. (2012). Coexistence of wildlife and pastoralism on extensive rangelands: competition or compatibility? *Pastoralism* 2(1), 1-14. <https://doi.org/10.1186/2041-7136-2-8>.
- Painted Dog Conservation (2018). Education and Outreach Programs, 2018. <https://www.painteddog.org/education-and-outreach-programs>. Accessed 15 November 2018.
- Peace Parks Foundation (n.d.). Kavango Zambezi, Peace Parks Foundation. <https://www.peaceparks.org/tfacs/kavango-zambezi/>.
- Quézel, P. (1985). Definition of the Mediterranean region and the origin of its flora. *Geobotany* 7, 9-24.
- Remis, M.J., Robinson, J. and Carolyn, A. (2012). Reductions in primate abundance and diversity in a multiuse protected area: synergistic impacts of hunting and logging in a Congo Basin forest. *American Journal of Primatology* 74(7), 602-612. <https://doi.org/10.1002/ajp.22012>.
- Saunders, D.A., Hobbs, R.J. and Margules, C.R. (1991). Biological Consequences of Ecosystem Fragmentation: A Review. *Conservation Biology* 5, 18-32. <http://dx.doi.org/10.1111/j.1523-1739.1991.tb00384.x>.
- Schildkrout, E. (1996). Kingdom of Gold. *Natural History* 105(2), 36-44.
- Secretariat of the Convention on Biodiversity (2014). *Global Biodiversity Outlook 4: A Mid-term assessment of Progress towards the Implementation of the Strategic Plan for Biodiversity 2011 - 2020*. Montreal. <https://www.cbd.int/gbo4/gbo4/publication/gbo4-en.pdf>.
- Signé, L. (2018). *Africa's tourism potential: Trends, drivers, opportunities, and strategies*. Washington, DC: Africa Growth Initiative at Brookings Institution. https://www.brookings.edu/wp-content/uploads/2018/12/Africas-tourism-potential_LandrySigne1.pdf.
- South Africa, Government Gazette (2004). National Environmental Management: Protected Areas Act. <https://www.golegal.co.za/wp-content/uploads/2017/04/National-Environmental-Management-Protected-Areas-Act.pdf>.
- South Africa, Department of Environmental Affairs (2014). *People & Parks Programme: Celebrating 10 years of Collective Conservation of our Parks*. Pretoria. https://www.environment.gov.za/sites/default/files/docs/publications/peopleandparksprogramme_inclusivseparkmanagement.pdf.
- South Africa, Department of Environmental Affairs (2016a). Rhino poaching statistics update 2007-2015. https://www.environment.gov.za/projectsprogrammes/rhinodialogues/poaching_statistics#2015. Accessed 2 April 2017.
- South Africa, Department of Environmental Affairs (2016b). Transfrontier Conservation Areas (TFCAs): Programme of Work in Protected Areas. <https://www.cbd.int/doc/meetings/pa/paws-2016-01/other/paws-2016-01-day2d-en.pdf>.





- Stiassny, M.L.J., Brummett, R.E., Harrison, I.J., Monsembula, R. and Mamonekene, V. (2011) The status and distribution of freshwater fishes in Central Africa. In *The Status and Distribution of Freshwater Biodiversity in Central Africa*. Brooks, E.G.E., Allen, D.J. and Darwall, W.R.T. (eds.). Gland and Cambridge: International Union for Conservation of Nature. 27-46. <https://portals.iucn.org/library/efiles/documents/RL-67-001.pdf>.
- Tittensor, D.P., Walpole, M., Hill, S.L.L., Boyce, D.G., Britten, G.L., Burgess, N.D., Butchart, S.H.M. *et al.* (2014). A mid-term analysis of progress toward international biodiversity targets. *Science* 346(6206), 241-244. <http://doi.org/10.1126/science.1257484>.
- Torres, J., Brito, J.C., Vasconcelos, M.J., Catarino, L., Gonçalves, J. and Honrado, J. (2010). Ensemble models of habitat suitability relate chimpanzee (*Pan troglodytes*) conservation to forest and landscape dynamics in Western Africa. *Biological Conservation* 2(143), 416-425. <https://doi.org/10.1016/j.biocon.2009.11.007>.
- United Nations, Department of Economic and Social Affairs (2015). Youth population trends and sustainable development. *Population Facts* 2015(1). https://www.un.org/en/development/desa/population/publications/pdf/popfacts/PopFacts_2015-1.pdf.
- United Nations Environment Programme (2001). *The Democratic Republic of The Congo Post-Conflict Environmental Assessment: Synthesis for Policy Makers*. Nairobi. http://postconflict.unep.ch/publications/UNEP_DRC_PCEA_EN.pdf.
- United Nations Environment Programme (2016). *GEO-6 Regional Assessment for Africa*. Nairobi. DEW/1963/NA. http://apps.unep.org/publications/index.php?option=com_pub&task=download&file=012099_en.
- van Riet, W. (2019). Willem van Riet and the Peace Parks Foundation. <https://www.gerbera.org/landscaping-magazine/landscape-sa-index/july-august-2006/willem-van-riet-peace-parks-foundation/>. Accessed 14 July 2019.
- Wit, M. and van Dam, J. (eds.) (2010). *Chainsaw milling: supplier to local markets*. Wageningen: Tropenbos International. <http://www.etfrn.org/file.php/3/etfrn-52.pdf#page=145>.

Chapter 6

Youth Potential for Green Policies





Key Messages

Many environmental policy instruments encourage and provide for stakeholder involvement in both policymaking and implementation. The extensive wealth of knowledge that these stakeholders possess contributes to good policies and strong execution of these policies. Such broad stakeholder involvement is however dependent on the availability of funds and strong leadership.

As key stakeholders in society, African youth must be on the frontlines of environmental policymaking and implementation in Africa.

It is critical for African countries to implement green economy policies that result in increased youth employment. It is, however, incumbent on young people to keep investing in self-organisation that will enable them to contribute optimally towards policy implementation.

Young environmental specialists and scientists are especially well-positioned to make significant contributions towards environmental legislation, for example by filling the data gaps necessary for policymaking.

Making young people part of the policymaking processes could bring in a fresh breath of ideas that would help in successful policy implementation and enforcement.

6.1 Introduction

Youth are capable of proactive engagement in environmental conservation including in terms of environmental policy development and implementation.

Today, there are many youth-led organisations that are working to effectively and sensibly manage the environment. In recent years, climate change effects have drastically increased and this can be felt in all parts of the world to different devastating extents (United States Environmental Protection Agency [US EPA] 2017). In cooperation with governments and NGOs, many young people are effecting change to tackle these issues through national policy development and implementation at the local and national levels. The mobilization and support of youth groups by these organisations have had rather successful results in several areas. These types of collaborations need to be maintained for more achievements.

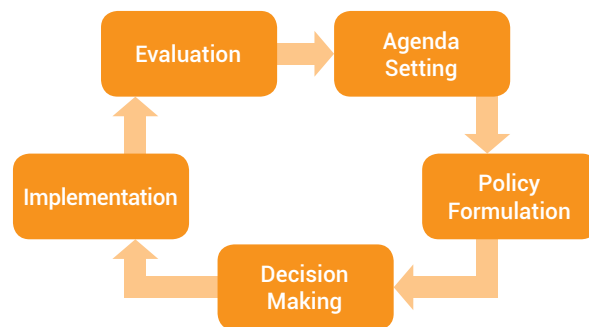
6.2 The policymaking process and youth stakeholders

Environmental challenges are on the rise, often crossing national boundaries (Bleicher 1972; Saxema 2015). The United Nations Environment Programme (UNEP) was established in 1972 and is the leading global environmental authority that sets the global environmental agenda (UNEP 2019a).

The Brundtland Report that set the global sustainable development agenda emphasized that sustainability pathways will require firm policy changes (Hauff ed. 1987). This requires the deliberate unfolding of a policy cycle that often begins with agenda setting. This entails the

identification of a problem or issue that requires government action. After the agenda has been set, options for addressing these problems are explored. Thirdly, decision makers lay out a policy roadmap that must then be executed through policy implementation. Finally, policy results are then evaluated as per initial policy goals. Fruitful policy implementation results from diverse stakeholders whose values and interests may be different. This policymaking process can only succeed if stakeholder dynamics are decisively addressed (UNEP 2009) (Figure 9).

Figure 9: Policymaking Cycle



Source: Adapted from UNEP (2009)



Agenda 21 makes it clear that young people are major stakeholders and should be involved in designing and implementing appropriate environmental policies (United Nations Conference on Environment and Development [UNCED] 1992). In light of this, the United Nations has had a long-standing recognition that youth imagination, ideals, and energies are critical to fostering sustainable development. Because sustainability is anchored in good policies, youth must be involved in policy processes from conception to implementation. Such youth participation is critical because the extent to which policy affects youth capabilities will impact their current and future employment prospects. In this regard, policy that safeguards green jobs is quite critical for the wellbeing of African youth and should be rooted in sufficient data (United Nations 2007).

The Rio+20 Conference further reaffirmed that policy implementation requires the active participation of youth from local communities. Moreover, it is critical for African countries to implement green economy policies that result in increased youth employment (United Nations 2012). It is, however, incumbent on young people to keep investing in self-organisation that will enable them to contribute optimally towards policy implementation (UNEP 2014). Youth contribution should also be supported by good governance that drives stakeholder engagement and ensures successful policy implementation (UNEP 2019b). In order to hold policymakers accountable, youth can use their demographic dominance to ensure that political considerations do not push policymakers to substitute effective policymaking with symbolic action (Howlett 2014).

While there are many success stories of youth action, there are still many young people that lack opportunities for success, as unemployment rates remain high in many African countries. The rate of unemployment amongst Africa's youth is twice that of adults (AfDB 2016). Many of the unemployed are young African scientists yet it is they who are central to the continent's sustainable development quest because they are drivers of innovation and knowledge creation (Beaudry, Mouton and Prozesky 2018). These young scientists need to be empowered and placed in positions where they can contribute towards sustainability. They can conduct research that can be used to inform new policies and bridge existing gaps to ensure its effective implementation.

The beneficial impacts of enforcing environmental management and sustainability are not limited to the environment; they also positively impact the economy. For this reason, the concepts of the green and blue economy have been adopted in many countries to enhance the sustainable use of natural resources for economic growth. These two concepts encompass and address our interconnected systems. In order to ensure continuity in the future development of this process, young people need to be educated, trained, and involved at every level, including policymaking and implementation.

6.3 Bridging the divide between young scholars and environmental legislation

Environmental legislation is the legal framework by which natural resource extraction is governed (Yang and Percival 2009; Guruswamy and Leach 2012). Environmental legislation has become a crucial element of national and international legislation around the world, and is designed to guide the management of natural resources and enable conservation efforts (Kiss and Shelton 1994).

Young scholars are especially well-positioned to make significant contributions towards the legislation that arises from this agenda. They can do this by assisting in provision of the data necessary for policymaking (Crewe and Young 2002). Successful legislation implementation that places emphasis on young scholar's capacity to provide research for future knowledge and development with input from the public can create positive impacts (Guruswamy and Leach 2012). Equally, quality research can yield relevant information that may be approved and implemented by decision makers (Court, Hovland and Young eds. 2005; Sawyerr 2004). Therefore, legislation outcomes based on research with quality information add value to legislation (Court, Hovland and Young eds. 2005). Additionally, data outcomes of practical research from young scholars can be communicated to decision makers and influence the implementation of legislation (Crewe and Young 2002).



A traditional dance of the Maasai Mara tribe that inhabits parts of Kenya and the United Republic of Tanzania

Mohamed Hazem Abd El-Aziz



Capacity building can assist efforts in filling legislation gaps (Bentley, McCarthy and Mean 2003). It involves utilization of human and social capital towards development of capacities required to succeed in developing communities and countries (Bentley, McCarthy and Mean 2003; Blagescu and Young 2006). As such, young scientists could be provided with training opportunities to improve analytical and communication skills. This will require policymakers and scholars to adopt a participatory approach to empower partnerships to strengthen interventions of legislation (Blagescu and Young 2006). Developing a culture of decision makers and young scholars working together may lead to systems of working groups, creating legislation development advantages (Court, Hovland and Young eds. 2005). Associations between young scholars and decision makers can encourage peer learning, creating an environment for knowledge exchange (Keeley and Scoones 1999; Court, Hovland and Young eds. 2005). International organisations dealing with legislation implementation have realised the importance of policymakers making changes as a result of being part of a network led by scholars (Court, Hovland and Young eds. 2005). Effective legislation implementation entails connecting to a network of scholars to improve design, application, and knowledge, well in advance of operationalizing legislation (Neilson 2001).



Youth are key stakeholders

Young scholars can assist with building the political will for approaches to development that integrate environmental and social goals (Gemmill and Bamidele-izu 2012). Affording young scholars the opportunity to fill the data gaps of green legislation can provide employment, exposure to networks, and structured support from partnerships (Jarvis, Ram and Varma 2011). Young people treated as credible partners and collaborators in policy formulation rather than through

ad-hoc approaches to attend small sessions including conferences and meetings can be exposed to great network linkages for the development of communities (Gemmill and Bamidele-izu 2012). Investing resources into young scholars contributes to the achievement of national and international development as well as long-term economic growth, wealth creation and poverty reduction (Blagescu and Young 2006).

Many environmental policy instruments in Africa provide for stakeholder involvement not just in making policies, but also implementing those policies. The extensive wealth of knowledge that these stakeholders possess contributes to good policies and strong execution of these policies. Such broad stakeholder involvement is however dependent on the availability of funds and strong leadership (UNEP 2016).

Need for more assessment on the efficiency of existing legislation

In 2017, Kenya banned the use, manufacture, and importation of plastic carrier bags, in a bid to protect the already choking environment from plastic bags. This ban saw a colossal reduction of plastic bags in the environment in Kenya. However, there have been challenges with the proper enforcement of the ban, with some parts of the country still having bags in circulation.

To gauge if environmental legislations in place are truly working to protect the environment, assessment of these policies should be done to determine their effectiveness and existing loopholes.

Young graduates have time, creativity, energy, and are cost effective. They can therefore be used as research assistants to help in gathering data as the basis of current legislation. They can also help locals understand the policies which in turn makes the adoption process of the policies easier. Moreover, young people are often tech savvy and can use some of this knowledge to make sure that environmental legislations are properly enforced. An environment must be created to allow them to make applications to assist in data collection to properly enforce the legislations in place. Additionally, this in itself becomes a job creation opportunity for youth.

Young people have a wide array of knowledge and skills that are needed in curbing environmental challenges. Making young people part of the policymaking processes could bring in a fresh breath of ideas that would help in proper policy implementation and enforcement.



Food for thought

- Fruitful policy implementation results from diverse stakeholders whose values and interests may be different. This policymaking process can only succeed if stakeholder dynamics are decisively addressed. Agenda 21 makes it clear that young people are major stakeholders and should be involved in designing and implementing appropriate environmental policies.
- Policies that safeguard green jobs are quite critical for the wellbeing of African youth and should be rooted in sufficient data. Data outcomes of practical research from young scholars can be communicated to decision-makers and influence the implementation of legislation.
- In order to hold policymakers accountable, youth can use their demographic dominance to ensure that political considerations do not push policymakers to substitute effective policymaking with symbolic action.

6.4 The potential of young scholars to trigger green legislation

Scholars play a crucial role in fuelling innovation, national development and economic growth (Nicolaidis 2014). Scholarly work has provided knowledge that helps policymakers to clearly see the delineation between what works and what cannot work effectively.

Unfortunately, in Africa, there is not enough investment in research (Kumwenda *et al.* 2017), weak intellectual property protection mechanisms (Sikoyo, Nyukuri and Wakhungu 2006), ineffective ways of disseminating research results, and few opportunities for collaboration and networking (Sawyer 2004; Kumwenda *et al.* 2017).

Young scholars are often isolated from legislative decision-making (Gyimah-Brempong and Kimenyi 2013). For example, during most climate negotiations, African countries often send very small national delegations that are rarely inclusive of youth (Richards 2001). As discussed in the World's Programme of Action for Youth to the Year 2000 and beyond (United Nations, Economic and Social Council 1995), supporting young participation in formulation of policies should be given high priority. In any development agenda, youth should be at the forefront at all levels of policymaking and development planning (Mengistu 2016). This will enrich the debate and policy dialogue, and encourage other young people to participate more fully in their nation's development (United Nations 2006). Finally, creating young professional programmes can help overcome setbacks that might hinder young scholars from participating in decision-making because of lack of practical experience.



Students engaging in birdwatching at Kibaoni Village, United Republic of Tanzania

Youth Action 27: Youth groups catalysing blue economy jobs, Seychelles

With the increasing threats of climate change particularly to SIDS, like Seychelles, effective environmental management policies are crucial to the protection of our coasts. NGOs like the SIDS Youth AIMS Hub (SYAH) and Wildlife Club of Seychelles (WCS) are youth groups playing a major role in empowering and building capacities of young people. They promote participatory governance and provide a platform for young people to actively engage in conservation action and sustainable development decision-making processes nationally, regionally, and globally. Through groups like these, young people are being given a voice and opportunity to contribute towards change.

In 2015, SYAH launched a successful local campaign to ban plastic bags - a major cause of pollution particularly on the coasts of Seychelles' outer islands. The campaign was applauded regionally and supported by numerous local organisations including the government. This achievement and other projects led by this group brought the government and the private sector together to form collaborations, and act on pertinent environmental issues. The ambition and success of this youth group also attracted funding opportunities namely from the British Embassy which granted them a substantial amount of funds to execute a Blue Economy Internship Programme (Belle 2018). This internship has had three effective programmes which have helped to train over 50 young people. These programmes were implemented with the aim of inspiring young people to take up a career in ocean-based economy and to encourage them to identify gaps, and propose ways to bridge those gaps, through innovation within the blue economy sector.

While the term blue economy is relatively new, it is not a new concept to Seychelles which has been benefiting from ocean resources for more than



200 years. However, there is a critical gap in the implementation mechanism of the blue economy concept at the national level. With an Exclusive Economic Zone (EEZ) of 1.37 million km², a land area of 455 km² and a coastline of about 491 km, about 47 per cent of jobs in Seychelles are generated through the ocean (FAO 2014). This is through both the tourism and fisheries sector which are highly dependent on marine and coastal resources, and are the main pillars of Seychelles' economy. Therefore, the primary focus of the Blue Economy department, which falls directly under the Vice President's office, is to invest in youth development to create technical and professional capacities in blue economy related fields. Through the support of the Commonwealth Secretariat, the government of Seychelles is developing a National Blue Economy Strategic Framework and Roadmap to achieve this and also address some of the challenges that exist in the sector. One of the ultimate goals of this roadmap is the creation of high value jobs and local investment opportunities which will benefit a broad range of relevant stakeholders and citizens, including youth (Seychelles Marine Spatial Plan Initiative 2018).

While developments of national strategic frameworks and coastal management policies can increase blue economy jobs, synergies between all environment management policies and plans are needed to prevent overlaps and contradictions in some policies which make them difficult to implement as stakeholder roles are not always clear. Integrated Coastal Zone Management (ICZM) policies, protected area management plans, fisheries policies, and tourism frameworks, are all related, and contribute towards the creation of blue economy jobs. Therefore, youth need to be involved and trained in all these areas for them to make informed and coordinated decisions about the future. More money needs to be invested in the sector by the government especially for capacity building, training of young people, scholarships, and research grants. Young people need to be involved not only in the development of policies, but also in their implementation.

There are many challenges that need to be overcome but young people and youth groups like SYAH and WCS are taking the initiative and affecting change within their communities. Involving youth in decision-making and policy development is how their needs can be identified, and their potential put to use, particularly in the blue economy sector which is the main source of income for small countries like Seychelles.

Quick facts

- It is critical for African countries to implement green economy policies that result in increased youth employment (United Nations 2012).
- Environmental legislation has become a crucial element of national and international legislation around the world, and is designed to guide the management of natural resources and enable conservation efforts (Kiss and Shelton 1994).
- It is imperative that youth from all parts of the world participate actively in all relevant levels of decision-making processes because it affects their lives today and has implications for their futures (UNCED 1992).

6.5 The role of young scientists in ensuring sustainable environmental management

Young scientists should not be discouraged by the monumental task of solving global issues, because global issues in most cases are manifestations of localized problems aggregating into globalized scales. Thus, young scientists can strive towards solving localized problems but with global perspectives in mind.

Youth Action 28: Local Action for a global cause, Ethiopia

Koshe dumpsite was the only dumpsite in Addis Ababa which grew as the town grew in population, and the dumpsite increased up to 36 football pitches (Alex 2018). In 2017, a massive landslide occurred there killing 114 people out of the thousands of people that scavenged the dumpsite. This prompted Samuel Alemayehu, an Ethiopian Engineer and one of The World Economic Forum's 2018 Group of Young Global Leaders, to design Africa's first waste incineration facility (Reppie Facility) which could burn over 1,400 tonnes of waste per day with the following results (Alex 2018):

- Boiling water whose steam is used to power turbine generators to produce electricity;
- Producing about 3 million bricks from the ash;
- Recovering over 30 million litres of water;
- Converting Addis Ababa's CO₂ energy which is equivalent to planting 900,000 trees per year;
- Creating employment; and finally
- Creating pleasant scenery within the area.

Youth Action 29: Young scientists blazing a trail in Ghana

Young African scientists should be fully supported since their efforts can go a long way in making a lasting difference on the continent. The government of Ghana, through its Ministry of Environment, Science and Technology (MEST), for example, has initiated a national young scientist award. The first recipient of this award was Michael Kwabena Osei. He is the first Ghanaian scientist to have discovered three new distinct tomato virus strains associated with Tomato Yellow Leaf Curl Virus (TYLCV) disease in Ghana (Young Professionals for Agricultural Development [YPARD] (n.d.).



6.6 Conclusion

Stakeholder involvement is a central component of policymaking and implementation. As key stakeholders in society, African youth must be on the frontlines of environmental policymaking and implementation in Africa. Indeed, bridging the gap between young scholars and green policymaking, requires appreciation of the need to include issues affecting young people in setting the development agenda. The

potential in young scholars can be tapped through creation of platforms like young environmental professional programmes and the integration of legislative issues in all levels of formal education. Addressing these issues will demand strong collaboration amongst research institutions, governments, and the private sector. These three should consistently strive to move African youth from the side lines of environmental policymaking and implementation, to the frontlines of the same.

References

- African Development Bank (2016). *Jobs for Youth in Africa: Strategy for Creating 25 Million Jobs and Equipping 50 Million Youth 2016-2025*. https://www.afdb.org/fileadmin/uploads/afdb/Documents/Boards-Documents/Bank_Group_Strategy_for_Jobs_for_Youth_in_Africa_2016-2025_Rev_2.pdf.
- Alex, G. (2018) This African City is turning a Mountain of Trash into Energy, 9 May. <https://www.weforum.org/agenda/2018/05/addis-ababa-reppie-trash-into-energy/>. Accessed 30 May 2018.
- Beaudry, C., Mouton, J. and Prozesky, H. (2018). *The next generation of scientists in Africa*. Cape Town: African Minds. <http://www.africanminds.co.za/wp-content/uploads/2018/10/AM-The-Next-Generation-of-Scientists-in-Africa-TEXT-WEB-11112018-1.pdf>.
- Belle, K. (2018). Youth Inclusion in International Decision-Making Processes. Statement to the Oceans4Africa conference 2018. Seychelles, 21 February. <http://syah-seychelles.weebly.com/youth-inclusion.html>.
- Bentley, T., McCarthy, H. and Mean, M. (2003). *Executive Summary in Inside Out: Rethinking Inclusive Communities*. London: DEMOS. <http://www.demos.co.uk/files/insideout.pdf>.
- Berry, W. (2003). *The Art of the Commonplace: The Agrarian Essays of Wendell Berry*. California: Counterpoint Press.
- Blagescu, M. and Young, J. (2006). *Capacity Development for Policy Advocacy: Current thinking and approaches among agencies supporting Civil Society Organisations*. London: Overseas Development Institute. <https://www.odi.org/sites/odi.org.uk/files/odi-assets/publications-opinion-files/156.pdf>.
- Bleicher, S. (1972). An Overview of International Environmental Regulation. *Ecology Law Quarterly* 2(1), 1-89. <https://doi.org/10.15779/Z38W52Q>.
- Hauff, V. (ed.) (1987). *Our Common Future*. Oxford: Oxford University Press. <https://sustainabledevelopment.un.org/content/documents/5987our-common-future.pdf>.
- Crewe, E., and Young, J. (2002). *Bridging Research and Policy: Context, Evidence and Links*. London: Overseas Development Institute. <https://www.odi.org/sites/odi.org.uk/files/odi-assets/publications-opinion-files/184.pdf>.
- Court, J., Hovland, I. and Young, J. (eds.) (2005). *Bridging Research and Policy in Development: Evidence and the Change Process*. Birmingham: Practical Action Publishing. <https://doi.org/10.3362/9781780444598>.
- Food and Agriculture Organization of the United Nations (2014). *The R/V Dr FRIDTJOF NANSEN: A Platform for Collaborative Marine Research in Developing Countries*. Rome. http://newnansen.imr.no/resources/images/prosjekter/nye-dr.fridtjof-nansen/EAF-NANSEN_brochure_2014_En.pdf.
- Gemmill, B. and Bamidele-Izu, A. (2012). The Role and NGOs and Civil Society in Global Environmental Governance. *Global Environmental Governance: Options and Opportunities*. https://www.researchgate.net/publication/228786506_The_role_of_NGOs_and_Civil_Society_in_Global_Environmental_Governance.
- Guruswamy, L. and Leach, M. (2017). *International Environmental Law in A Nutshell*. Minnesota: West Academic Publishing.
- Gyimah-Brempong, K. and Kimenyi, M. (2013). *Youth Policy and The Future of African Development*. Washington, DC: The Brookings Institute. https://www.brookings.edu/wp-content/uploads/2016/06/04_youth_policy_african_development_kimenyi.pdf.
- Howlett, M. (2014). Why are policy innovations rare and so often negative? Blame avoidance and problem denial in climate change policy-making. *Global Environmental Change* 29, 395-403. <https://doi.org/10.1016/j.gloenvcha.2013.12.009>.
- Jarvis, A., Ram, J. and Varma, A. (2011). *Assessing Green Jobs Potential in Developing Countries: A Practitioner's Guide*. Geneva: International Labour Organization. https://www.ilo.org/wcmsp5/groups/public/-dgreports/-dcomm/-publ/documents/publication/wcms_153458.pdf.
- Keeley, J. and Scoones, I. (1999). *Understanding Environmental Policy Processes: A Review*. Sussex: Institute of Development Studies. https://www.researchgate.net/profile/Ian_Scoones/publication/235737520_Understanding_Environmental_Policy_Processes_A_Review/links/561ac05208ae044edbb20dae/Understanding-Environmental-Policy-Processes-A-Review.pdf.
- Kiss, A. and Shelton, D. (1993). *Manual of European Environmental Law*. Cambridge: Cambridge University Press.
- Kumwenda, S. and Bongo, G. (2017). Challenges facing young African scientists in their research careers: A qualitative exploratory study. *Malawi Medical Journal* 29(1), 1-4. <http://dx.doi.org/10.4314/mmj.v29i1.1>.
- Mengistu, M. (2016). The Quest for Youth Inclusion in the African Politics: Trends, Challenges, and Prospects. *Journal of Socialomics* 6(1), 1-5. <http://dx.doi.org/10.4172/2167-0358.1000189>.
- Neilson, S. (2001). IDRC-Supported Research And Its Influence On Public Policy: Knowledge Utilization and Public Policy Processes: A Literature Review. International Development Research Centre. <https://pdfs.semanticscholar.org/698e/eab7bfe8b4647b12d0062a38713df8dd1390.pdf>.
- Nicolaides, A. (2014). Research and Innovation - the drivers of economic development. *African Journal of Hospitality, Tourism and Leisure* 3(2), 1-16. http://www.ajhtl.com/uploads/7/1/6/3/7163688/article_9_vol.3_2_july.pdf.
- Richards, M. (2001). *A review of the effectiveness of developing country participation in the climate change convention negotiations*. London: Overseas Development Institute. <https://www.odi.org/sites/odi.org.uk/files/odi-assets/publications-opinion-files/4740.pdf>.
- Rose, G. (2011). *Gaps in the Implementation of Environmental Law at the National, Regional and Global Level*. Kuala Lumpur: United Nations Environment Programme. <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.472.3667&rep=rep1&type=pdf>.
- Saxema, M. (2015). International Environmental Laws – Concept, Elements And Principles. *International Journal of Research* 3(9), 2394-3629. http://granthaalayah.com/Articles/Vol3Iss9SE/28_JRG15_S09_55.pdf.
- Seychelles Marine Spatial Plan Initiative (2018). *Strategic Policy Framework and Roadmap: Charting the Future (2018-2030)*. Victoria. <https://seymsp.com/wp-content/uploads/2018/05/CommonwealthSecretariat-12pp-RoadMap-Brochure.pdf>.
- Sikoyo, G., Nyukuri, E. and Wakhungu, J. (2006). *Intellectual Property Protection in Africa: Status of Laws, Research and Policy Analysis in Ghana, Kenya, Nigeria, South Africa and Uganda*. Nairobi: African Centre for Technology Studies. <https://www.jstor.org/stable/resrep00103>.
- United Nations (2012). *United Nations Conference on Sustainable Development*. Rio de Janeiro, 20-22 June 2012. New York: United Nations. <https://sustainabledevelopment.un.org/content/documents/733FutureWeWant.pdf>.
- United Nations (2006). *Report on the current situation Youth Delegates to the UN General Assembly*. New York. Available at: <http://www.ebap.org/643-european-cme.htm>.



United Nations, Economic and Social Council (1995). *World Programme of Action for Youth to the Year 2000 and Beyond, Resolution and Decisions adopted by the Economic and Social Council at Its Resumed Substantive Session Of 1995*. 25 October, 2 November and 12 December 1995. E/RES/1995/64. <https://digitallibrary.un.org/record/202231>.

United Nations Conference on Environment and Development (1992). *Agenda 21*. Rio de Janeiro, 3-14 June 1992. <https://sustainabledevelopment.un.org/content/documents/Agenda21.pdf>.

United Nations Environment Programme (2009). *Integrated policymaking for sustainable development: A reference manual*. Nairobi. <https://unep.ch/etb/publications/IPSD%20manual/UNEP%20IPSD%20final.pdf>.

United Nations Environment Programme (2014). *Strengthening UNEP's Legitimacy: Towards Greater Stakeholder Engagement: Perspectives Issue No 11*. Nairobi. http://wedocs.unep.org/bitstream/handle/20.500.11822/7461/-UNEP_Perspective_Series_%e2%80%93Strengthening_UNEP%e2%80%99s_Legitimacy_Towards_Greater_Stakeholder_Engagement-2014ENVIRONMENT_PAPERS_DISCUSSION_11.pdf.pdf?sequence=3&isAllowed=y.

United Nations Environment Programme (2016). *GEO-6 Regional Assessment for Africa*. United Nations Environment Programme, Nairobi, Kenya.

United Nations Environment Programme (2019a). About UN Environment. <https://www.unenvironment.org/about-un-environment>. Accessed 18 June 2019.

United Nations Environment Programme (2019b). *Global Environment Outlook – GEO-6: Healthy Planet, Healthy People*. Nairobi. <http://doi.org/10.1017/9781108627146>.

United States Environmental Protection Agency (2017). International Climate Impacts, 19 January. https://19january2017snapshot.epa.gov/climate-impacts/international-climate-impacts_.html. Accessed 11 December 2018.

Yang T. and Percival, R. (2009). The Emergence of Global Environmental Law, *Ecology Law Quarterly* 36, 615-664. <http://ssrn.com/abstract=1269157>.

Chapter 7

A Positive Outlook





Key Messages

By 2030, the number of African youths will have increased by 42 per cent. However, they face significant economic challenges; accounting for 60 per cent of all unemployed in Africa.

Young people can create a sustainable future that safeguards and multiplies green jobs if they fully appreciate the challenges that can hamstring that future and the immense opportunities it presents.

It is incumbent on African youth themselves to mobilize their demographic dominance, imagination, innovation, and brilliance towards achieving a sustainable future that will guarantee them green jobs and wellbeing.

7.1 Introduction

As the anonymous quote attributed to different sources goes, 'the best way to predict the future is to invent it.' This is particularly important for youth because their young age gives them the largest stake in the future. This chapter explore different futures, and as such, helps to identify the actions needed to realize a desirable future. Young people can, in essence, create a sustainable one that safeguards and multiplies green jobs. But they can only do that if they fully appreciate the challenges that can hamstring that future and the immense opportunities such a future presents.

7.2 Letters from 2063

To envision this future clearly, select African youth have written letters from the year 2063. This is the year at the heart of Agenda 2063, the African Union's roadmap to a better future for the continent.

These letters articulate different environmental scenarios, providing both caution and inspiration. After all is said and done, it is incumbent on African youth themselves to mobilize their demographic dominance, imagination, innovation, and brilliance towards achieving a sustainable future that will guarantee them green jobs and wellbeing.





7.2.1 A Kenyan lady's letter to her 21-year-old self

Dear 21-year old Liza Mungatia,

In 2010, Africa's population was only 100 million, but now we are 2,400 million. In my country, Kenya, half the population now lives in urban centres. I can guess the question in your head is 'why?' Well, we thought that cities were where the real action was, where we could have fun and make money. That is why we finally linked up the big cities on the continent through an elaborate railway line. So right now, you can travel from Nairobi to Dakar by train. I cannot believe that was not possible before! Unfortunately, we solved a transport problem but created many other problems. You see, we had to destroy thousands of hectares of forests and wetlands to make way for the railway. There were other routes but they were costlier, so we settled for the cheapest route and ignored the environmental consequences. How wrong we were! Forest cover is currently at less than 5 per cent, a far cry from the 10 per cent that we once aimed for.

Just last month I travelled to Accra, Ghana, on the trans-Africa high-speed train. When we reached the Congo Basin, I could barely see any forest. It was impossible to believe that Congolese rainforests used to sweep over the entire area way back in 2019. It made me wonder whether we had been faced by a false choice between the trans-Africa railway and the forests.

Was it not possible to have both? I guess we shall never know. But if we could just turn back the hands of time, we could find ways of ensuring that we expand a trans-Africa railway line even as we conserve our forest cover.

Greetings from 2063.

Yours Sincerely,
62-year-old Liza Mungatia, Kenya



Rami Elsayed

7.2.2 A Zambian man's letter to his 21-year-old self

Dear 21-year old Nathan Nyambe,

This current year of 2063 is a little over one hundred years since the wind of political independence swept across Africa. You would think that by now, we would have progressed immeasurably, but sadly, this has not been the case. Africa today remains the poorest continent in the world despite being endowed with precious natural and mineral resources.

Can you imagine that even today in 2063, we are still talking about 'Africa's great potential'? Leaders continue to proclaim that inter-African trade holds the potential to stand out as Africa's gateway to both economic and infrastructural development. I heard those same words back when I was 21 and now when I hear them, they ring hollow.

A big hi-five from 2063.

Yours sincerely,
Nathan Nyambe
P.S. Don't wait for tomorrow to tap into your potential. Start TODAY!



Rami Elsayed



7.2.3 A Zimbabwean man's letter to his 21-year-old self

Dear 21-year old Solomon Mutasa,

In the year 2013, the African Union gathered to seek ways for transforming the continent into a vibrant economic powerhouse that would improve the lives of its sons and daughters. They came up with an epic roadmap for the transformation of Africa within 50 years.

Known as Agenda 2063, this roadmap declared that, "We aspire that by 2063, Africa shall be a prosperous continent with the means and resources to drive its own development with sustainable and long-term stewardship of its resources."

Here we are in 2063. Although many things remain to be done, it is never too late to start over. But if we could just turn back the hands of time, we would ensure that we get started on implementing Agenda 2063 sooner rather than later!

Yours Sincerely,
Solomon Mutasa, Zimbabwe



7.2.4 A Rwandan lady's letter to her 21-year-old self

Dear 21-year old Edith Uwineza,

I am having such an amazing time! Remember what they used to tell us back then, that the future is bright? Well, that future has arrived and it is indeed very bright in a sustainable way. Can you believe that the Great Green Wall created Africa's second largest forest? More than half of the Sahara is now forested and people are living there. In fact, young Africans now migrate to this new forest and not to Europe. They do so because agribusiness and tourism are booming in this area so much, that now it is young Europeans and Americans who are migrating here!

While being on the subject of forests, you will be thrilled to learn that the conflicts that often complicated efforts to conserve the Congo Basin Forests ended three decades ago. As a result, these mammoth rainforests have seen drastic expansion which has greatly boosted ecotourism in the Central African region.

The good news doesn't end there. The River Basins of Congo River, Nile River, Senegal River, Niger River, Zambezi River, and all of Africa's transboundary rivers have seen full restoration. Consequently, fishery and agriculture in these basins has skyrocketed and, in the process, enhanced the livelihoods of millions.

By the way, it now takes only less than 30 hours to travel by train from Cape Town to Cairo; or from Nairobi to Dakar. If you prefer a road trip instead, it will take you a few more hours but you will get there. This drastically expanded transport infrastructure completely avoided disrupting natural ecosystems. Let me just put it this way – our roads and railways rock! It is Pan-Africanism on wheels like you have never seen.

I have a lot more to tell you but am just about to leave my house in Kigali for the 7 PM train to Bamako, Mali.

Find below a painting that will give you an idea about the Africa of 2063.

Luv U,
Edith Uwineza, Rwanda



Food for thought

- Young people can, in essence, create a sustainable future that safeguards and multiplies green jobs. But they can only do that if they fully appreciate the challenges that can hamstring that future and the immense opportunities such a future presents.



7.3 The demographic dividend of a future full of green jobs for youth

Africa's youth population is growing rapidly. It is expected that, by 2030, the number of African youths will have increased by 42 per cent (United Nations 2015). At the same time, youth in Africa face significant economic challenges, with youth accounting for 60 per cent of all unemployed in Africa (Africa Renewal 2013).

Because population growth has outstripped available jobs, many African countries are straining to generate jobs for the youth that are stepping into the workplace. As a result, young people constitute nearly half of sub-Saharan Africa's long-term unemployed (ILO 2015). Such high joblessness undermines Africa's demographic dividend. This rising unemployment stems from diverse challenges that include brain drain, increased automation, reduced need for manufacturing skills, and discordance between employer needs and youth skills (Mthuli Ncube 2018).

To harness demographic dividends and address Africa's high youth unemployment, labour force participation needs to be increased. There is a need for an enabling environment that would allow young people to innovate and, where needed, create their own enterprises. Considering that agriculture employs 60 per cent of the labour force in Africa and accounts for 25 per cent of the continent's GDP, it is important that this sector is prioritized to help absorb most of the youth in Africa facing unemployment (Sustainable Energy for All [SEforALL] 2015).

In addition, more research should be invested in emerging areas like biofuel. The Nigerian Biofuel Policy and Incentives in 2007 was created to enable the entrance of Nigeria into the biofuel sector. A four-year study by Elijah Ohimain unearthed scant progress in ushering Nigeria into a Biofuel economy (Ohimain 2007). This slow progress was occasioned by the failed implementation of policies. As the world continues to debate the sustainability or lack thereof of biofuels, African youth should not shy away from the debate. That way, they will have a large say and stake as the future of such emerging technologies continues to unfold.

Youth Action 30: African youth as key players in renewable energy production, Morocco

Ouarzazate is a city located in southern Morocco. It hosts the world's largest concentrated solar power plant. This plant will ensure that by 2030, more than half of Morocco's energy will be renewable, with solar contributing at least 14 per cent.

I visited the Polydisciplinary Faculty of Ouarzazate (PFO). Founded in 2009, it specializes in renewable energy exploitation techniques and builds the renewable energy capacity of young engineers. While on my field visit, I met Jaouad Ait Rabe, one of the graduates from Ouarzazate PFO University. I was inspired by his entrepreneurial success story in the field of renewable energy and energy efficiency. In 2009, he created the Moroccan Institute for Solar Energy (MISEN).





He says, "After graduating, I decided to found my renewable energy enterprise in the same city. My driving force was to create decent green jobs for youth. Our main objective is to provide a reliable, efficient, intelligent and above all competitive solar service."

This mix of entrepreneurial skills, renewable energy, and youth will entrench youth in a future where they will be key players in renewable energy production.

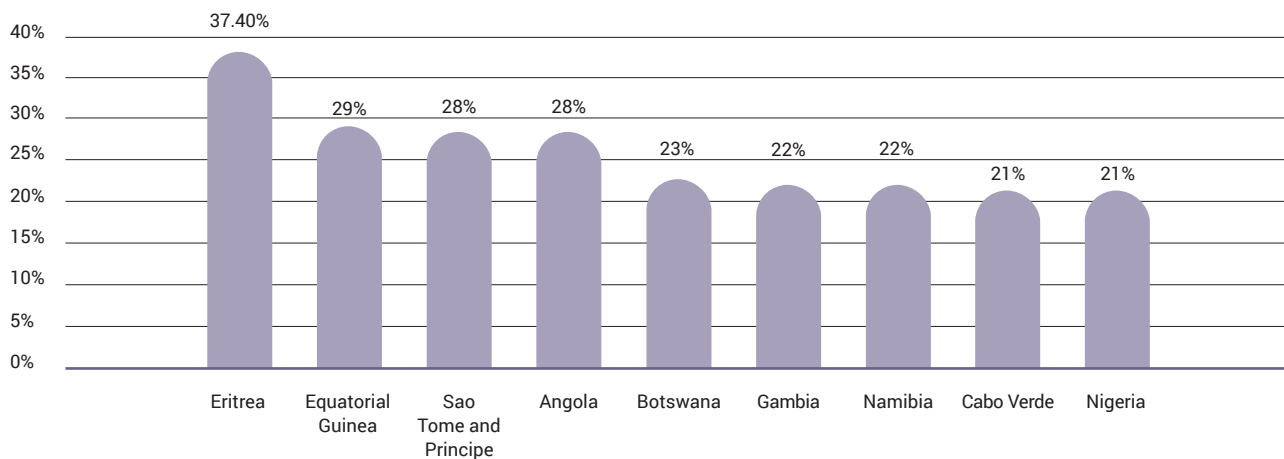
7.4 Rapid urbanization and rural development

Urbanization can improve the welfare of societies. More than 80 per cent of global GDP is produced by the fifty per cent of the global population

that lives in cities (UNDP 2017). However, urbanization often brings its own challenges. For instance, almost 40 per cent of global urban growth takes place in slums, thus worsening economic inequalities and poor living conditions (UNDP 2017). In addition, swift urbanization in coastal cities and river banks increases vulnerability to natural disasters like cyclones, storms, and floods. In order to defend their livelihoods and their future, youth should face such challenges head-on.

By 2050, Africa will have become 56 per cent urban, making the continent's urbanization to be the most rapid in the world (UN DESA 2014) (Figure 10).

Figure 10: Top ten African countries in terms of urbanization rates



Source: World Bank (2019)

That said, Africa's rural areas hold so much potential and too many opportunities for African youth to miss. They hold the key to transforming the agricultural agenda, along with offering African youth the sustainable jobs they need to support their living, while also improving Africa's declining food security. Although many African countries possess large tracts of arable land, between 21 and 37 per cent of the continent's land area is unsuitable for rain-fed agriculture (FAO 2006). Furthermore, a growing population is stifling the available arable land and crippling investments opportunities in that field. More challenges are low yields and land

productivity as a result of land degradation, difficulties with control of pests and diseases, water constraints, poor infrastructure and low investment. Moreover, both local and foreign investors have been pushed away by volatile and insecure environments (FAO 2011).

Innovative agricultural solutions and improved agricultural investments are some of the key areas that need to be addressed in the near future to decrease food imports, as well as improve food security and the lives of millions of farmers and families across Africa.



Youth Action 31: Green start-ups are on the rise!, Egypt

Between recycling, upcycling, waste management, water reuse and green fashion, eco-conscious African youth are building a mosaic of multidisciplinary efforts to protect their environment and improve its quality. Several environmentally-conscious social enterprises are promoting waste management and sustainability, proving start-ups are capable of leading real environmental solutions.

One example is "Mobikyra"; a green interior design studio and upcycled furniture company that specialises in using recycled architecture, furniture, and interiors. It uses materials such as old car tires, aluminium cans, plastic boxes, old electric devices to make impressive furniture that satisfies various tastes.

Another example is "Can Bank"; a start-up that put together a vending machine look-alike that gives users instant rewards like phone credit or promo codes in exchange for their used beverage cans or plastic bottles or allow them to give it away to charity. The machine is available in universities, clubs, malls, etc. The waste is later collected and classified to be recycled safe and responsibly. Not only do such start-ups help improve the environment and its quality, but also, they spread the recycling culture among their communities, inspiring even more youth to contribute to their cause, and motivating their sense of responsibility towards their environment.

References

- Food and Agriculture Organization of the United Nations (2006). Current and potential arable land use in Africa. <http://www.grida.no/resources/7868>. Accessed on July 2018.
- Food and Agriculture Organization of the United Nations (2011). Why Has Africa Become A Net Food Importer?. Food and Agriculture Organization of the United Nations, Rome. <http://www.fao.org/3/a-i2497e.pdf>.
- International Labour Organization (2015). *Global Employment Trends for Youth 2015: Scaling up investments in decent jobs for youth*. https://www.ilo.org/wcmsp5/groups/public/-dgreports/-dcomm/-publ/documents/publication/wcms_412015.pdf.
- Ncube, N. (2018). 'Africa Harnessing the demographic dividend', *The Herald*, 3 April. <https://www.herald.co.zw/africa-harnessing-the-demographic-dividend/>.
- Ohimain (2007). Can the Nigerian biofuel policy and incentives (2007) transform Nigeria into a biofuel economy?, *Renewable and Sustainable Energy Reviews* 22(June 2013), 246-256. <https://doi.org/10.1016/j.rser.2013.01.037>.
- Sustainable Energy for All (2015). Sustainable Energy for All Africa Hub Annual Report 2014-2015. https://www.seforall.org/news/sites/default/files/l/2015/10/SE4AllAR_web.pdf.
- United Nations, Africa Renewal (2013). Africa's jobless youth cast a shadow over economic growth. <https://www.un.org/africarenewal/magazine/special-edition-youth-2017/africas-jobless-youth-cast-shadow-over-economic-growth>. Accessed on July 2018.
- United Nations, Department of Economic and Social Affairs (2014). *World Urbanization Prospects: The 2014 Revision, Highlights*. <https://population.un.org/wup/Publications/Files/WUP2018-Highlights.pdf>.
- United Nations Development Programme (2017). Rapid urbanisation: opportunities and challenges to improve the well-being of societies, 6 September. <http://hdr.undp.org/en/content/rapid-urbanisation-opportunities-and-challenges-improve-well-being-societies>. Accessed on 9 July 2018.
- United Nations, Office of the Special Adviser on Africa (2015). <https://www.un.org/en/africa/osaa/peace/youth.shtml>. Accessed 19 June 2019.
- World Group (2019). World Development Indicators. Accessed 24 September 2019. <https://databank.worldbank.org/reports.aspx?source=2&series=SPURB.TOTL.IN.ZS&country=>

Quick facts

- Africa's youth population is growing rapidly. It is expected that, by 2030, the number of African youths will have increased by 42 per cent (United Nations 2015). At the same time, youth in Africa face significant economic challenges, with youth accounting for 60 per cent of all unemployed in Africa (Africa Renewal 2013).
- By 2050, Africa will have become 56 per cent urban, making the continent's urbanization the most rapid in the world (UN DESA 2014).

7.5 Conclusion

African youth are the biggest stakeholders in Africa's green future. What they do today will have a massive impact on their continent's tomorrow. As such, the future of Africa is in their hands. The time has come for them to be on the frontlines of building a great future where natural resources will be replenished sustainably and green jobs will abound in each of Africa's 54 countries.



Acronyms and Abbreviations

AfDB	African Development Bank	ICZM	Integrated Coastal Zone Management
AEWA	African-Eurasian Waterbird Agreement	IFRCs	International Federation of Red Cross and Red Crescent Societies
AFR100	African Forest Landscape Restoration Initiative	ILO	International Labour Organization
AGRA	Alliance for A Green Revolution in Africa	IMF	International Monetary Fund
ARFA	Association pour la recherche et la formation en agroécologie	IPBES	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
AYICC	Africa Youth Initiative on Climate Change	IPCC	Intergovernmental Panel on Climate Change
CAADP	Comprehensive Africa Agriculture Development Programme	IRENA	International Renewable Energy Agency
CBD	Convention on Biodiversity	ISW	International Secretariat for Water
CIF	Climate Investment Fund	IUCN	International Union for the Conservation of Nature
CO₂	Carbon dioxide	IWRM	Integrated Water Resource Management
COP	Conference of Parties	KNP	Kruger National Park
COPD	Chronic obstructive pulmonary diseases	LDC	Least Developed Country
CPA	Communal Property Association	MISEN	Moroccan Institute for Solar Energy
CSA	Climate smart agriculture	MSW	Municipal Solid Waste
CSAYN	Climate Smart Agriculture Youth Network	NAP	National Climate Change Adaptation Plan
CSS	Community Cleaning Services	NCCP	National Climate Change Programme
DIME	Development Impact Evaluation	NGOs	Non-governmental Organizations
ECOWAS	Economic Community of West African States	NIBACS	National IBA Conservation Strategies
EEZ	Exclusive Economic Zone	NTFP	Non-Timber Forest Product
ELCI	Environmental Liaison Centre International	NWRP	National Water Resources Plan
FAO	Food and Agriculture Organization of the United Nations	OECD	Organization for Economic Cooperation and Development
FIP	Forest Investment Plan	PES	Payment for Environmental Services
FRIN	Forestry Research Institute of Nigeria	PFO	Polydisciplinary Faculty of Ouarzazate
GDP	Gross domestic product	PPP	Public-Private Partnership
GHG	Greenhouse gas	PRDPT	Patterns of Resilience to Drought Project Team
GWP	Global Water Partnership	PV	Photovoltaic
IBA	Important Bird Area	RAJ	Réseau Alternatif des Jeunes
ICEED	International Centre for Energy, Environment and Development	RASA	Real Agricultural Solutions for Africa
		SDGs	Sustainable Development Goals
		SDN	Somali Diaspora Network

SEforALL	Sustainable Energy for All
SIDS	Small Island Developing States
SLM	Sustainable Land Management
SOMYAMDA	Somali Youth Agro-Marine Development Association
SYAH	SIDS Youth AIMS Hub
SYPW	Sudan Youth Parliament for Water
TESSA	Toolkit for Ecosystem Service Site-based assessment
TFCA	Transfrontier Conservation Area
TYLCV	Tomato Yellow Leaf Curl Virus
UN DESA	United Nations Department of Economic and Social Affairs
UN Habitat	United Nations Human Settlements Programme
UNCCD	United Nations Convention to Combat Desertification
UNCED	United Nations Conference on Environment and Development
UNDP	United Nations Development Programme
UNECA	United Nations Economic Commission for Africa
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNICEF	United Nations Children's Fund
UNW	United Nations Water
US EPA	United States Environmental Protection Agency
VMCA	Voluntary Marine Conservation Areas
WASH	Water, Sanitation and Hygiene
WCS	Wildlife Club of Seychelles
WH	Water Harvesting
WHO	World Health Organization
WMO	World Meteorological Organization
WUE	Water-use efficiency
WWAP	World Water Assessment Programme
WYPW	World Youth Parliament for Water
YALI	Young African Leaders Initiative
YPARD	Young Professionals for Agricultural Development



The United Nations Environment Programme's *Sixth Global Environment Outlook (GEO-6) for Youth: Africa* is substantively built on the GEO-6 Regional Assessment for Africa. Themed on green jobs, this youth publication has been produced through the collaborative effort of more than 100 youth writers, photographers, artists, and reviewers from 30 African countries. Drawn from all of Africa's six sub-regions, these young people provide a regional mosaic of practical ideas, insights, analyses, and experiences about the potential of Africa's natural resources to generate multi-sectoral green jobs. As is articulated in the publication, this potential can only be fully tapped into through the initiative of youth themselves, with the support of policymakers and the private sector.



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